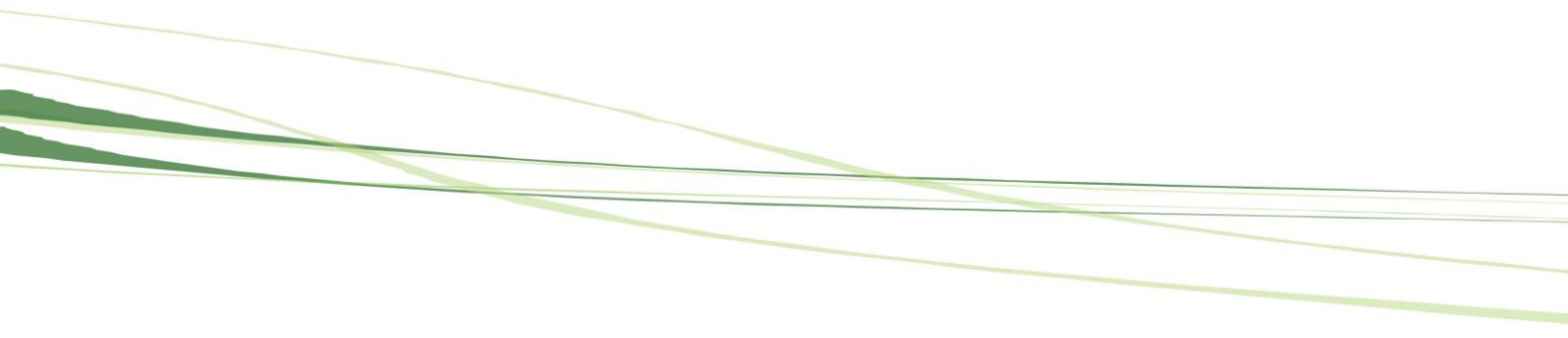


Really Zero?

Stakeholder Perspectives on Policy in England for the 2016 Zero Carbon Homes Target



Dr Dan Greenwood
Governance and Sustainability programme
University of Westminster
November 2010



Contents

Acknowledgements	3
Structure of the report	3
1 Summary of key issues.....	5
2 Background.....	7
2.1 An effective regulatory framework?	8
2.2 An effective policy process?	8
3 Objectives and Scope.....	10
4 Analytical framework.....	11
5 Methodology.....	15
6 Review of Policy for Low and Zero Carbon New Homes.....	16
6.1 How to define a zero carbon home?.....	19
6.1.1 On site or off site renewables?	19
6.2 How to measure energy efficiency?.....	25
6.2.1 A relative or absolute approach?.....	30
6.2.2 Defining the minimum energy efficiency standard	31
6.3 PassivHaus: an alternative design approach.....	33
6.3.1 PHPP: an alternative approach to measuring energy efficiency.....	34
6.4 How to choose building technologies?	36
6.5 How to define emissions reduction targets for different house types?	38
6.6 How to assess water efficiency?	40
6.6.1 Water	40
6.7 How to assess the sustainability of building materials?.....	46
6.8 General views about the Code for Sustainable Homes.....	49
6.9 Is policy being put into practice?	53
6.10 Is policy being informed by monitoring the performance of new homes?.....	56

6.11	Does the industry have the skills?	58
6.12	The zero carbon agenda – a party political issue?	59
7	Summary of policy perspectives	61
7.1	Long term?	61
7.2	Clear?	61
7.3	Flexible?	62
7.4	Outcome-focused?	63
7.5	Innovative?	64
7.6	Inclusive?	64
7.7	Accountable?	67
7.8	Simple?	69
7.9	Joined up?	69
7.10	Robust?	75
7.11	Evidence based?	76
7.12	Outward-looking?	77
7.13	Conflicting interests?	78
7.14	Sufficient resources?	79
7.15	On course for 2016?	80
8	Concluding Remarks	81
9	Future Research	83
10	Appendices	84
10.1	Appendix One: Comment on developments under the Conservative/ Liberal Democrat Coalition Government	84
10.2	Appendix Two: Interviewee details	84

Acknowledgements

I am grateful for funding for this research received from The Quintin Hogg Foundation. I would like to thank colleagues on the Governance and Sustainability programme at University of Westminster whose advice and feedback in relation to this project is much appreciated: Liza Griffin, Tassilo Herrschel, Patricia Hogwood, Simon Joss, Amanda Machin, Peter Newman, Malcolm Rigg and Fred Stewart. Thank you also very much to Jenny Lau at the Policy Studies Institute for her work on the design of this report.

I am extremely grateful to all of my interviewees for taking the time out of their busy schedules to discuss the issues with me. This project would of course simply not have been possible without their participation.

Structure of the report

This report is intended to be read by anyone with an interest in UK policy for sustainable housing. The parts of section 3 which give an introduction to policy are shown in grey boxes. Those readers who already have a detailed knowledge about policy might wish to skip these sections.

The structure of this report is as follows. Section 1 highlights the key findings of the research. Section 2 introduces the background to this research and the main questions addressed. The framework used to analyse policy and the policy process for reducing the CO₂ emissions of new homes is explained. Section 3 explains the project objectives and section 4 introduces the framework for analysing stakeholder perspectives. Section 5 outlines the methodology of this study. Section 6 introduces the key areas of policy and explains the findings of this research about the views of stakeholders. The policy areas covered are as follows:

- The definition of zero carbon, including the balance between on-site and off-site renewables, the target level of energy efficiency and how energy efficiency is assessed
- Some issues concerning the design of buildings
- Further parts of the Code for Sustainable Homes which also concern the CO₂ emissions of homes: water efficiency and the choice of building materials
- General views about the Code for Sustainable Homes
- The system for ensuring compliance with regulations and the Code
- Monitoring the performance of new homes
- Training and skills

Section 7 summarises the views of stakeholders about policy and the policy process, according to the criteria included in the analytical framework introduced in Section 2. Section 8 gives some concluding remarks, while Section 9 discusses the various ways in which this research might be further extended and developed.

1 Summary of key issues

It is widely agreed across the building sector that the 2016 zero carbon homes target is ambitious, yet one that has served to galvanise the industry, encouraging the development of new technologies and products.

The regulatory framework established by the Labour government aims to provide flexibility for designers and developers in terms of the technologies they may choose to adopt in designing low and zero carbon homes. However, there has been widespread concern in the industry about the emphasis of the definition of zero carbon on CO₂ emissions reductions being achieved using 'on-site' renewable technologies. Many practitioners have argued that there is a need to allow greater scope for the use of 'off-site' solutions. For developers building new homes to be assessed in terms of the Code for Sustainable Homes, many stakeholders are of the view that the energy and water parts of the Code for Sustainable Homes, particularly for Code levels 5 and 6, encourages solutions which are economically and environmentally sub-optimal.

A common theme in the views of practitioners is the need for policy for new build housing to be developed in a way that more effectively 'joins up' with other areas of policy such as policy for existing and non-domestic buildings, as well as energy and transport infrastructure. There is a considerable degree of uncertainty amongst practitioners about the inter-relationships between these different areas of policy.

There has also been uncertainty about the definition of zero carbon itself since the zero carbon 2016 target was announced by the Labour government in 2006 and the definition remains to be confirmed. Although government has provided an indication of the direction of policy in general terms, it is often felt that a clearer, more specific outline of future policy and the inter-relationship between policies has been needed sooner, with more advance notice, to allow industry time to adapt and innovate.

Some stakeholders with a close involvement in the policy process are concerned that the sequencing of policy updates and announcements has not always been conducive to achieving a joined up approach to this policy challenge.

Concerns expressed by practitioners highlight cases where the way that targets are set by policy for new homes, such as for energy efficiency, can fail to capture important information. This, they suggest, can distort the decisions of developers and designers seeking cost-effective ways of reducing CO₂ emissions and other environmental impacts such as water use and the impacts of building materials. A widely held view is that there is a need for policy tools to move away from the current approach of defining targets relative to an ideal, pre-defined standard and towards measuring performance in absolute terms – for example, measuring CO₂ emissions in absolute terms.

The objective of the current approach to measuring energy efficiency is to serve as a neutral, impartial method of assessing the CO₂ emissions caused by different low and zero carbon technologies, thus establishing a 'level playing field'. However, stakeholders point out that there is scope for strengthening the robustness of the current methodologies and testing procedures used. Some stakeholders highlight a few cases where they consider the influence of lobbying from some sections of industry to have worked against an impartial regulatory framework being sustained.

An issue often mentioned by practitioners, particularly those directly involved in the policy process, is the need for a stronger evidence base for informing policy and indeed from which industry can draw in working towards the zero carbon target. This involves making available more resources for testing the on-site performance of various low and zero carbon technologies and monitoring the post-occupancy performance of new homes. Many practitioners consider the proposed timescale of achieving zero carbon for all new homes by 2016 to be over-ambitious because of a lack of evidence to support both the definition of regulations and the progress of industry towards the zero carbon target.

There are concerns about some specific features of the approach of the Code for Sustainable Homes as an assessment tool, several of which reflect wider concerns about the current approach in UK policy to assessing energy and water efficiency. Yet there is wide support for the purpose of the Code for Sustainable Homes of encouraging innovation both in industry practice and in terms of how the sustainability of homes is assessed. Some developers do, however, consider the Code to be a significant burden, unnecessarily overlapping with regulatory and planning policy which creates an extra administrative and financial burden.

Some experts and industry representatives have reported favourably on how their views are listened to and appreciated by civil servants in both briefing and committee meetings. However, a primary cause of frustration is where suggestions communicated to government, sometimes which are widely agreed among practitioners, are either not translated into ministerial decisions or take a long time to be incorporated into policy.

Some stakeholders emphasise that the procedures by which the Standard Assessment Procedure (SAP) used for assessing energy efficiency and the Code are updated lacks transparency and accountability. This is a result, some suggest, of these key policy tools being administered and developed by BRE, a private company. However, with BRE working for government on a contract basis, government is ultimately responsible for the remit of BRE.

The recent work of the Zero Carbon Hub, particularly on the minimum energy efficiency standard has been widely welcomed. Participants in this work generally welcomed the way that policy discussions were facilitated by the Hub. However, some stakeholders suggest that there is scope for the Hub to broaden and strengthen its remit to consider related policy areas such as planning and non-domestic and/ or existing buildings.

Some experts from a range of different organisations and sections of industry, with direct involvement in the policy process, wish to see government take a stronger leadership role in establishing a clear direction for policy. The current approach to policy-making, which some describe as 'consensual,' can, they suggest, often result in government seeking to appease all stakeholders, rather than being willing to take a clear stand of its own. The approach during the Labour government was also often one of incremental change. While incremental changes to areas such as SAP and the water calculator have been agreed to be welcome progress, some stakeholders suggest that there has been a need for a more decisive break from previous policy in relation to issues such as the definition of minimum energy efficiency standards and the emphasis of the Code for Sustainable Homes on on-site solutions. Some participants suggest that feature of the policy process such as short term ministerial appointments and a reluctance to be seen as reversing previously established policy have worked against a clearer sense of policy direction being established at an earlier stage.

2 Background

While there is broad agreement on the need to move towards a more environmentally sustainable, low carbon economy, the question of how to achieve this in practice is often the cause of disagreement and political contestation. Defining and delivering specific policies for moving towards sustainability involves addressing various, often complex, choices and trade-offs. This is evident in current debates about how to achieve CO₂ emissions reductions in order to mitigate the problem of climate change. With a focus on this challenge, particularly in relation to policy in England for new housing, this research aims to explore some of these debates, difficulties and opportunities and how they are addressed through the policy process.

In the U.K., buildings account for around 40% of CO₂ emissions¹. Much of the recent focus of policy development has been on new build housing. In 2006, the stated aim of the U.K. Housing Minister was to establish a 'world leading' framework for steering the markets towards the delivery of sustainable, low and zero carbon homes². An ambitious target was set that, by 2016, all new homes built in the UK should be 'zero carbon.' The approach to achieving this target was to incorporate increasingly high energy efficiency standards into the building regulations. Also, the Code for Sustainable Homes, a tool for assessing new housing in terms of a range of sustainability criteria had also been introduced shortly beforehand and soon became associated with the zero carbon agenda. Local planning authorities were given powers to set target Code levels for social housing. Private developers could also opt to achieve certain Code levels, although this would not be mandatory. As further explored by this project, some argue that the strong focus on policy for new build has been at the expense of policy for tackling CO₂ emissions from the existing housing stock. According to one projection cited by government, by 2050 approximately one third of the housing stock will have been built since 2006.³ While there is significant uncertainty and disagreement about what the exact figure will be, new build will constitute a significant part of the challenge of reducing emissions from housing. There is potential for some of the technological learning achieved in the new build sector to inform the development of products for existing buildings, and though the specific products used in these two sectors are often different. Also, it would seem that some of the challenges involved in developing policy discussed in this report, such as reconciling the views of a number of different interests and 'joining-up' different areas of policy, arise in defining policy for both new and existing homes. In this respect there might be some scope for transferable learning. The research reported here focuses on policy for new homes because it is an important example of the policy process seeking to address a complex policy challenge.

Debates amongst economists raise questions about the capacity of central government to define effective regulations. Considerable scepticism about government was expressed during the 1980s, where the case was strongly made for rolling back the state. Yet there is wide agreement, even from advocates of market-based solutions, that ensuring environmental sustainability requires some kind of government action. In relation to a global externality problem, this can include, for example, the introduction of a carbon tax, as introduced in some European countries⁴ or emissions trading schemes such as that established by the EU. Such macroeconomic measures involve significant problems of implementation and political feasibility. Many economists agree that a mix of policies is needed, including investment in emerging technologies and the strengthening of regulations, as well as fiscal measures. The E.U. emissions trading scheme has had a significant impact on industries producing materials used in construction such as cement and bricks. However, in

¹ Carbon Trust, Low Carbon Buildings Accelerators (2010).

² ARUP, New generation of zero carbon homes moves a step closer (2009).

³ DCLG, Proposal to introduce a Code for Sustainable Homes (London: HM Government, 2006b).

⁴ Green Fiscal Commission, How Effective Are Green Taxes? (2009).

terms of the assessment of the design of new homes, a primarily regulatory approach has been adopted.

2.1 An effective regulatory framework?

There are various possible approaches to defining regulations for achieving sustainability objectives in a policy area such as new housing. Some environmental regulations prescribe particular approved technologies, penalising those companies that do not conform. An alternative approach is to define performance standards, allowing industry flexibility in terms of how they are to meet the standard. While the former, prescriptive approach can be simpler to implement, it relies on policy-makers having the expert knowledge about which technologies to prescribe. A performance standard can be considered more suitable where there is a need for a regulatory approach that allows industry to adapt their choice of technologies to particular situations, as is the case with sustainable housing. In this area, there is also considerable uncertainty about the performance of technologies and great potential for innovation which suggests that prescriptive approaches would be problematic. With many describing the industry as conservative and resistant to change, there is also a need for a regulatory framework that encourages companies to voluntarily seek to go beyond the minimum mandatory standard.⁵

Policy in England and Wales for new housing has the objective of steering the housing industry towards the adoption of more sustainable plans, designs and technologies, whilst allowing sufficient flexibility for experimentation and innovation.⁶ Research by the UK Green Building Council shows this approach is widely preferred to the alternative approach of encouraging particular technological solutions.⁷ Designing such a policy framework means that various kinds of policy impacts need to be considered. Even in relation to CO₂ emissions there are numerous factors to be considered. As well as the energy efficiency of the building itself, the CO₂ impacts of water and building materials, transport and energy infrastructure are all significant. Furthermore, while CO₂ emissions are clearly of importance, there are of course a range of other factors that require attention in the planning and design of housing, ranging from comfort and aesthetic appearance, to size and accessibility, to flood risk, pollution and ecological impacts. The question of how to design a policy framework to encourage CO₂ emissions reductions in a way that effectively addresses these other issues can often be the subject of significant contestation. This research explores the views of stakeholders about current policy and their experience of putting current policy into practice, focusing on policies for CO₂ emissions reductions while also considering the inter-relationships between these impacts, to gain insights into whether UK policy is achieving an appropriate balance between steering and flexibility.

2.2 An effective policy process?

The nature of the policy process has a vitally important bearing upon the effectiveness of policy in the face of complex issues such as sustainable housing. There is a need for decision-making processes that draw from the knowledge and insights of a range of different actors. In the case of policy for new homes, the policy process currently draws from the opinions and expertise of a range of different organisations, including numerous representatives from private companies, industry groups and non-governmental organisations. The design and maintenance of the Standard Assessment Procedure (SAP) used in the regulations for

⁵ Neil Gunningham, Peter Grabosky and D Sinclair, *Smart Regulation: Designing Environmental Policy* (Oxford: Oxford University Press, 1998), 39-50.

⁶ DCLG, *Building a Greener Future: policy statement* (London: 2007a), 18, DCLG, *Definition of Zero Carbon Homes and Non-Domestic Buildings: Consultation* (London: HM Government, 2008a), 15.

⁷ UKGBC, *Making the Case for a Code for Sustainable Buildings* (2009), 11.

assessing home energy efficiency is sub-contracted to a private company, BRE, formerly known as the Building Research Establishment when it was partly nationalised. BRE are currently responsible for administering and developing SAP and the Code for Sustainable Homes. Furthermore, a range of advisory groups within government oversee the general management and development of policy. For example, the Department of Communities and Local Government (DCLG) host advisory groups for the Building Regulations and the Code for Sustainable Homes to advise on the general direction of policy, along with their technical sub-groups which focus on specific areas such as energy efficiency and water. A wide range of different stakeholders are involved in these groups, including private companies, industry groups (e.g. Home Builders Federation, Construction Products Association, Good Homes Alliance), and non-governmental organisations, e.g. World Wildlife Fund (WWF). More recently, the Zero Carbon Hub, a semi-independent organisation, has been established by government to advise on the definition and delivery of a strategy for achieving the 2016 zero carbon target. The Hub consists of a small core of permanent staff, as well as numerous experts and practitioners who are co-opted to contribute to their work. While each of these advisory groups can provide recommendations, all decisions require ministerial approval. This project has sought the views of a range of stakeholders involved in these various parts of the policy process, in order to gain insights into the effectiveness of current decision-making arrangements.

3 Objectives and Scope

The objectives of this report are:

- To offer insights into and compare the views held by a selection of stakeholders, from a range of different organisations and with a range of different areas of expertise, about policy for the zero carbon target
- To give insights into the views of these stakeholders about the effectiveness of the processes through which policies are developed and implemented
- To place these views in the context of a framework for analysing policy and the policy process, as detailed in Section 4

The term 'stakeholder' is used in this report to refer to the entire range of different kinds of organisations and actors with an interest in policy for sustainable housing. The category can of course be used to include the public in general. However, the debates discussed in this report primarily involve stakeholders with an active role in the development and delivery of policy and professionals responsible for the design, delivery and assessment of new homes.

The challenge for policy-makers of addressing complex policy challenges such as the zero carbon agenda is discussed in two key government publications, *Professional Policy Making for the Twenty First Century*⁸ and *Better Policy-Making*.⁹ These two publications set out criteria for "modern", "professional" policy-making that form the basis of the analytical framework applied in this research for analysing how stakeholders view policy and the policy process.

Just as assessing the sustainability of homes involves numerous criteria, there are many areas of policy that affect the environmental impact of housing developments. Each area has numerous, often voluminous, government policy documents associated with them, as well as the wide range of reports produced by other organisations. It is beyond the scope of this study to provide a detailed analysis of all relevant areas of policy. The focus is on selected areas which directly relate to reducing the CO₂ emissions of new housing, namely, the zero carbon target, energy efficiency, water efficiency and building technologies. Some of the inter-relationships between these selected policy areas and other criteria for assessing housing are considered. For example, some general issues about energy supply, particularly the balance between on-site and off-site renewables are considered. However, even within the selected areas of focus, there has been a need to be selective in the issues, policy documents and reports analysed. For example, it is beyond the scope of this project to provide an in-depth analysis of views about specific low and zero carbon technologies, including renewable technologies. The areas of policy which are the subject of focus have been selected because they were referred to by interviewees as being of particular significance and concern.

This study focuses on the development of policy between 2006 and 2010 under the Labour government. The development of policy under the new Conservative/ Liberal Democrat coalition government since May 2010 is not covered in any detail (though see Appendix 2 for some comment on the recent course of the policy process). Note also that the 2016 zero carbon target is applicable only to England owing to devolution of power to Northern Ireland, Scotland and Wales and it is beyond the scope of this study to cover the policies adopted by these three devolved regions.¹⁰

⁸ Cabinet Office, *Professional Policy Making for the Twenty First Century* (London: 1999).

⁹ CMPS, *Better Policy-Making* (London: 2001).

¹⁰ An even more ambitious 2011 'zero carbon' aspiration was set by the Welsh assembly but no such target was set by the devolved administrations in Scotland and Northern Ireland. These latter two regions also each manage their own building regulations.

4 Analytical framework

The challenge of complexity for policy-makers has been explicitly acknowledged by government. The Centre for Management and Policy Studies describe this challenge as follows:

“The need for change is multifaceted. The world for which policy-makers have to develop policies is becoming increasingly complex, uncertain and unpredictable. The electorate is better informed, has rising expectations and is making increasing demands for services tailored to their individual needs. Key policy issues, such as social exclusion and reducing crime, overlap and have proved resistant to previous attempts to tackle them, yet the world is increasingly inter-connected and inter-dependent.”¹¹

The two documents published by government establish the following key criteria for evaluating the effectiveness of policy and the policy process, which are of defining importance for the analytical framework applied in this research. The documents include the findings of research assessing the extent to which policy processes in the U.K. currently meet these criteria. The criteria, between which there are of course close inter-relationships, are that policy making should be:

- Orientated towards achieving long-term objectives
- Outcome-focused
- Flexible
- Clear
- Inclusive
- Outward looking
- Innovative
- Robust
- Joined up
- Evidence-based
- Based on regular policy evaluation
- Strategic – looks ahead and contributes to long term government goals

The Cabinet Office report acknowledges that policy-making is often primarily reactive, responding to changes in circumstances rather than taking a longer term, strategic view.¹² The problem of short-termism, it is suggested, can be exacerbated by the focus of ministers on achieving short term results to get re-elected, rather than on medium or **long term** objectives.¹³

A focus on **outcomes** means that policy “aims to deliver desired changes in the real world”.¹⁴ A more specific indication of what is meant by an outcome focus is suggested later with the statement that “having to specify precise outcomes, products and milestones early on helps policy makers to build evaluation into the policy making process from the outset”.¹⁵ This suggests the need to establish clear policy targets, as was strongly emphasised under the Labour government. However, as discussed in Section 7.4 below, there can be significant difficulties involved in defining targets.

¹¹ CMPS, Better Policy-Making, 15.

¹² Cabinet Office, Professional Policy Making for the Twenty First Century., section 3.7.

¹³ Cabinet Office, Professional Policy Making for the Twenty First Century., section 4.2.

¹⁴ Cabinet Office, Professional Policy Making for the Twenty First Century., section 2.4.

¹⁵ Cabinet Office, Professional Policy Making for the Twenty First Century., section 3.8.

As discussed above, there is a need to allow for **flexibility** in how actors achieve these outcomes. The importance of establishing a **clearly defined** policy framework, while not explicitly emphasised by the government review, is nonetheless a pre-requisite for allowing practitioners flexibility. As the government review acknowledges, a clear definition, not only of policy objectives¹⁶ but also working relationships between different areas of government is needed if clarity is to be achieved.¹⁷

For the policy process to be **inclusive** means that it takes account of the interests of all.¹⁸ As is acknowledged, an “increasingly wide diversity of interests needs to be co-ordinated and harnessed”.¹⁹ These include various groups with interests and expertise particularly relating to the policy issue concerned, as well as those who have to implement policy on the ground.²⁰ Of course, the interests of the wider public who are affected by policy also require consideration.

Closely related to the concept of inclusiveness, yet given less emphasis by the ‘Modernising Government’ agenda, is the criterion of **accountability**.²¹ Whereas the former involves a willingness to draw from the opinions and insights of others, the latter means that policy makers provide information about the evidence and processes through which policy is formulated.

An **outward-looking** policy process is one where policy makers seek to take account of and learn from developments in other countries. It can also mean “an awareness of how ... policy can best be communicated to various audiences in the wider world beyond the civil service, not least to the public at large”.²² The need for two-way communication between policy makers and the public means this criterion is closely related to that of inclusiveness.

A further criterion is the extent to which policy-making is **innovative**, meaning that there is willingness to question established ways of working and an encouragement of new ideas²³ and experimentation.²⁴ According to the Cabinet Office report, there is a view that civil service culture does not welcome new thinking or change and outsiders tend to perceive policy makers as inward looking.²⁵ A closely related criterion is the need for a **robust** policy process that “stands the test of time and works in practice from the start.”

A further criterion that is not referred to in the two aforementioned reports but is often raised in discussions about regulatory policy is the need to ensure that regulations are not unnecessarily complicated. In 2005, the Better Regulation Task Force called for UK regulations to be **simplified**, in order to reduce the administrative burden of the current regime and its associated costs for industry. Such simplification, argued, the Task Force, could be achieved either by removing some regulations, or consolidating them where they overlap.

¹⁶ Cabinet Office, Professional Policy Making for the Twenty First Century., section 10.10.

¹⁷ CMPS, Better Policy-Making., p.14.

¹⁸ Cabinet Office, Professional Policy Making for the Twenty First Century., section 2.4.

¹⁹ Cabinet Office, Professional Policy Making for the Twenty First Century., section 2.3.

²⁰ Cabinet Office, Professional Policy Making for the Twenty First Century., section 8.7.

²¹ This concept is briefly mentioned in the *Modernising Government* white paper (p.32), it is not included in the list of criteria given in *Better Policy Making*.

²² Cabinet Office, Professional Policy Making for the Twenty First Century., sections 1.3, 5.1.

²³ CMPS, Better Policy-Making., p.14.

²⁴ Cabinet Office, Professional Policy Making for the Twenty First Century., section 1.6.

²⁵ Cabinet Office, Professional Policy Making for the Twenty First Century., section 6.4.

There is often a need for a **'joined up'** approach to policy making, as is strongly emphasised by the two government reports. This can mean either 'horizontal' joining up between departments, where objectives cut across their areas of responsibility, or 'vertical' joining up between policy-makers and those who deliver and implement policy.²⁶ Achieving such 'joining up' requires consideration of the most appropriate management and organisational structures for delivering such cross-cutting objectives, while developing a rewards and incentives system that encourages and maintains crosscutting working. The Cabinet Office report states that "the importance of joining up effectively is now well understood by policy makers but they are still feeling their way when it comes to how best to achieve it".²⁷ Some feel that 'hierarchical' structures stand in the way and that it is hard to get "buy in" from other departments.²⁸

The importance of policy being **evidence-based** was similarly emphasised by the Labour government. Policy, it is stated, should be designed on the basis of evidence and information drawn from a wide variety of sources²⁹ and experts³⁰. The Cabinet Office report questions whether this is being achieved in practice:

"our interviews revealed anecdotal evidence that little of the research commissioned by departments or other academic research was used by policy makers. There does seem to be a need to ensure that policy makers either have the skills themselves to find and interpret research data, or have access to others who have them (as they do in those departments which have specialised analytical services divisions). The existence and provision of evidence by itself is not sufficient"³¹.

It is highlighted that policy makers might need skills in economics, statistics and relevant scientific disciplines in order to act as 'intelligent customers' when they receive complex policy evidence. One suggestion, supported by some stakeholders interviewed for this research, is that of developing a 'policy researcher' role within government³², which could serve as an interface between policy-makers and various kinds of expert. Policy-makers were said to feel at the beginning of this process of change.³³

As well as drawing from evidence in the initial formulation of policy, there is a subsequent, ongoing need to **evaluate** policy after it has been introduced. However, the Cabinet Office report found that there is a "widespread perception amongst policy makers that the policy process does not put enough emphasis on learning lessons from experience" through regularly evaluating and reviewing existing policies, although the records of different departments on establishing a culture of policy evaluation is mixed.³⁴

²⁶ Cabinet Office, Professional Policy Making for the Twenty First Century., section 9.1.

²⁷ Cabinet Office, Professional Policy Making for the Twenty First Century., section 9.2.

²⁸ CMPS, Better Policy-Making., p.9.

²⁹ Cabinet Office, Professional Policy Making for the Twenty First Century., section 7.1.

³⁰ Cabinet Office, Professional Policy Making for the Twenty First Century., section 7.14.

³¹ Cabinet Office, Professional Policy Making for the Twenty First Century., section 7.7.

³² Cabinet Office, Professional Policy Making for the Twenty First Century., section 7.21.

³³ CMPS, Better Policy-Making., p.22.

³⁴ Cabinet Office 1999, section 10.2.

“The majority of policy-makers who responded to the survey understood the need for modernising the policy-making process and agreed with the aims of the Modernising Government White Paper. There was widespread support for the agenda, and a universal recognition that the civil service had to change if it was to continue to be Ministers' preferred source of policy advice. A small, but nevertheless significant, minority of policy-makers considered that the agenda was not necessarily new”.³⁵

An important issue in understanding the policy process, highlighted by academic research in political science, yet not discussed by the two government reports, is the importance of the potentially **conflicting interests** of the various 'stakeholders' who have an influence on policy. The nature and influence of these interests of course varies for the various types of organisations and their different roles. A further key issue concerns the **resources** made available by government for the development and implementation of policy.

Just as this report does not seek to offer policy recommendations, nor is the aim here to offer a definitive evaluation of the policy process in terms of this framework. The aim is instead to report on the views expressed by stakeholders and relate them to the criteria highlighted. It could of course be that these opinions are heavily affected by stakeholders' views about the *outcomes* of the policy process. Hence, those who are less satisfied with policy are likely to be more critical of the process through which policies were established and vice versa. There can also be expected to be variation in the extent to which different stakeholders feel able to openly express their views, depending on their roles. Given these caveats, it is nonetheless felt important to report here on the views about the policy process which were expressed, in the context of the objectives of this project of gaining an understanding of stakeholder perspectives and identifying key issues for further research.

³⁵CMPS, Better Policy-Making., p.19.

5 Methodology

In order to gain insights into the views of a variety of stakeholders with an interest in policy for sustainable housing, this project has drawn from a range of different kinds of source. These include policy and consultation documents published by H.M. Government and a wide selection of reports and papers published by non-governmental and quasi-governmental organisations and private companies. As the sole researcher on this project, I have attended several practitioner conferences and seminars, including those organised by the Good Homes Alliance, the Concrete Centre, the Princes Foundation and Ecos Trust. Additionally, I attended numerous seminars at the Ecobuild 2009 and 2010 events at Earls Court, London.

I have also conducted 39 interviews with stakeholders from a broad range of professions and roles who are involved in the formation and implementation of policy. The interviews were conducted between March 2009 and October 2010. Interviewees included officials and representatives of national and local government and non-governmental organisations. Many of the interviewees were practitioners with a varied range of expertise and experience. The term 'practitioners' is used in this report to refer to a range of different professionals involved in the delivery of new homes, including housing developers, engineers, architects, building project managers, environmental and economic consultants, Code assessors. 21 of the practitioners interviewed had been involved in the policy committees hosted by government. The interviews involved in-depth discussions about the issues discussed in this report.

It must be emphasised that, given the wide range of different types of stakeholder with an interest in sustainable housing, this report does not claim to provide a representative sample of the opinions of these groups. Instead, the objective is to report on the views and insights of stakeholders about where the key areas of contestation lie and to consider where a degree of common ground between stakeholders is apparent. The aim is not to seek to quantify the extent of such agreement and disagreement across the building industry. Such an aim would be well beyond the scope of this project. (Note that the term 'industry' is used here to include the construction of homes and other buildings, as well as the manufacture of products used by the building sector, including low and zero carbon technologies such as renewable energy systems.) Nor is it an objective of this project to give detailed consideration to quantitative analyses of policy impacts. Neither does the report seek to make policy recommendations but rather to introduce and offer insights into the issues at stake.

A draft of this report was circulated to interviewees in August 2010 and this version of the report has been revised in response to the helpful feedback received.

6 Review of Policy for Low and Zero Carbon New Homes

The building regulations for England and Wales define a set of minimum standards for all new buildings. Since the 1960s, building regulations in the U.K. have specified minimum standards for the insulation of homes. More recently a section of the Building Regulations (Part L) specifically concerned with the Conservation of Fuel and Power has been introduced. The 2002 version of part L specified minimum energy efficiency standards for the building fabric (such as walls, floors, ceilings and windows), as well as for space heating, hot water and lighting systems. Revisions to Part L came into force in 2006 following the introduction of the 2002 E.U. Performance Buildings Directive (EPBD). The EPBD required that each member state establish a methodology for setting a carbon emissions target for the whole building and measuring whether each building had achieved this target. The U.K. already had such a methodology available for measuring the carbon emissions of dwellings, known as the Standard Assessment Procedure (SAP). (Further information about SAP is provided in section 6.2 below). Part L 2006 specified that SAP must be used to assess compliance with the building regulations. SAP was updated in 2005 to ensure that it took into account of the full range of factors, listed by the EPBD, which need to be considered in measuring the energy efficiency of buildings.³⁶



Photo: A development by the Princes Foundation, Upton, Northamptonshire

³⁶BRE, Part L explained (Watford: BRE, 2006b), 15-19.

The levels of energy efficiency required by Part L 2006 represented an average of 20% improvement on Part L 2002, which in turn had been a 25% improvement on the previous regulations³⁷. However, the U.K. government, not least due to their commitments under the 1997 Kyoto Protocol, wanted to go further. In December 2006 they set the ambitious target of ensuring that all domestic buildings, by the year 2016, would be 'zero carbon.' As a set of milestones towards achieving the 2016 target, the government also signalled that the minimum energy efficiency standards in the building regulations for new homes would, in a series of three steps, become increasingly stringent over a period of ten years.

In the months preceding this announcement, the government had supported the development of the Code for Sustainable Homes, an assessment tool for assessing the sustainability of new homes. A key objective for the Code was to encourage innovation across industry towards building more sustainable homes.³⁸ Individual homes are assessed by the Code not only in terms of energy efficiency but eight other categories relating to sustainability: water, materials, surface water run-off, waste, pollution, health and wellbeing, management and ecology. The Code specifies six levels of sustainability which each home can achieve, with Code level six being the highest level of sustainability. For the energy and water categories, a minimum standard must be met to achieve each Code level. Homes are awarded credits according to their performance in each of the nine categories. The sum of these category scores (weighted according to their relative significance) determines the Code level achieved.

As indicated in the table below, the minimum energy efficiency standards for achieving Code levels 3 and 4 correspond to the 2010 and 2013 building regulations standards respectively, while 'zero carbon' is required for achieving level 6.

Year	2010	2013	2016
Energy efficiency improvement (compared to 2006 building regulations)	25%	44%	Zero carbon
Equivalent energy/ carbon standard in the Code for Sustainable Homes	Level 3	Level 4	Level 6

Table 1: Towards the zero carbon target

³⁷ BRE, Part L Explained - The BRE Guide (Watford: BRE, 2006a), 2-3.

³⁸ DCLG, Building a Greener Future: policy statement, 4.

The Code has been developed and administered, under the direction of DCLG, by the now private company BRE, formerly the Government-funded research body known as the Building Research Establishment, as part of their suite of assessment methods for different building types, known as BREEAM (BRE Environmental Assessment Methods). The previous BREEAM tool for assessing new housing was known as EcoHomes. Although the Code is non-mandatory, it is now widely used by local authorities and the Homes and Communities agency, who specify a particular Code level as a requirement for their social housing projects. Also, given the milestones towards the 2016 zero carbon target, which will be mandatory for all new homes, the Code was also expected to attract interest from developers of housing for private sale.

While DCLG also manage Part L of the building regulations, the SAP is managed by a different department, that of Energy and Climate Change (DECC). Energy policy, which is managed by DECC does of course have a significant impact on the carbon cost of new build housing. For example, DECC manage Renewable Obligation Certificates, which require energy suppliers to provide a certain proportion of their electricity from renewable sources. They have also recently introduced Feed-in tariffs, a scheme in which owners of renewable technologies receive income for the renewable electricity they generate, which came into effect in April 2010.

Two other areas of policy managed by DCLG which are of particular significance are:

- Energy Performance Certificates, which rate the energy efficiency of a home and are issued to house buyers.
- Planning policy statements are produced by DCLG to explain statutory provisions and to guide local authorities on planning policy and the operation of the planning system. Statements have been issued on a wide range of topics, relating to sustainable housing policy, including Delivering Sustainable Development (PPS1), Planning and Climate Change (PPS 1 supplement), Renewable Energy and Development (PPS 22) and Flood Risk (PPS 25).

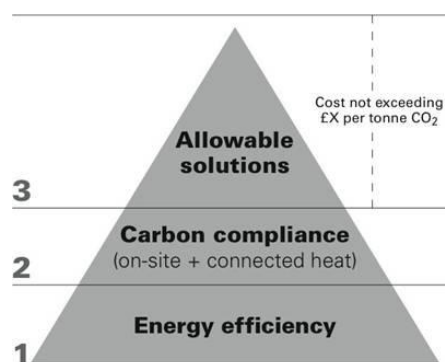
Each of these policies, which are important parts of wider UK energy policy, is an important part of the mix of regulations which affect new housing. Although this report contains some discussion of these areas of policy, the main focus of the research is on the policies which more specifically focus on regulating new homes, including the building regulations, the definition of zero carbon and the Code for Sustainable Homes.

6.1 How to define a zero carbon home?

6.1.1 On site or off site renewables?

Since the government announced the 2016 zero carbon homes target, the question of how to define a zero carbon home has been the subject of widespread debate. According to the original, high level definition offered by DCLG, 'zero carbon' means that the net carbon emissions from all energy use in the home over a year should be zero (DCLG, 2007a, p. 9). This means that all energy used should be compensated for by the generation of energy from renewable sources. This definition left open two important questions. Firstly, concerning the demand side of this net energy use calculation, would energy use caused by cooking and appliances, be included in the calculation of net energy? These are known as 'unregulated emissions' because they are not included in current building regulations. Secondly, which types of energy supply can be included in the calculation?

Regarding the first question, the responses to the DCLG consultation on the zero carbon definition reveals evidence of some disagreement on the issue of whether to include energy from appliances in the zero carbon calculation.³⁹ The second question concerning the supply side of the net energy calculation has been especially controversial.⁴⁰ The widespread discussion on this question is discussed here with reference to the pyramid shown below which has been adopted by the government as a framework for understanding the concept of a zero carbon home.



The three levels of the pyramid indicate three types of measures which could contribute to achieving zero carbon. Reducing the energy demand of a building is of course a fundamental starting point for achieving zero carbon. The first, base layer of the pyramid is energy efficiency. The energy efficiency of the fabric is of course of crucial importance here. Other systems which might also be considered in measuring the energy efficiency of a building include heating and hot water systems. The issue of which systems are included and how their efficiency is measured is discussed in Section 6.2.2 below.

³⁹ DCLG, Definition of zero carbon homes and non-domestic buildings – consultation Summary of responses (London: HM Government, 2009c), 11.

⁴⁰ The later DCLG consultation on the zero carbon definition reveals evidence of disagreement on the issue of whether to include energy from appliances in the zero carbon calculation DCLG, Definition of Zero Carbon Homes and Non-Domestic Buildings: Consultation..

For any home which consumes a positive amount of energy, the only way of achieving 'zero carbon' is to compensate for this energy consumption by generating energy from renewable sources. The second layer, known as 'carbon compliance' measures, refers to the generation of renewable energy and heat on the site of the home itself, by, for example wind turbines or solar panels on the roof of a property. Intuitively, referring to a 'zero carbon home' would seem to imply that the home itself has a net energy use of zero and hence that the renewable energy technologies used are situated on the site of the home itself. This would mean that 'zero carbon' must be achieved through energy efficiency and carbon compliance levels alone. A key question involved in defining zero carbon has been whether to include the third layer shown in the pyramid above. Known as 'allowable solutions,' these are measures for reducing CO₂ emissions which are not achieved directly on the site of the home. This could include, for example, the use of, or investment in, renewable energy technologies situated away from the site of the home itself. These different types of 'off site' measures which might count as 'allowable solutions' are further discussed below.

The concept of 'zero carbon' homes originated from *Bioregional*, an entrepreneurial charity with a prominent role in U.K. debates about sustainability and the built environment. The use of the term by *Bioregional* over three years before the announcement of the 2016 zero carbon target allowed energy generated by off-site solutions to count towards achieving zero carbon.⁴¹ The government seemed initially sympathetic to such a use of the concept, acknowledging the difficulties and potential costs of generating all of the energy required in a home from renewable sources on the site of developments, especially at urban sites with a shortage of space.⁴² Their consultation revealed that there was widespread support for including allowable solutions.⁴³

Shortly afterwards, a definition of zero carbon was published by the Treasury for the purposes of giving tax relief to zero carbon homes. This stipulated that only on-site renewables, or off-site renewable solutions connected to the development by a private wire, would count towards achieving zero carbon⁴⁴. As pointed out by one interviewee, in defining a tax exemption policy, a clear mechanism is needed for assessing whether a home is eligible. Viewed from this perspective, it might not have been feasible to include allowable solutions in the stamp duty exemption, given the uncertainty about how to define them. Some stakeholders also suggested that there was a further financial motive behind the '100% on-site' Treasury definition because it would result in relatively little stamp duty exemption being granted.

⁴¹ Bioregional, *Z-squared: enabling one planet living in the Thames Gateway* (Wallington, U.K.: 2004), 16,62,66.

⁴² DCLG, *Building a Greener Future: policy statement*. P17

⁴³ DCLG, *Building a Greener Future: policy statement*, 15.

⁴⁴ H.M. Treasury, *Statutory Instrument: Stamp Duty Land Tax* (London: H.M. Government, 2007). This definition was published by the Treasury for the purposes of defining which homes would be entitled to Stamp Duty Land Tax relief by virtue of their being a 'zero carbon' home.



Photo: BRE Innovation Park

To maintain consistency with the Treasury definition and also reflecting the case made at the time by some participants in the policy process such as WWF, the Code for Sustainable Homes was defined to not give credit for the use of off-site renewable sources without a private wire connection. This definition, which effectively meant a requirement for 100% carbon compliance, did receive support from some key consultants and designers with specialist expertise in this area such as Bill Dunster, the architect who designed the well known 'BedZed' housing development in Surrey. It was also supported by the World Wildlife Fund which has had an active role in the policy process in relation to this issue. While these stakeholders accept the need for off-site solutions, they emphasise that, given the urgency of the climate change challenge, these solutions be adopted in addition to, rather than instead of, on-site solutions. These stakeholders argued that a regulatory emphasis on 'on site' solutions would encourage innovation, leading to a reduction in the cost of on-site renewable technologies. The Code, after all, as some interviewees emphasised, is a set of voluntary standards intended to encourage development and innovation above the regulatory minimum. The aim was for the learning from building to the Code to inform changes to the building regulations. While on-site renewables are needed to achieve Code levels 5 and 6, there were, one interviewee commented, only expected to be very few homes built to these highest Code levels by now.

The 'Merton Rule', named after the London borough that initially formulated it, had the same emphasis, requiring that 10% of the energy required by new developments be generated from on-site renewables. The Rule was adopted, though in various different forms, by around 325 of all 390 local authorities in England.⁴⁵

In 2008, the U.K. Green Building Council produced a report which showed that the requirement for 100% carbon compliance had been the subject of considerable criticism from house builders who questioned the cost and feasibility of such a target.⁴⁶ Their report demonstrated that this '100% on site' definition of zero carbon could not be achieved by 80% of sites because of the costs and practical difficulties of on-site renewables, particularly on small developments. According to one interviewee with an involvement in the policy debate at the time, this was in the context of evidence emerging about technologies such as small wind turbines being found to not be as effective as first thought. The UK Green Building Council (UKGBC) argued that "non private wire, near-site solutions" should count alongside on-site renewables towards achieving carbon compliance⁴⁷.

In June 2008, following the recommendation of the Callcutt review of housing, the Zero Carbon Hub was established. The Hub is an organisation intended to promote and facilitate the transition of the building sector towards this target. In December 2008, the government soon launched a public consultation on the definition of zero carbon. Responses to the consultation were broadly favourable to the idea of including 'allowable solutions' within the zero carbon definition. Only 11% of respondents supported a requirement of carbon compliance achieving 100% of CO₂ emissions reductions, with 43% of respondents favouring a 44% target and 46% favouring 70%.⁴⁸ The greater flexibility offered by allowing 'off-site' renewables and other allowable solutions to count is widely favoured. Interviews for this research also reveal that the incorporation of the 'site connection' definition into the Code caused a significant amount of concern from a wide range of stakeholders.⁴⁹ Following the UKGBC report, the position of the World Wildlife Fund (WWF) during negotiations, having previously supported 100% carbon compliance, was to accept the case for allowable solutions being incorporated into the zero carbon definition.

⁴⁵ Interseasonal Heat Transfer, The Merton Rule affects major development projects (2010).

⁴⁶ UKGBC, Zero Carbon Task Group Report (London: UK Green Building Council, 2008a), 4.

⁴⁷ UKGBC, Zero Carbon Task Group Report, 31.

⁴⁸ UKGBC, Zero Carbon Task Group Report, 11.

⁴⁹ This conclusion is supported by the findings of UKGBC (p.19) and NHBC (p.x)



Photo: BRE Innovation Park

The 'zero carbon' target is widely thought of as an appealing 'sound bite' which caught policy-makers' imagination and has had a significant impact in terms of galvanising the industry. However, the target is also considered unrealistic by many, sometimes even nonsensical. One consultant expressed this view by saying that the "urge for a simple message" has caused us to walk "around the wrong avenues," referring to the emphasis placed on on-site renewables in current policy, as evident in the Code. Interviews conducted for this research reveal that staff at BRE were not all in favour of the '100% on site' definition introduced by the Treasury. Discussions about the feasibility of such a target were taking place before this definition was incorporated into the Code. Given that many sites face considerable difficulties in generating energy through on-site renewables and hence achieving zero carbon on site, some stakeholders question whether the policy goal is most appropriately defined as 'zero carbon'. Some suggest that the phrases 'Net zero carbon' or 'No new carbon' would be more appropriate, as they would more explicitly acknowledge the need to account for allowable off-site solutions. A further point stressed by some practitioners is that the primary objective of policy should be to reduce energy use, rather than CO₂ emissions reductions per se. An objective of energy reduction does of course entail a reduction in CO₂ emissions, while also reflecting the importance of using renewable energy efficiently, given its limited availability.

The Merton Rule was also the subject of criticism from some interviewees. A case in point was one interviewee who had initially been supportive of the rule but explained that (s)he had since experienced the practical difficulties that it creates on some sites. Also, two developers interviewed strongly emphasised the problems that can arise in trying to reach the percentage renewables targets set by local authorities. These targets, one pointed out, can conflict with achieving the Code because some low carbon technologies such as gas Combined Heat and Power achieve Code credits but are not classed as renewable. One interviewee considered local authorities to lack sufficient understanding of the implications of the renewables targets they are setting. One local authority (s)he worked with had, for example, refused permission to the use of solar thermal on a site due to its visual impact and to biofuel deliveries to another site, without taking into account the difficulties this created for the developer seeking to achieve the renewable target in an economically viable way. This developer also complained that the local authority had not consulted with them on the economic impact of the planning decision in relation to this development. Another developer commented that other planning requirements, such as those relating to design,

can make it unfeasible to reach renewable targets. One local council had, (s)he explained, not allowed them to place solar panels on the front of the roof because it conflicted with their design objectives, even this would have been the most effective position for the panels.

In July 2009, after the consultation on the zero carbon definition, the Housing Minister John Healey announced that the carbon compliance level would be set at 70% of regulated energy use. Yet the debate on this issue continued. Some practitioners, with a role in policy discussions, emphasised the need for further research to inform this policy decision. These included developers and some consultants who consider 70% to be too challenging as a minimum standard and still not offering sufficient flexibility. Interviews for this research suggest that developers tend to prefer a reduction to 44%, the minimum standard for 2013. Developers point to the practical and economic difficulties of achieving 70% on site, particularly for small sites. As one developer put it, for larger sites of over 1000 units it is far more feasible to build larger scale renewables.

The July 2009 statement left open the question of the kinds of 'allowable solutions' which could count towards achieving zero carbon beyond the required 70% carbon compliance level. However, the minister did indicate that the following allowable solutions had received broad support in responses to the consultation⁵⁰:

- Further carbon reductions on site beyond the regulatory standard. This might be achieved, for example, by higher levels of fabric efficiency, connected heat, or on-site renewable energy technologies.
- Energy-efficient appliances meeting a high standard which are installed as fittings within the home. The details of the kinds of appliances which could count remain to be confirmed but they might include washing machines, fridge freezers, waste water heat recovery units and mechanical ventilation and heat recovery units.
- Advanced forms of building control system that reduce the level of energy used in the home. These might include, for example, whole house control systems which can quantify energy savings, or partial systems such as lighting and heating systems.
- Export of low carbon or renewable heat from the development to other developments;
- Investments in low and zero carbon community heat infrastructure.

The consultation responses highlight a range of questions and concerns about how such allowable solutions will be defined, delivered and implemented. There is stated to be wide concern from housing developers and designers about whether they have the knowledge and expertise required to select and deliver allowable solutions. In this context, it is suggested, there is a danger that developers would simply select the cheapest option, rather than adequately considering the sustainability implications⁵¹. Another important issue, concerning implementation, is ensuring that the CO₂ savings credited to an allowable solutions project are truly 'additional,' meaning that they would not definitely have been achieved in the absence of the project. Hence there is a need to ensure that savings resulting from other policies and regulations, such as renewable obligations certificates and planning regulations are not double counted with the introduction of allowable solutions.

⁵⁰Building Sustainable Design (2009) "CLG publishes zero carbon homes definition

" Building Sustainable Design

⁵¹ DCLG, Summary of Responses to Consultation on Definition of Zero Carbon Homes and Non-Domestic Buildings (London: HM Government, 2009a), 49.

There are further issues still to be resolved in defining allowable solutions. A key decision is the level at which the price of carbon is to be set. WWF, for example, advocate a relatively high price for carbon to ensure that there remains a strong push towards innovation in on-site renewables. There is a need to decide on the number of years over which emissions reductions will be calculated. In the case of communal low and zero carbon sources, there is a need to decide how to allocate emissions reductions achieved between individual dwellings. As one engineer interviewed put it, there is currently “no robust methodology” for calculating this. Another interviewee, involved in discussions within the Hub, strongly emphasised that defining and implementing allowable solutions is a significant challenge, given the complexity involved. As further explored in section 6.11, there are questions raised about whether industry currently has the expertise required to address this challenge.

Some experts argue that the current definition of allowable solutions contains inconsistencies, which entails a risk of the industry under-delivering on important, legally binding emissions targets. They refer to the economies of scale and greater simplicity and certainty that could be achieved by pooling funds for allowable solutions into a larger scheme⁵². Such a centrally administered fund, they suggest, could take a more strategic approach to the planning and delivery of off-site energy generation and the setting of a price for off-site measures.⁵³ This would remove the need for developers to have to speculate about the potentially variable cost of a range of different allowable solutions, as might be required under the policy proposed in the consultation. This idea of a community energy fund was strongly supported in the consultation⁵⁴. Some interviewees suggested that there is support for this idea in some government departments but not within the Treasury where such a measure would be viewed as being too much like a tax. Several stakeholders interviewed emphasised the importance and relative urgency for these questions about the definition of allowable solutions to be resolved. This issue concerning the clarity of policy is further discussed in Section 7.2 below.

6.2 How to measure energy efficiency?

In the U.K. regulations, the energy and carbon performance of buildings must be calculated for compliance purposes using the National Calculation Methodology, which specifies how the calculation is to be performed and the software to be used. For dwellings, the calculations are based on standardised assumptions for factors such as number of occupants, heating patterns and room temperatures. Part L specifies that the estimated CO₂ emissions for a building, known as the 'dwelling emissions rate,' (DER), be compared with the emissions from a hypothetical 'notional' building of the same size and shape, referred to as the 'target emissions rate' (TER), expressed as kgCO₂/m²/year. Part L requires that the DER is equal to or better than the TER. As the zero carbon target approaches, the TER will reduce as the building regulations become progressively stringent (as shown in Table 1 above). For dwellings, the Standard Assessment Procedure (SAP) is used to calculate the DER and TER. The SAP method for calculating the DER and TER takes into account the annual energy consumption, and associated CO₂ emissions, for space heating, water heating, ventilation and lighting. SAP is based on a series of facts and assumptions about the energy efficiency of a variety of different types of building materials, dwelling designs and service technologies.

⁵² E.g. Fulcrum Consulting, Fulcrum's Dream Definition of Zero Carbon Buildings (2009b).

⁵³ Note that, the Conservative housing minister Grant Shapps, appointed after the May election, has since announced plans to set up such a community energy fund. Jonathan Tilley (2010) "Shapps to set up community energy fund," Building magazine

⁵⁴ DCLG, Summary of Responses to Consultation on Definition of Zero Carbon Homes and Non-Domestic Buildings, 49. The idea was also supported by some interviewees for this project.

In calculating the TER for a dwelling, 'CO2 emissions factors' in SAP are used which indicate the assumed rate of CO2 emissions for different sources of energy. As well as taking into account available data about direct and indirect emissions, caused by the production and consumption of different fuels, the methodology for calculating emissions also includes a forecast, or 'forward look' about the likely carbon intensity of fuels in the coming 5 years. Achieving the TER is more demanding for dwellings with heating systems using more 'carbon intense' fuels, such as electricity and oil. However, the regulations include a 'fuel factor' that has the effect of increasing the TER for such dwellings with electric heating, thus making it easier for them to achieve their target than it would otherwise be, although still more difficult than for dwellings with gas heating.

Some experts have made a number of different criticisms of Part L and SAP, questioning whether they provide a suitable framework for evaluating progress towards zero carbon. SAP was originally developed in the 1980s from a study of poorly insulated, energy inefficient homes⁵⁵. Many stakeholders are of the view that the SAP model had been a satisfactory tool for the purpose of assessing standard buildings of the kind being built before the zero carbon agenda was introduced. However, there are doubts among a significant number of experts about the suitability of SAP for assessing buildings with a high level of energy efficiency, as required with the 2016 zero carbon target approaching. In particular, it is suggested that some of the parameters of the SAP model are not sufficiently accurate to model such high performance buildings. The recent 2009 update to SAP, as explained below, has sought to address a number of such issues.

One problem, highlighted by several interviewees, concerns the relationship between SAP and the Code for Sustainable Homes. The Code uses the methodology of calculating the DER relative to TER as the basis for awarding energy credits. As explained above, even with the 'fuel factor' specified in Part L, it was more challenging for dwellings using electricity or coal-based heating to satisfy the minimum building regulation standards than for those using gas heating⁵⁶. While the fuel factor might be considered to ensure a suitable minimum standard for these dwellings, the TER/ DER methodology in Part L is also used to assess the Code level of homes and here the fuel factor has a consequence of which many practitioners have been critical. This is that, in relaxing the TER, the fuel factor has the effect of making it easier to achieve Code levels 3 or 4 using electricity rather than gas heating (because of the higher TER for dwellings with electric heating), even though the carbon intensity of electric heating is currently higher than gas in the UK.⁵⁷ As a result, in order to achieve a higher Code level, some developers have installed electric heating in homes, even though they could have access to gas, a fuel which entails lower CO2 emissions. Many practitioners are aware of this 'Code 4 loophole,' which has been the subject of comment in the industry press.⁵⁸ One reason given for the introduction of the 'fuel factor' was to ensure that those properties which are "off the gas grid or in blocks of flats where a gas service to each apartment is not a preferred choice"⁵⁹ are not excessively penalised. Another motivation referred to by some stakeholders is the need to provide some protection for the manufacturers of electrical heating systems, an important industry within the UK.

⁵⁵ AECB, Projecting Energy Use and CO2 Emissions From Low Energy Buildings - A Comparison of the Passivhaus Planning Package (PHPP) and SAP (AECB - The Sustainable Buildings Association, 2009b).

⁵⁶ BRE, Part L explained

⁵⁷ In one example a flat has 18% greater emissions at CSH level 3 than the same flat with gas built to 2006 Building Regulations. Neil May and Peter Warm, Code for Sustainable Homes (CSH): Technical comments re levels 3 and 4 - energy (Good Homes Alliance, 2008).

⁵⁸ Chloë Stothart (2008) "Code for Sustainable Homes: Sometimes things aren't as green as they seem," Building magazine

⁵⁹ DCLG, Building Regulations - Energy efficiency requirements for new dwellings: A forward look at what standards may be in 2010 and 2013 (London: HM Government, 2007b).

Of course, the sustainability of electricity itself depends on the carbon intensity of the means by which the electricity is generated. Some stakeholders strongly emphasise the potential for 'greening the grid' through the increased use of low carbon sources of energy such as renewable technologies. The need to take account of this potential is particularly stressed by manufacturers of products and systems using electricity, such as electric heat pumps, mechanical ventilation systems and air-conditioning units, in order to emphasise the potential benefits of their products in terms of achieving CO₂ emissions. Some interviewees point out that this goal of decarbonisation is a longstanding one and are sceptical about how soon it will be achieved, given the limited progress made so far. The issue of the assumptions made in regulations about the future greening of the grid and other fuels also involves taking into account that the producers of other fuels have plans to decarbonise. Some interviewees emphasise that this is an example of where the policy for building regulations needs to 'join up' with energy infrastructure policy.

A recent set of updates to SAP, released for consultation in 2009 and to be introduced from October 2010 have been introduced with the objective of improving the accuracy of SAP as a means of assessing the energy efficiency of dwellings.⁶⁰ One of the key changes in SAP 2009 is that it takes into account recent evidence that significant levels of heat loss occur through 'party walls' (i.e. walls which divide two adjacent dwellings). Previously, SAP assumed zero heat loss through party walls, an assumption that, as one engineer suggested, seemed to have been made because the air temperature could be expected to be the same either side of the party wall. However, this engineer explained that this assumption has since been found to not give adequate consideration to the air inside the cavity within a party wall. Research undertaken by Leeds Metropolitan University revealed that party wall heat loss can in fact be twice as high as emissions from an external wall⁶¹. As a consequence of being revised to account for such heat loss, the CO₂ emissions of a given dwelling predicted by the SAP model has now increased.

SAP 2010 contains several other modifications to the way in which energy efficiency is measured. There are changes to the way the effect of 'thermal bridging' is measured. Thermal bridging, a significant cause of heat loss from a building, occurs where a thermally conductive material, such as a metal fastener or a concrete beam, slab or column, penetrates or bypasses an insulation system.⁶² Another significant change in SAP 2009 is that explicit account is now taken of the effect of 'thermal mass,' which means the ability of construction materials to absorb, store and release heat, which can help to keep a building warm in winter and cool in summer. SAP 2009 also contains revisions to the assumptions concerning average temperature (to account for seasonal variations), boiler efficiency and the energy use entailed by hot water consumption. Another SAP 2009 revision concerned the heat gains from lights, appliances and other incidental gains. SAP was previously based on the assumption that the light bulbs and appliances installed would be of a standard kind rather than the more energy efficient alternatives which have become available in recent years. SAP 2009 assumes lower internal heat gains from such appliances in order to encourage house-builders to install more efficient alternatives.

⁶⁰ BRE, The Government's Standard Assessment Procedure for Energy Rating of Dwellings (2009 draft) (London: 2009b).

⁶¹ R Lowe, J Wingfield, M Bell and J.M. Bell, "Evidence for significant heat losses through party wall cavities in load-bearing masonry construction. Building Services Engineering Research and Technology," Building Services Engineering Research and Technology 28(2) (2007): 161-181,

⁶² A thermal bridge can be defined as "a thermally conductive material which penetrates or bypasses an insulation system; such as a metal fastener, concrete beam, slab or column" REN Solutions, REN Solutions - Building and dwelling thermal imaging (2010).

The responses to the SAP 2009 consultation and interviews conducted for this research indicate that most of the updates discussed above that were subsequently included in SAP 2009, were widely viewed as welcome steps forward.⁶³ One issue, emphasised by some experts to be where further development of SAP is needed, concerns the possibility of overheating in buildings with high levels of air tightness. This potential problem was mentioned by some interviewees for this project and has been highlighted at some seminars for practitioners as having important implications for the comfort and health of housing occupants⁶⁴. The need for further research on the problem of overheating and the further development of SAP in relation to this issue is stressed in a recent report by the Zero Carbon Hub.⁶⁵

The adjustment to SAP to account for heat loss through a party wall was emphasised by some interviewees to be especially significant in terms of its effect on SAP ratings. While discovery of this important issue was welcomed, concern was expressed that this change to SAP could create problems for measuring progress towards the goal of achieving, by 2010, 25% reductions in CO₂ emissions compared with 2006. The change would have the effect of relaxing the TER in terms of which Part L 2010 would measure the energy efficiency of a home. This, it was pointed out, would make it easier to achieve the 25% reduction. Indeed, it was suggested that much of the target reduction would be achievable by filling and sealing cavity walls to prevent party wall heat loss. Some practitioners remark that such measures are not trivial and will lead to substantial change to industry practice. However, because SAP 2006 assumed zero heat loss through a party wall, addressing the party wall problem does not constitute the kind of improvements to the building fabric that it was the original intention of the regulations to encourage in their 2010 version.

Research commissioned by the government had shown that the changes to SAP 2009 meant that it was actually easier to meet 2010 building regulations than to meet the 2006 regulations, even though the 2010 regulations are meant to be 25% more stringent. The party wall issue was a significant factor in this. As a result, some participants in the policy process suggested that there could be a need to re-set the 2006 baseline to be measured in terms of SAP 2009. Notably, this issue has since been handled by amending Part L 2010 to state that addressing the party wall issue does not count towards achieving the 25% reduction.⁶⁶

A more contentious matter in the SAP 2009 consultation, as the responses show, concerned the carbon emissions factors for fuels. In particular, the factor for electricity was the subject of considerable discussion. The emissions factors for all fuels shown in the 2009 consultation were based on a revised version of the methodology used for SAP 2005.⁶⁷ Whereas the 2005 methodology only measured direct and indirect CO₂ emissions, this revised version took other greenhouse gases into account, such as nitrous oxide and methane, measured as CO₂ equivalents. Also, the 2009 methodology sought to take a more consistent approach to calculating emissions, including 'indirect' emissions caused by the production, processing and transportation of fuels.⁶⁸ Using the revised methodology and updated projections about the decarbonisation of the grid, the CO₂ emissions factor for electricity was calculated to be 0.591kgCO₂/kWh. By contrast, the factor calculated for electricity for use in SAP 2005 was 0.422 kgCO₂/kWh. The main reason for this difference was that, since 2005, an increased proportion of electricity had been generated by burning coal due to an increase in the price

⁶³ BRE, Consultation on SAP 2009 (2009a).

⁶⁴ E.g. Neil May, Seminar presentation on policy for sustainable homes (Upton, Northamptonshire: 2009).

⁶⁵ Zero Carbon Hub, Carbon Compliance for Tomorrow's New Homes - A Review of the Modelling Tool and Assumptions (2010b).

⁶⁶ HM Government, The Building Regulations 2000: Conservation of Fuel and Power. Approved Document L1A Conservation of fuel and power in new dwellings (London: 2010), 11.

⁶⁷ Christine Pout, Methodology for the Generation of UK Emission Factors for Use in the National Calculation Methodologies (Watford: BRE, 2009).

⁶⁸ A brief outline of the previous methodology is provided in Christine Pout, CO₂ Emission Figures for Policy Analysis (Watford: BRE, 2005).

of gas. A secondary factor was that a rapid decarbonisation of the grid projected in 2005 did not materialise.

A majority of respondents to the SAP 2009 consultation expressed their support for the proposed 2009 revisions to the methodology⁶⁹. However, electrical heating industry interests were concerned about the higher emission factor for electricity that was produced, as they feared it would reduce demand for their products. The TER and DER methodology within Part L, which allows for variation in the fuel factor for electricity over time, meant that the impact of the higher emissions factor, from the point of view of achieving compliance with the building regulations, is nullified.⁷⁰ This could change, however, if there was a move away from the notional building approach to measuring energy efficiency towards an absolute approach (the difference between these two approaches is further discussed in Section 6.2.1 below). If such a change were to be introduced, the increased emissions factor for electricity would mean that electrical products would be significantly less attractive for designers in terms of their calculated CO₂ emissions. Given that DECC's Chief Scientists encourage heat pump technology⁷¹, it is assumed that DECC would be concerned about the impact on heat pumps of higher carbon factors for electricity. This seems to have been the case as the DECC website indicates that the 2005 methodology has been used to inform SAP 2009.⁷² The factor for electricity in SAP 2009 is given as 0.517 kgCO₂/kWh.⁷³

There have also been debates about the energy efficiency of other technologies, where the interests of various manufacturers are at stake. For example, one interviewee questioned the accuracy of the efficiency assumptions used by SAP, given that EU Directives allow manufacturers to make claims for performance based only on testing pre-production prototypes. It has also been shown by round-robin (LABNET) tests that there can be inconsistency between the results produced by the different types of test permitted.⁷⁴ Furthermore, test methods can become outdated as new products are brought onto the market.

As there is a three or four year period between each SAP update, the Appendix Q procedure was introduced in SAP 2005 to provide a route for new products to be given a SAP rating. Where data on the performance of specific products is not available within SAP, assumptions have to be made based on generalised information about the performance of products of that type. Some practitioners interviewed emphasised the need for SAP to capture more product-specific information. A case in point is that SAP, in comparison with PHPP, captures less product-specific information about products such as windows.⁷⁵ In policy discussions, the issue has been raised of the management of SAP, with the case being made for more independent oversight of the process by which different products are assessed in SAP. One interviewee suggested that the range of products given a product-specific rating in SAP can appear "arbitrary." This relates to the question of the accountability of policy, as further discussed in Section 7.7.

⁶⁹ BRE, Consultation on SAP 2009.

⁷⁰ Dyfrig Hughes (2009) "10 ways that SAP 2009 will affect you," Building magazine

⁷¹ David MacKay, Sustainable Energy - without the hot air (Cambridge: 2009).

⁷² DECC, The Standard Assessment Procedure (SAP) - Questions and Answers (2010).

⁷³ The emissions factors for SAP 2009 are confirmed on Table 12 of the SAP 2009 document: BRE, SAP 2009: The Government's Standard Assessment Procedure for Energy Rating of Dwellings (Watford: BRE, 2010c), 150.

⁷⁴ Daniel Hec, Jean Schweitzer, Karsten V. Frederiksen, T Williams and M Manucas, European initiatives on labelling of central heating gas boilers (Date unspecified), 6.

⁷⁵ AECB, Projecting Energy Use and CO₂ Emissions From Low Energy Buildings: A Comparison of the PassivHaus Planning Package (PHPP) and SAP (2008), 26.

6.2.1 *A relative or absolute approach?*

Some experts are critical of the very principle of assessing CO2 emissions reductions relative to a target that is defined in relation to a notional building. They suggest that this approach runs the danger of distorting the decisions of house builders and designers. For example, developers or designers might install an electrical heating system because it makes it easier under SAP to achieve emissions reductions relative to the base case, as explained above. Some practitioners interviewed argue that, for the purposes of measuring progress towards a target level reduction, it would be far simpler to use a measure of absolute CO2 emissions of each building. A further problem, as mentioned above in relation to the party wall issue, is that the notional building used as the benchmark for assessing performance of a building, can change, making it difficult to track the level of emissions reductions being achieved in real terms over time.

According to two interviewees, during the last year of the Labour government, support for an 'absolute' approach grew amongst stakeholders directly involved in the policy process. A significant majority of them, one interviewee suggested, now consider such an approach to be preferable. This research has also found substantial support, amongst interviewees, for an 'absolute' approach and problems with the relative approach were pointed out by some consultants interviewed with different areas of expertise such as engineering and environmental and economic consultancy. Such support is evident in a recent report from the Zero Carbon Hub task group on carbon compliance, which recommends that: "Building Regulations 2013 should apply an absolute carbon limit in place of reductions from a 2002 notional dwelling."⁷⁶ Notably, an absolute approach has been adopted for measuring progress towards the target of a 60% carbon reduction for schools.⁷⁷ However, another interviewee pointed out that there is a much greater degree of variation amongst domestic buildings than schools. This interviewee argued that a switch to the absolute approach at the time the Code was introduced would have been a major change that could have caused the government to "lose" industry at a time when it was vital to gain their support for the transition to low and zero carbon housing.

⁷⁶ Zero Carbon Hub, Carbon Compliance for Tomorrow's New Homes - A Review of the Modelling Tool and Assumptions 10.

⁷⁷ Schools and Families Department for Children, Road to zero carbon Final report of the Zero Carbon Task Force (London: HM Government, 2010).

6.2.2 Defining the minimum energy efficiency standard

In July 2009, at the same time as John Healey announced his preference for a 70% carbon compliance level, the minister set up a specialist task group within the Zero Carbon Hub to advise on the definition of the minimum energy efficiency standard for zero carbon dwellings. The task group published a set of recommendations in November 2009. These recommendations were adopted by the government, as reflected in an announcement the following month. The key features of the definition are as follows:

Energy efficiency would be measured as the amount of energy demanded for the space heating and space cooling, measured as kWh/m²/yr. The calculations required for this are already available within SAP.⁷⁸

Following the recommendations of the task group, different minimum energy efficiency levels were set for two sets of dwelling types:

39 kWh/m²/ yr for apartment blocks and mid-terrace houses

46 kWh/m²/yr for semi detached, end of terrace and detached houses

Dwellings of the first types have less exposed building fabric relative to the floor area. This means, as the report explains, that “they are able to achieve a particular kWh/m²/yr space heating and cooling demand with a less challenging construction specification.”⁷⁹ (Zero Carbon Hub, 2009)

Notably the definition only covers the ‘passive features’ of a building – i.e. the efficiency of the materials and construction techniques used. The benefits of additional technologies such as mechanical ventilation systems and heat gain from hot water systems are excluded from consideration by this minimum energy efficiency standard. The benefits of such technologies, as the task group recommend, can be counted towards achieving carbon compliance, hence included within the second layer of the pyramid in terms of which zero carbon is defined (See Section 6.1.1).

The introduction of a stronger minimum energy efficiency standard was welcomed by many. This reflected a view that achieving emissions reductions should start from placing a strong emphasis on energy efficiency prior to the installation of renewables. This is emphasised by many stakeholders to be a relatively cost effective approach. It is often pointed out that the fabric and construction of the building are long lasting features, in comparison with renewable technologies which require more regular maintenance and can more quickly become outdated. Practitioners have so far had only limited opportunity to build up experience in working to this recently defined energy efficiency standard. Opinions across the industry, at this early stage, vary about the actual levels at which the energy efficiency standard was set. Three interviewees representing developers viewed the standard as highly challenging. By contrast, some engineers and consultants interviewed suggest that the standard is too relaxed.

⁷⁸Zero Carbon Hub, Defining a Fabric Energy Efficiency Standard for Zero Carbon Homes: task group recommendations (London: 2009), 69.

⁷⁹ Zero Carbon Hub, Defining a Fabric Energy Efficiency Standard for Zero Carbon Homes: task group recommendations, 9.

The decision to adopt the kWh/m²/yr measure, a widely known international 'currency' for measuring energy efficiency⁸⁰, has been favourably received. For example, one interviewee commented that this is a more meaningful measure than the Heat Loss Parameter, the measure used in the Code that does not take into account important factors affecting internal temperatures such as solar heat gains.

More contentious and the subject of disagreement in the working group, was the question of which types of energy use should be covered by the standard, particularly whether water or ventilation should be included. The air tightness levels required to achieve the standard eventually set are such that MVHR is not necessarily required to ensure the comfort and health of occupants. Some members of the working group were of the view that the standard should be set at a more stringent level, which would mean that an MVHR system would be required. Yet this suggestion was opposed by others. In the view of one interviewee, who favoured a more rigorous standard, those who are sceptical about MVHR assume that natural ventilation is preferable, even though there is a lack of evidence available about how natural and mechanical ventilation systems compare in terms of their air quality and comfort. Some representatives of house builders within the task group emphasised what they saw as the dangers of a requirement to install MVHR. The home buying public, they argued, would not adequately understand such a system. As a result, they might, for example leave windows open, which interferes with the working of an MVHR system and can lead to a net increase in the CO₂ emissions from the home. The energy efficiency standard decided on was, in the words of the aforementioned interviewee, a "compromise" between the different interests and views within the group. However, according to this interviewee, there is no evidence that buildings with an air change rate at the minimum standard set, will not suffer from an internal build-up of moisture. Anyone not installing a MVHR "would be taking a risk", (s)he commented.

In its report, the task group emphasise that there are a variety of ways in which the energy efficiency standard can be met, hence encouraging innovation.⁸¹ The intention for the energy efficiency standard to be a "challenging"⁸² one is clearly stated. A higher level of energy efficiency has been set as a minimum standard for apartment blocks and mid-terraced houses than for detached dwellings. Detached dwellings have more surface area relative to building volume and hence this form of building is innately less efficient. This means that, although the minimum energy efficiency standard is lower for detached dwellings than for apartments and mid-terraced houses, it is still tougher to meet. Even so, as the report explains, some members of the task group argued against giving a lower minimum standard for larger, detached dwellings. This reflects the view that this lower minimum standard still gives some encouragement to develop less efficient dwelling types.⁸³ However, as the report points out, it can be argued that some relaxation of the target for larger dwellings was necessary because of the need to consider social issues such as the level of supply of larger dwellings suitable for families.⁸⁴

⁸⁰ Zero Carbon Hub, Defining a Fabric Energy Efficiency Standard for Zero Carbon Homes: task group recommendations, 9.

⁸¹ Zero Carbon Hub, Defining a Fabric Energy Efficiency Standard for Zero Carbon Homes: task group recommendations, 10.

⁸² Zero Carbon Hub, Defining a Fabric Energy Efficiency Standard for Zero Carbon Homes: task group recommendations, 7.

⁸³ This point was made by the PassivHaus Network in their response to the 2010 Code for Sustainable Homes Consultation, question 48.

⁸⁴ Zero Carbon Hub, Defining a Fabric Energy Efficiency Standard for Zero Carbon Homes: task group recommendations, 59.

6.3 PassivHaus: an alternative design approach

PassivHaus is a set of principles for designing energy efficient buildings, which has German origins and is gaining increased attention in the U.K. The PassivHaus approach involves achieving a highly efficient building fabric by means of super insulation, carefully planned use of solar heat gains, minimising problems of thermal bridging and thermal bypass and ensuring stringent levels of air tightness. Given these high levels of air tightness, good indoor air quality is ensured by installation of a mechanical ventilation and heat recovery system for the whole building which transfers heat between the inside and outside of the building. PassivHaus involves taking a holistic view of energy use in buildings, thus minimising the energy used for electrical appliances and water, as well as for space heating.



Photo: A PassivHaus built in Germany

As well as being a set of design principles, PassivHaus is a specific, certified standard formulated by the Passivhaus Institute in Germany. For Europe, the standard to be achieved is a total energy demand for space heating and cooling of 15 kWh/m²/yr and a total primary energy use for all appliances, domestic hot water and space heating and cooling of less than 120 kWh/m²/yr.⁸⁵ Note that this standard is significantly more stringent than the energy efficiency standard recommended by the Zero Carbon Hub of 39 or 46 kWh/m²/yr depending on the dwelling type. Achieving the PassivHaus standard means that comfortable temperatures can be achieved in all seasons without the need for conventional heating or active cooling systems. In the winter, comfortable temperatures can be achieved by using the ventilation system to heat the air being transferred into the building. The PassivHaus Institute have developed a software package (the PassivHaus Planning Package, or PHPP), which can serve both as an aid for designers seeking to achieve the PassivHaus standard and as a tool for monitoring whether this standard has been achieved.

Some advocates of the PassivHaus approach to sustainable building design emphasise the need for policy to incorporate a more strongly 'fabric first' approach and favour a higher energy efficiency standard that demands the best from the fabric.⁸⁶ Others even suggest that the PassivHaus standard be incorporated into building regulations, although this research suggests that there is not wide support for this latter proposal, even from those who actively support a PassivHaus approach to building design. There is a stronger need for PassivHaus in countries with much colder winters than the U.K. such as Sweden, Germany and Austria. Yet, even in these countries, although the approach has been far more widely employed than in the U.K., the number of PassivHaus developments in these countries

⁸⁵ BRE, "PassivHausUK -Towards sustainable design," (2010a),

⁸⁶ Passivhaus Network, Passivhaus Network response to the CSH consultation (Passivhaus Network, 2010).

remains a tiny proportion of their total housing stock.⁸⁷ Some stakeholders, while acknowledging the fundamental importance of achieving an energy efficient building fabric, emphasise that before committing to “pushing the fabric” to efficiency levels approaching PassivHaus, there is a need to consider, other potentially more cost effective ways of reducing CO₂ emissions, such as through improving public transport infrastructure, or introducing policies to encourage more sustainable consumption. It is also emphasised by some that, particularly in the U.K. but also more generally across Europe, the supply chains required for the materials and products used for PassivHaus buildings and the skills required will take more time to develop. In 2007, the extra cost of achieving PassivHaus standard in five Western European countries was found to vary between 2.85% (Seville, Spain) to 5.54% (U.K.) to 9% (France).⁸⁸ Costs can, however, be expected to decrease as supply chains become more established. A further reason why the scalability of the PassivHaus approach to mass market housing is questioned is the significant change in lifestyle required on the part of residents. In order to achieve the potential energy efficiency of a PassivHaus, occupants need to take an active role in monitoring and adjusting the settings of technologies such as mechanical ventilation systems.

Nonetheless, PassivHaus principles can still inform standards and design in the UK.⁸⁹ The Sustainable Buildings Association (AECB) have introduced their own set of standards which draw from some of the same principles as Passivhaus, while being more easily achievable. AECB offer training and guidance for achieving these standards, as well as a certification process⁹⁰. The principles of PassivHaus can be adapted to different building techniques, as has been achieved, for example, in an exemplar project using cavity walls, a method widely used across the U.K.⁹¹

6.3.1 PHPP: an alternative approach to measuring energy efficiency

The approach of PHPP has been preferred by some practitioners to SAP as encouraging a more accurate and transparent means of measuring progress towards the goal of zero carbon homes. For example, AECB have licensed PHPP in preference to SAP as the tool for demonstrating compliance with their AECB standards. However, in comparing the two tools, it is important to bear in mind that they were developed with very different objectives. This is acknowledged by AECB in their comparative study of how SAP and PHPP model the energy efficiency of buildings.⁹² As the study points out, SAP was originally developed to assess the energy efficiency of buildings in the 1980s, while relatively efficient for their time⁹³, were far below the efficiency levels that the building regulations and the Code now require. A key objective of SAP was for it to be relatively easy to use by assessors, given a relatively straightforward level of software training. In order to achieve such ease of use, SAP contains some built-in assumptions that were made to reduce the amount of data that SAP assessors would be required to input. By contrast, PHPP was designed and developed during the 1990s specifically as an aid both to the design and assessment of high performance buildings

⁸⁷ Notable examples include the Green Building Store's PassivHaus at Denby Dale in West Yorkshire (the first ever to be built in the U.K.) and the 28-unit development by Gentoo at the Racecourse Estate in Tyne and Wear.

⁸⁸ Brian Ford, Rosa Schiano-Phan and Duan Zhongcheng, *The PassivHaus Standard in European Warm Climates: Design Guidelines for Comfortable Low Energy Homes* (Nottingham: University of Nottingham, 2007).

⁸⁹ T. Lane (2009) "No biomass, no turbines, no solar panels. Is Passivhaus the way to zero carbon? ." *Building magazine*,

⁹⁰ AECB, *AECB - Guidance and Standards* (AECB, 2010).

⁹¹ The approach has been applied in the low energy house built by the Green Building Store at Denby Dale, near Huddersfield, West Yorkshire.

⁹² The AECB explain that the study does not seek to be a complete comparison but instead focuses on some key areas where there were expected to be differences between PHPP and SAP.

⁹³ Approximately equivalent to 1995 building regulations levels.

seeking to achieve PassivHaus standard. Although SAP can be used to inform design decisions, it was not intended to serve primarily as a design tool.

Given these objectives, it is perhaps not surprising therefore that some of the default values and assumptions in SAP were found to make it less accurate than PHPP as a means of modelling the emissions of today's very low energy building designs. For example, it is suggested that SAP underestimates the significance of insulation and air tightness and assumes internal heat gains which are too high. Also, it is found that, compared with PHPP, SAP lacks a facility for the detailed modelling of windows, shading and is less sensitive to regional and seasonal variations in climate.

As one interviewee noted, most of the key differences between SAP and PHPP tend to be in terms of the assumptions and default values specified by each. If you remove, these assumptions from SAP, (s)he commented, the underlying model in SAP has been found to have a "pretty good" correlation with PHPP. This would suggest that some of the discrepancies between the two can be addressed by adjusting these parameters, rather than necessarily replacing the SAP model entirely. Indeed, some of the issues identified by AECB were addressed in the 2009 update to SAP, such as seasonal variations in climate and internal heat gains.

As one interviewee pointed out, any compliance tool inevitably becomes used for design purposes to an extent. Not surprisingly given its original objective as a compliance tool, AECB find that the design functions of SAP are in particular need of further development.⁹⁴ PHPP software, by contrast, contains both a design and assessment mode. With the PHPP model taking into account a greater range of variables, more data needs to be entered by the user and the interface is more complex than for SAP. Yet designers have commented that a two-day PHPP training course greatly helps them to become familiar with the software and start to benefit from what they see as the more transparent, detailed feedback that it provides about the energy implications of different design options.⁹⁵ Hence, while PHPP is often viewed as more difficult to learn, from an AECB perspective this learning has a pay-off in that the software encourages the designer to think from first principles about the implications of design for energy use. The new version of SAP now shows the fabric energy efficiency of a building in absolute terms. The nature and extent of the further changes needed to SAP as the current compliance tool remains to be seen and is the subject of ongoing research.⁹⁶

⁹⁴ AECB, Projecting Energy Use and CO2 Emissions From Low Energy Buildings: A Comparison of the PassivHaus Planning Package (PHPP) and SAP, 38.

⁹⁵ P Smyth, Doing the sums – PassivHaus in practice (2010), 16.

⁹⁶ Zero Carbon Hub, Carbon Compliance for Tomorrow's New Homes - A Review of the Modelling Tool and Assumptions

6.4 How to choose building technologies?

Of course, PassivHaus is just one approach to the design of low carbon buildings and as discussed above, there are a variety of approaches. These range from traditional 'brick and block' construction methods⁹⁷ to lightweight timber frame designs. One test of the extent to which policy has been 'vertically' joined up (see section 7.9) is the extent to which house builders feel they have the knowledge about these technologies needed to deliver low and zero carbon homes. Research published by NHBC in 2008 found that "comparatively few house builders are confident that they will be able to build a zero carbon home by 2016, from either a technical (26%) or commercial perspective (14%) (Table 24). Indeed, half (52%) are not at all or not very confident in their technical ability to do this".⁹⁸

The gap in skills and knowledge suggested by this finding means that there is a need to provide accessible information for designers to aid them in addressing complex technical choices about which technologies to adopt. One way of assisting designers in their choice of building technologies and designs is to establish 'accredited details' schemes. These schemes give accreditation to certain 'details' which specify particular designs, including details of the kinds of materials and products to be used, for particular types of construction.

In 2006, DCLG published a series of generic Accredited Construction Details (ACDs) intended to serve as an aid to building designers and developers for achieving compliance with thermal and air tightness performance standards. Given the generic nature of this 2006 scheme and that the details only applied to standardised homes, the proposed 2010 regulations aim to develop a more comprehensive ACD scheme that would apply to a greater range of dwelling types. The proposed approach is to allow private companies gain accreditation for their own proprietary details that they develop, which would then be made publically available on a single website.

The principle of accredited details has wide support among stakeholders, as reflected in the response to the 2010 Part L consultation.⁹⁹ A point emphasised by many is that an ACD scheme should not restrict designers who wish to develop their own details. One interviewee pointed out that not all details need to gain accreditation and another commented that there is a need to allow room for innovation. An engineer interviewed made a related point that it is very important for ACD schemes to be underpinned by a correct methodology for assessing the performance of details and another interviewee questioned the performance of the details in the 2006 ACD scheme.

Schemes such as 'Carbon Lite,' a programme of design guidance, software provision and training run by AECB can facilitate such knowledge sharing. Of course, the commercial interests of the manufacturers of construction products are closely intertwined with this question of which technologies to adopt. This is reflected, for example, in the discussions about the relative advantages and disadvantages of lightweight and heavyweight methods

⁹⁷ As NHBC explain, "Brick and block construction is commonly used now, with an insulated cavity between the inner and outer leaves, so is likely to be popular with homeowners and builders alike. The inherent thermal mass regulates temperatures inside the structure more efficiently than lightweight materials. The disadvantage is that it can be difficult to achieve the high levels of airtightness required using conventional techniques in the challenging environment of a traditional building site" NHBC, Zero carbon: what does it mean to homeowners and housebuilders? (2008), 91. By contrast "A timber or other lightweight frame carries the structural loads with partition wall panels and cladding used to infill and create the building envelope" NHBC, Zero carbon: what does it mean to homeowners and housebuilders? , 92.

⁹⁸NHBC, Zero carbon: what does it mean to homeowners and housebuilders? , 82.

⁹⁹ 75% of the 194 respondents were in favour of the need to accredit proprietary details. DCLG, Part L consultation - Summary of responses (London: 2010a), 56.

of construction, where the interests of the timber and concrete industries are notably at stake. Most stakeholders questioned about heavyweight and lightweight methods of construction did not consider either approach to necessarily be better in all circumstances and instead emphasised the need for building design to be appropriate for each specific site, taking into account factors such as local climate and orientation. However, some issues have been raised about whether SAP establishes a 'level playing field' in terms of how different building designs are assessed. For example, concrete walls provide high thermal mass and the concrete industry has made the case for thermal mass to be taken account of in SAP. This issue was addressed in SAP 2009 (See Section 6.2).

Some work recently started by the Construction Products Association seeks to further facilitate knowledge sharing in a way that seeks to avoid being biased to any given set of commercial interests. The focus of this work is currently on the refurbishment of existing buildings, with the CPA having funded and produced a guide to Loft Conversions¹⁰⁰ and having recently started work on a guide to domestic refurbishment. However, such an approach might be applicable to new build, with the intention being to provide clear information and insights into design and technology options, codifying the knowledge of a range of specialists such as builders and inspectors which might otherwise not be easily accessible. Where opinions amongst experts differ, the aim is to openly explain each of the different views. These guides can serve as a benchmark against which house builders can audit their skills and supply chains. The process of preparing such documents involves consultation with groups such as the Federation of Master Builders and Building Control officers. Two interviewees suggested that such information might also be incorporated into software packages as an aid to designers.

¹⁰⁰ Construction Products Association, Loft Conversion: Project Guide (London: 2010).

6.5 How to define emissions reduction targets for different house types?

Different types of dwellings vary significantly in terms of their energy usage and the relative cost effectiveness of improving their energy efficiency.¹⁰¹ For example, there can be greater scope for achieving CO₂ emissions reductions in a larger, detached house that uses more heating and where problems with the air tightness of the building fabric can have a greater impact. Consequently, the marginal cost of achieving emissions reductions in dwellings of this type can be lower, raising the question of whether the emissions reduction milestones and the target of zero carbon should be specified differently for different types of dwelling. Hence this issue relates to the problem of defining outcomes, as further discussed in Section 7.4.

The target for new homes in 2010 had already been set, of a 25% reduction in CO₂ emissions in comparison with the requirements for 2006 building regulations levels. This question was considered as part of the consultation on the 2010 amendments to Part L. Two options for measuring this 25% reduction were considered, referred to as the 'flat' and the 'aggregate' approach.

1. Flat approach

The 'flat' approach means that each dwelling must achieve a flat 25% emissions reduction, relative to 2006 regulations. Hence the DER is assessed relative to the target emissions rate (TER) for the 2002 notional building.¹⁰²

Having said this, the consultation document suggests, a modification of this TER would be required to account for heat loss from party walls, (see Section 6.2 above) a problem that was discovered since 2006.

2. Aggregate 25% approach

The 'aggregate' approach means that, while an average 25% reduction is achieved across all buildings, the specific percentage reduction achieved by each building could vary from the average. In contrast with the flat approach, which uses a single notional building, the aggregate approach would use a different notional building for each building type, which is also adjusted if electrical resistance heating is used¹⁰³. These different notional buildings would be designed to ensure that an aggregate 25% improvement was achieved, while equalising the marginal cost of achieving emissions reductions for each building type.

¹⁰¹ DCLG, Proposals for amending Part L and Part F of the Building Regulations – Consultation Volume One (London: HM Government, 2009b), 7.

¹⁰² DCLG, Proposals for amending Part L and Part F of the Building Regulations – Consultation Volume Two (London: HM Government, 2009f), 200.

¹⁰³ DCLG, Proposals for amending Part L and Part F of the Building Regulations – Consultation Volume Two, 202.



Photo: 'One Brighton' development by Bioregional Quintain

The Consultation showed a small majority of stakeholders in favour of the flat approach (117 out of 201 respondents)¹⁰⁴. One interviewee suggested that this could have been partly a reflection of the government stating their preference for the flat approach. However, the aggregate approach was widely favoured by industry representatives with a direct involvement in the policy process because it was seen as allowing some flexibility in the emissions targets for different dwelling types and encouraging the adoption of more cost effective abatement measures. For advocates of the aggregate approach, the use of marginal abatement costs as the basis for setting the TER would be increasingly advantageous as emissions reduction targets become more stringent in the coming years. As is pointed out in the Consultation document, the cost-based approach would help designers to determine the point at which they should switch from adopting energy efficiency measures (the first layer of the zero carbon pyramid) to renewable energy technologies (the second and third levels of the pyramid). Critics of the flat approach to defining targets are that it could have a distortive effect on the choice of house builders on the types of houses they build. For, detached dwellings are less energy efficient than terraced dwellings or apartments but the marginal cost of achieving a specified percentage emissions reduction in detached dwellings would be lower.

For these reasons, a briefing paper prepared by government consultants recommended to DCLG officials that the aggregate approach be adopted for non-domestic buildings¹⁰⁵. They also favoured the aggregate approach for dwellings, but for 2010 thought the flat approach would continue to be feasible. A ministerial decision was made to adopt the flat approach. The suggested advantages of the flat approach, concerned its simplicity and familiarity, with designers and developers having become familiar with the method for calculating the TER used in the 2006 regulations. The flat approach can also be considered simpler in the sense that only one notional building is used for all building types. Having said this, some participants in the policy discussions and in the consultation document, point out that the compliance software tools from the point of view of the designer or developer using them, would remain the same for the aggregate approach. The reason is that the software would handle the calculation of the different TERs, as required by the 'aggregate' approach, which

¹⁰⁴ DCLG, Part L consultation - Summary of responses, 21.

¹⁰⁵ The Consultants concerned were AECOM and a number of other bodies and individuals making up the 'FM Nectar' consortium.

would be hidden from the end user of the software.¹⁰⁶ In this respect, the complexity of the aggregate approach would be hidden from the designer.

6.6 How to assess water efficiency?

6.6.1 Water

Water resources are already under stress in the U.K.¹⁰⁷ With the population of England projected to rise significantly¹⁰⁸, the Environment Agency suggest that between 2008 and 2020, total demand for water could increase by 5%.¹⁰⁹ The average water consumption per person per day in the UK is approximately 150 litres, taking into account cooking, cleaning, washing and toilet flushing. It is estimated that water consumption has been rising by 1% each year since 1930.¹¹⁰ Hence, water efficiency is one of the nine categories within the Code for Sustainable Homes for assessing new housing.

¹⁰⁶DCLG, Proposals for amending Part L and Part F of the Building Regulations – Consultation Volume Two, 201.

¹⁰⁷ Environment Agency, Water resources in England and Wales - current state and future pressures (2009), 17.

¹⁰⁸ Potentially by 10 million between 2008 and 2031 Environment Agency (2008) Water resources in England and Wales - current state and future pressures, p.17.

¹⁰⁹ Environment Agency, Water resources in England and Wales - current state and future pressures, 20.

¹¹⁰ Q Dawson, Integrated water resources management in development: opportunities and constraints in RHW and greywater recycling (Earls Court, London: 2010). Source: Waterwise 2009

As with energy, a minimum standard of water efficiency in the home must be met for achieving each level of the Code for Sustainable Homes. These minimum standards, in terms of consumption per person per day, are:

Code levels 1 and 2: 120 litres

Code levels 3 and 4: 105 litres

Code levels 5 and 6: 80 litres

A 'water calculator' is used to assess the daily water consumption per person within a home. The calculator considers the number and specification of the various appliances installed in the home which use water, ranging from dishwashers and washing machines to baths and taps. The calculator combines this information with a series of assumptions about occupant behaviour, for example average shower time, amount of water used for cooking etc, to calculate total water consumption per person for the home.

Building regulations now contain a requirement that all new homes be designed for consumption of no more than 125 litres per person per day. This is equivalent to the 120 litres allowed for Code levels One and Two, with an additional 5 litres allowed for outdoor use. The same water calculator is used for measuring water use under the building regulations as for the Code for Sustainable Homes.

One option for reducing the mains water consumed by a household is to install a rainwater or greywater harvesting system. Rainwater harvesting systems collect, treat and store rainwater for use in the home. Greywater recycling systems collect and treat wastewater from showers, baths and wash basins. The recycled water from these systems is 'non-potable', which means that it is not of drinking water quality but can be used for purposes such as flushing toilets, garden watering and vehicle washing. The water calculator allows the non-potable water supplied by such a system to be offset against the total non-potable water consumption for the dwelling.

The water calculator has been the subject of some criticism from designers and is another example of the difficulties that can arise in defining sustainability targets. For example, the calculator, in its original form, assumed that water use from appliances such as taps is proportional to their flow rate. Consequently, achieving higher levels of the Code, particularly levels 5 and 6, required the installation of taps and showers with very low flow rates. However, this did not take account of water uses which are not dependent on flow rate such as the need to fill up washing up bowls, kettles or other vessels¹¹¹. Developers are strongly concerned that such flow rates are considered unacceptable by most users¹¹². Setting such stringent standards, some argue, runs the danger of giving water saving a bad name¹¹³. Stakeholders often point out that an unintended consequence of the standards could be that homebuyers soon replace these appliances with much less efficient appliances such as 'power showers.' Because the Code only assesses the home at the time of purchase, this possibility is not addressed by the Code.¹¹⁴

Seeking to assess water efficiency in terms of the number and types of appliances installed also creates potential for loopholes which could be exploited by developers seeking to achieve a particular Code level. For example, the calculator, in its original form, derived home bath water use per person from the average bath size in the home. In large homes, this, it was argued, created the incentive for developers to install extra, smaller baths to bring down the average.¹¹⁵

In response to these criticisms, the water calculator was updated in May and September 2009. The usage figures for different fittings were revised to take account that some types of water use are not dependent on flow rates (for example, water used for filling a kettle or sink). These changes have been welcomed as leading to a more realistic estimate of water usage. As a result of these changes, the minimum water efficiency standards for achieving Code levels 5 and 6 can now be achieved by installing appliances such as taps which have flow rates that are generally agreed to be more likely to be acceptable to consumers. The 'average bath size' loophole referred to above was also corrected by the introduction of a different measure which is based on the largest volume appliance.¹¹⁶

While the most significant anomalies of the calculator might have been addressed, some argue that the very principle of a water calculator, which seeks to predict water usage using a set of assumptions about user behaviour, is problematic. For example, by assuming the number of times occupants will use a bath, the calculator infers that installing a large bath entails high water consumption. However, the bath might only be used occasionally and hence some argue that installation of the bath itself should not be penalised by regulations.

111 Nick Grant, A Critique of the CSH Water Efficiency Requirements (Good Homes Alliance, 2008), 7.

112 Grant, A Critique of the CSH Water Efficiency Requirements A developer interviewed for this project explained that customer feedback about water saving appliances had not been very positive.

113 Grant, A Critique of the CSH Water Efficiency Requirements

¹¹⁴ In relation to this issue the Waste Resources Action Programme has published guidance on water-efficient procurement which takes into account the acceptability to consumers of different flow-rates for appliances such as taps used for different purposes, WRAP, Model procurement requirements for water efficiency – draft (Banbury, Oxfordshire: 2010).

115 Grant, A Critique of the CSH Water Efficiency Requirements 9.

116 The size of the largest volume appliance is multiplied by 0.7 DCLG, The Water Efficiency Calculator for new dwellings

The Government's national calculation methodology for assessing water efficiency in new dwellings in support of:

The Code for Sustainable Homes, May 2009 and subsequent versions

The Building Regulations 2000 (as amended)

The Building (Approved Inspector etc) Regulations 2000 (as amended) (London: HM Government, 2009g), 11.

The Good Homes Alliance suggest that it is actually possible for occupants to achieve consumption of below 80 litres pppd relatively easily by adopting some quite straightforward changes of behaviour “such as showering in preference to baths and turning off the tap when brushing teeth.”¹¹⁷ They therefore favour an approach of setting reasonable minimum standards for all appliances, rather than forcing house builders to fit appliances which many consumers would consider unacceptable. The AECB Water Standard also takes such a minimum performance standards approach. The GHA recognise that the water calculator can be a useful tool for assessing the long term implications of using appliances but suggest that it is not suitable for defining targets due to the uncertainty about how, in practice, appliances will be used by occupants.

Setting minimum standards does not in itself guarantee high levels of efficiency of the kind aspired to by the Code. However, the Code in itself, with its focus on defining efficiency in terms of the types of appliances installed, cannot provide such a guarantee either. Occupant behaviour remains a crucial factor in determining levels of water consumption. At one extreme, there is a concern that homebuyers might find water saving appliances, such as taps with low flow rates, unacceptable and install new, more water-intensive fittings.¹¹⁸ As another interviewee commented, water appliances are features with which house buyers interact first of all and hence have an important bearing on their initial perceptions of low carbon homes. Here, as emphasised by the GHA and others, there is a need for more research assessing the water consumption habits of occupants, in order to facilitate a more ‘evidence-based’ approach.

There are some further measures that might be taken by developers to encourage occupants to adopt behaviours that are more efficient in terms of water use. For example, there is potential that future revisions of the Code could give credits for measures such as the installation of smart multi-utility meters, internal leak alarms and the supply of information for occupants about the technologies which have been installed and their benefits.¹¹⁹ Also, the Code does not provide credit for measures to ensure the correct installation and suitable maintenance of appliances, or the removal of ‘dead leg’ sections of water pipe which cause inefficiency. As shown by the AECB standards, this is an issue that can potentially be assessed by regulatory standards, though might be considered better suited to a minimum standards approach of the kind developed by AECB.¹²⁰

¹¹⁷ Grant, A Critique of the CSH Water Efficiency Requirements 4.

¹¹⁸ John Tebbit (2007) "Water Efficiency," Building magazine Research by Waterwise shows that there is considerable variation in the extent to which different appliances are accepted by users. Dual flush toilets and water efficient showers are widely accepted, with consumers noticing little difference from previous fittings. By contrast, aerated taps, which mean that it can take one or two minutes to fill a kettle have caused a lot of complaints. Clare Watters, Sustainability considerations beyond the Water Calculator (London: 2010).

¹¹⁹ Watters, Sustainability considerations beyond the Water Calculator

¹²⁰ AECB, AECB Water Standards: Delivering buildings with excellent water and energy performance - Volume One (2009a).

Practitioners report that, with the water calculator, it is very difficult for a home to achieve the 80 litres pppd required for Code levels 5 and 6, unless either no bath included or a rainwater or greywater harvesting system is installed. Such recycling systems have therefore become the norm for homes seeking to achieve these highest Code levels. By reducing net consumption of mains water, these systems do indeed improve the water efficiency of a home and so can be considered worthy of credits under the water efficiency section of the Code. However, some concerns are expressed with these technologies which again raise the question of whether there is a strong enough evidence base to support current policy. Some practitioners stress that there are difficulties involved in using and maintaining these systems (referred to by one practitioner as their 'fiddle factor').¹²¹ There have also been concerns, expressed by four interviewees, about their potential health risks, particularly in the case of greywater systems, although a new British standard for greywater systems which addresses health impacts has recently been announced.¹²²

Furthermore, as shown by a recent Environment Agency report, evidence suggests that the water provided by these systems is, at least in the case of most water recycling systems currently available on the market, more expensive than mains water in terms of the energy and CO2 emissions that it entails¹²³. Rainwater and greywater systems need to be installed to run in addition to the mains water supply, which is required for providing potable water, as well as possibly some of the non-potable water used in the home. Hence the water supplied by these systems, with their separate processes for treating water and pumping it into the home tends to actually entail an increase in CO2 emissions. Additionally, there is a need to consider the CO2 emissions caused by the manufacture of these systems, referred to as their 'embodied energy'. The potential energy cost of water recycling systems has been suggested for some time.¹²⁴ It is reported that there are one or two water recycling systems now on the market which do provide recycled water in a way that has lower carbon intensity than the provision of mains water.¹²⁵ Hence, as pointed out by some stakeholders, this problem is starting to be addressed by manufacturers and is expected by some to be an area for significant further innovation which the Code might help to encourage. One interviewee argued that there is a neglect of the potential for innovation in this area that reflects a culture of scepticism in the water industry about decentralisation of the water supply.

Critics of water recycling technologies also point to their high costs. In an argument rather like that which is made about on-site renewables, it is suggested that the money used to pay for these systems could be spent on more cost effective ways of improving water efficiency. Also like renewables, water recycling systems can yield economies of scale, so therefore tend to be more cost effective for larger housing developments.¹²⁶ Because of these various concerns developers tend to avoid these technologies, except where needed for achieving higher Code levels.

¹²¹ G makes this point in relation to rainwater systems.

¹²² British Standard BS 8525-1: 2010 for Greywater systems.

¹²³ Environment Agency, Energy and carbon implications of rainwater harvesting and greywater recycling (2010).

¹²⁴ Grant, A Critique of the CSH Water Efficiency Requirements, J Thornton (2008) "Rainwater harvesting systems: are they a green solution to water shortages?," Green Building

¹²⁵ Of the systems assessed by the Environment Agency report, only short retention greywater systems are found to be less carbon intensive than mains water supply, being 40% less intensive.

¹²⁶ It is also pointed out that these technologies are more cost effective for developments which have sustainable urban drainage systems, which are designed to collect water as well as reduce flood risk. Adam Mactavish (2007) "What the Code will cost," Building magazine

Current uncertainty regarding the energy impact and other environmental implications of water recycling makes it difficult to define regulations that will encourage house builders to make the most sustainable decisions in this area. Currently, the Code does not fully account for the energy cost of water recycling. Yet, particularly in regions with high rainfall where water shortages are not generally a problem, it is often argued that energy rather than water efficiency should be the main criterion for choosing a water supply system. It is widely thought that, while water recycling might indeed be 'part of the mix' of solutions for achieving sustainable housing, there is a need for water efficiency targets to reflect the varying degree of water stress in different regions of England and Wales.

Indeed, currently, the Code does not assess the energy impact of water use. No distinction is made in the Code between cold and hot water savings and the National Calculation Methodology used to calculate energy use does so on a floor area basis and is not designed to capture potential variations in hot water consumption. As one Code assessor interviewed argued, given that the water category of the Code is concerned with water efficiency, their energy efficiency might be best accounted for in SAP. One stakeholder interviewed, with a close involvement in the policy process reports that the National Calculation Methodology is indeed in the process of being modified to address this issue. Reflecting their view that especially high priority needs to be given to energy saving, the AECB scheme prioritises hot water savings. Also in contrast with the Code, AECB Water standards (AECB 2009) do not require the installation of grey or rainwater recycling "because of the poor economic and environmental case for such technologies. It is possible that these technologies are appropriate in certain unusual situations but they should not be assumed to be appropriate by default" (AECB 2009: 4).

6.7 How to assess the sustainability of building materials?

As well as considering the impact of the design of homes on energy and water consumption, a further important area to consider is the environmental impacts of the materials and products used in construction.

BRE have developed a tool called the Green Guide to Specification to assess the environmental impacts of building materials. The Green Guide is used to assess the number of credits a development is to receive under the Materials (MAT 1) section of the Code which covers the environmental impact of materials. Assessment is made of each of the following elements of a home: roof, external walls, internal walls, upper and ground floors, windows, floor finishes, insulation, and landscaping. The Green Guide provides a rating A+ to D (with A+ being the most sustainable) for each of the products and materials used in the design of these five elements. These individual products and materials are weighted according to the extent to which they are used within each element. The weighted ratings are summed to produce an overall rating for each of the five elements.

The Green Guide contains a 'Life Cycle Assessment' to analyse products and materials 'from cradle to grave.' This involves assessing the impact of the materials over a sixty year period in terms of 13 categories of impacts, relating to various kinds of pollution and resource depletion. The analysis includes impacts from the manufacture and maintenance of products, as well as their dismantling or demolition at the end of the life (which could be any time after the sixty years).¹²⁷ The points gained by a particular product will depend on the period of time over which they will be used.

The Green Guide includes a database of General Profiles and Product Profiles.¹²⁸ Product Profiles are intended to capture the impacts of particular products. Where a Product Profile is not available, a General Profile should be used which is intended to reflect the average impacts for a particular type of material. To have a Product Profile included in the Green Guide, manufacturers must commission BRE to assess the product, a process which typically costs between £8000-12,000.

For each category of product, ratings are calculated using a 'normalisation' procedure. The highest and lowest performing specifications for each element of the home are taken as the range relative to which all specifications are rated. The highest performing are rated as A+ and the lowest as D.

Practitioners generally welcome the idea of having such a Green Guide available, given that assessing the environmental impacts of materials is a highly complex matter, requiring time and information which they themselves do not have. However, the Green Guide has been the subject of a number of criticisms. This is perhaps not surprising due to its potential impact on the commercial interests of product suppliers. Having said this, although some of the individual product ratings have been disputed, other criticisms have been directed at the general methodology and process used to produce these ratings, as explained further below.

¹²⁷DCLG, Code for Sustainable Homes: Technical guide (2009e)..

¹²⁸ BRE, Green Guide to Specification (2010b).

There are hundreds of thousands of construction products and General Profiles are used in the Green Guide is to avoid the need for a full life analysis of each individual product. The Good Homes Alliance (GHA), in a wide-ranging critique of the Green Guide published in November 2008,¹²⁹ suggest that this approach has resulted in some very effective products with good environmental credentials not being included in the Green Guide. They also point out that manufacturers of products with lower than average credentials have no incentive to obtain a rating for their product. In support of the Green Guide approach, it is explained that, where producers have a product performing significantly better than the Generic Profile, they do have the option of obtaining a product-specific profile. The GHA argue that the cost of obtaining such a product-specific profile acts as a barrier for small and medium sized companies seeking to enter the market.¹³⁰ However, in defence of the current system, as one interviewee pointed out, the process of obtaining a rating is inevitably costly due to the in-depth technical analysis involved.

The GHA 2008 critique also criticises what it considers to be a lack of transparency in the calculation of Green Guide ratings. It is, they argue, unclear which impacts during the production process are considered and whether co-products are accounted for.¹³¹ However, the need to respect the commercial confidentiality of data about firms' business processes does, some stakeholders argue, inevitably limit the scope for such accountability. A more recent update published by the GHA acknowledges that BRE have since made more information available on their website. The information that has been published includes the type of life cycle analysis of the energy cost of products, the weightings of the different categories of environmental impact¹³² and data on the different environmental impacts of different products. A further argument made by the GHA however is that there is no opportunity to challenge formally Green Guide ratings, again raising the question of the accountability of the process through which policy tools are developed.

A further important criticism from the GHA of the Green Guide is that, like the current means of calculating energy and water efficiency, suffers from adopting a relative, rather than an absolute measure of environmental impacts. The normalisation procedure used to rate products means that, for elements where one very poorly scoring specification is included, all other specifications achieve a high 'A+' rating. Examples of categories in the Guide where all specifications achieve an A+ rating are Blockwork Cavity Walls (under the external wall category) and Timber Framed Construction and Light Steel Framed Construction categories (under the Fairface Blockwork Construction category). The GHA emphasise that, in such cases, there is not sufficient opportunity for consumers to distinguish between the environmental credentials of different specifications and therefore less incentive for manufacturers to improve their products.¹³³

¹²⁹ G, Neil May and Gary Newman, Critique of the Green Guide to Specification (London: Good Homes Alliance, 2008), p.22

¹³⁰ May and Newman, Critique of the Green Guide to Specification, 12.

¹³¹ May and Newman, Critique of the Green Guide to Specification, 9-10.

¹³² BRE, Product Category Rules for Type III environmental product declaration of construction products (draft) (2007).

¹³³ May and Newman, Critique of the Green Guide to Specification, 15.

The ratings given to some products have been questioned. A particularly controversial example is the A rating given to PVC windows, which is much better than the C rating for aluminium windows and the D rating for aluminium-clad timber windows. The Good Homes Alliance comment that "(i)t is known and documented that PVC windows had a C rating one week prior to the release of the Green Guide," inferring that lobbying from the PVC industry could have had a significant influence. The Green Guide rating for PVC windows is defended by the British Plastics Federation¹³⁴ and several manufacturers. Others remain highly critical of PVC windows due to the chemicals released during their production and disposal¹³⁵ and it is argued by some that the ratings for timber understate the good environmental credentials and energy efficiency level which is achievable by timber.¹³⁶

According to some further criticisms, there are important criteria for assessing the sustainability of building materials which are not adequately captured by the Green Guide.

- The efficiency with which materials are used. As one interviewee put it, "you could build a ... building full of A+ materials," (s)he argued "but it might be using twice as much materials as necessary." This interviewee pointed out that the scale of resource use would be automatically captured by an absolute approach to measuring environmental impacts. It could also be captured by measuring the environmental impact per square metre or using a similar metric. This issue is currently being addressed by some current projects developing Design and Decision Tools for the Low Impact Buildings platform run by the Technology Strategy Board.¹³⁷
- The effect of materials on air toxicity. One practitioner described this omission as "incredibly frustrating."
- The GHA argue that the full range of factors affecting the thermal performance of buildings are not taken into account by the Green Guide. There is, they suggest, a focus on the U-value of materials which results in the full impact of factors such as thermal mass and non-repeating thermal bridging not being accounted for. In response, one interviewee argued that it is actually the role of the national calculation methodology (i.e. SAP) to ensure that such factors are fully considered, not necessarily the Green Guide.

There are currently moves towards addressing the methodological issues discussed above at the EU level with the development of a set of harmonised standards for construction products.¹³⁸ An EU-level approach would also make it possible to establish a common standard for assessing the environmental impacts of the transport of imported products. This is a further issue concerning the GHA because, they argue, excessively penalising imported products can hinder the development of a market for such products, which could be manufactured in the U.K. once a sufficient demand base is established.¹³⁹

¹³⁴ British Plastics Federation, *Why Use PVCU Windows* (London: 2010).

¹³⁵ Greenpeace, *LOOK OUT: Your choice of window frames could seriously affect the health of our planet* (London: 1998).

¹³⁶ Andrew Eagles, *Inefficiencies of PVC Windows* (2008).

¹³⁷ Technology Strategy Board, *Low Impact Building Competitions* (Swindon: 2010).

¹³⁸ These are known as the CEN/TC 350 standards.

¹³⁹ May and Newman, *Critique of the Green Guide to Specification*, 22.

A developer and a Code assessor interviewed for this research commented on the considerable amount of time it takes to prepare the documentation required for an assessment under the materials section of the Code. The importance of being aware of the Code requirements at the very start of a project, especially in relation to the materials section, was mentioned by another developer. It was commented that there is often uncertainty about which members of the project team will be responsible for gathering the information required and that for MAT2 and MAT3, retailers and suppliers often do not have readily available the information required regarding the source of the materials used in their products. This information can be difficult, if not practically impossible for them to acquire and entails significant extra administrative costs.

6.8 General views about the Code for Sustainable Homes



As pointed out in the recent consultation document, just over 10,000 homes have been issued Code certificates at design and post construction stage since the Code was introduced. Much has been learned about how to build sustainable homes in this time and a number of areas have been identified where the Code may not work as well as planned. The document recognises the need for this learning to be reflected back into the Code.¹⁴⁰

The general purpose of the Code is to encourage designers to incorporate a range of sustainability criteria into their decisions and manufacturers to develop more sustainable technologies, whilst allowing these industries flexibility to explore different ways of achieving these objectives. The comment is often made that the introduction of the Code has encouraged the development of a wide array of products over the last three years since it was introduced. The aim of the Code to encourage consideration of a broad range of sustainability criteria is welcomed by many designers and consultants, including some interviewed for this project. However, problems are widely pointed out in terms of the impact of the Code on design decisions, particularly in relation to the higher Code levels 5 and 6.

Stakeholders with considerable experience in building to the Code now view Code level 3 as achievable with a relatively low additional cost relative to the average cost of a home. For example, Stephen Stone of Crest Nicholson expressed this view at the Ecobuild 2010 conference, commenting that “a while ago” he thought Code 3 would be “very difficult” to achieve due to “the cost burden”.¹⁴¹ Now, he suggests, there are solutions available for achieving Code 3 by improving the energy efficiency of the building fabric without needing to purchase expensive renewable technologies. It is suggested by some that Code level 4 is achievable, or at least almost achievable, without renewables, although obviously this is more challenging.¹⁴² Code levels 5 and 6 are, however, the subject of most criticism, given that they entail a need to install technologies such as on-site renewable energy generation and water recycling which involve much greater additional costs. Several interviewees said that there is significant uncertainty about the performance of such technologies and their use involves considerable risk. As discussed in Section 6.1, 6.6 and 6.7, many stakeholders question whether Code levels 5 and 6 actually do encourage the most ‘sustainable’ kinds of building design. Others, in response to this criticism, argue that the higher Code levels were only ever intended to be applied in ‘cutting edge’ developments to encourage innovation in areas such as on-site renewable and were not intended to be applied to mainstream

¹⁴⁰ DCLG, Sustainable New Homes - The Road to Zero Carbon. Consultation on the Code for Sustainable Homes and the Energy Efficiency standard for Zero Carbon Homes (London: HM Government, 2009d), 21.

¹⁴¹ Stephen Stone, Clarifying the Zero Carbon Conundrum (London: 2010).

¹⁴² A project supported by the Technology Strategy Board on achieving Code level 4 without renewables is currently in progress. Technology Strategy Board, Low Impact Building Competitions.

housing for many years. The two highest Code levels, as two interviewees put it, were not meant to be applicable to mainstream housing. From the perspective of critics of the Code, however, there is a need for the higher Code levels to encourage designs that could be more widely applicable, leading the way towards the 2016 target.

Some of the interviewees who were critical of the Code expressed doubt about whether Code levels 5 and 6 will remain in their current form, with their current emphasis on the need to install on-site renewables. One architect with an involvement in a Code level 6 project has stated that Code 6 should only be considered for relatively large developments and is unsuitable for individual homes because of the difficulties of the need for economies of scale with renewables. One interviewee pointed out that very few Code level 6 homes are currently being built in England. Of these the largest is the Hanham Hall development in Bristol, an exemplar project built on land purchased at a discount from English Partnerships.

143

There are diverging views among stakeholders about the range of sustainability criteria covered by the Code, with some suggesting that this is too broad and others too narrow. The Code provides an assessment of each individual home. This orientation means that there are some criteria, such as those concerning public transport and local amenities, which are included in Ecohomes to assess the sustainability of housing *developments*, rather than individual homes, which are not included in the Code. This omission is regretted by some stakeholders. Indeed, it caused WWF to publicly withdraw from the Senior Steering group within DCLG that established the Code, although they later rejoined in 2006.¹⁴⁴ Others suggest that the provision of public transport and other infrastructure is more effectively addressed through the planning system. Some site-level criteria are included in the Code, which can be viewed as an inconsistency. A consultant interviewed for this project, with expertise relating to the planning of developments, argued that three of these criteria, Health & Well-being, Ecology and Management are not as "strong" as they might be, in terms of the number of credits available under the Code rating system. For example, the Management category, it was suggested, leaves out many issues concerning negotiation and consultation in the design of developments, which were dealt with by Ecohomes in more detail.

Some stakeholders express dissatisfaction with what they see as unnecessary changes to the definition and labelling of Code criteria proposed in the 2009 Code consultation document, for example changing the cycle storage criterion from ENE7 to ENE8 and home office from ENE8 to ENE9.¹⁴⁵ The justification given by DCLG for this re-ordering of criteria is that it will "better reflect the zero carbon hierarchy as well as emerging requirements from European Directives."¹⁴⁶ However, some stakeholders express dissatisfaction that homes receiving Code certification at different times will not be directly comparable. One interviewee for this project was also critical of the re-labelling of the 'ENE7 Low and Zero Carbon Technologies' criterion to 'ENE3 Renewable Technologies', which (s)he saw as a step backwards given the need for a 'fabric first' approach to reducing CO₂ emissions (this issue is further discussed in section 6.1). The change of name has been influenced by the EU Renewable Energy Directive requires member states to establish renewable energy targets.¹⁴⁷

¹⁴³ Mark Jansen (2010) "Down to zero " CIBSE Journal

¹⁴⁴ DCLG, Proposal to introduce a Code for Sustainable Homes Regulatory Impact Assessment (London: HM Government, 2006a).

¹⁴⁵ DCLG, Sustainable New Homes - The Road to Zero Carbon. Consultation on the Code for Sustainable Homes and the Energy Efficiency standard for Zero Carbon Homes, 29.

¹⁴⁶ DCLG, Sustainable New Homes - The Road to Zero Carbon. Consultation on the Code for Sustainable Homes and the Energy Efficiency standard for Zero Carbon Homes, 27.

¹⁴⁷ DCLG, Sustainable New Homes - The Road to Zero Carbon. Consultation on the Code for Sustainable Homes and the Energy Efficiency standard for Zero Carbon Homes, 37.

Two interviewees suggested that, from a developers' perspective, the Code is too "cumbersome" (to quote one of them) both in terms of the number of issues covered and the assessment process. They suggest, for example, that the water section of the Code duplicates part G of the building regulations (which also now includes a water calculator) and that other areas of the Code such as ecology and flooding overlap with current planning policy statements. They therefore view the process of Code assessment as causing some unnecessary extra time and expense. Other stakeholders varied in the degree to which they shared this view. One trained Code assessor interviewed, by contrast saw the Code as an "audit process" of a kind that is "common in lots of other industries." While there might be scope for simplification, (s)he commented, this in part reflects the complexity of the topic and significant further research is needed for this to be achieved.

The 2010 consultation on updates to the Code does contain a section entitled 'Streamlining the Code' that raises the question of whether to remove issues from the Code which do not relate to climate change. The examples given are Lifetime Homes Standard (under the Health and Well-Being section of the Code) and Acoustics (under Pollution). One interviewee, who supports the inclusion of the current range of Code criteria, expressed the hope that this latest proposal will not be agreed and saw it as a "direct result" of the difficulties house builders are having in the current economic climate.

These issues regarding the scope of the Code are more frequently cited by stakeholders as being their greatest concern. However, a few interviewees also expressed reservations about the weighting system in the Code. A few commented on the difficulties of weighting the nine criteria. How, one interviewee asked, can you weight the relative significance of reducing CO2 emissions, compared with saving landfill space, or preventing flooding? Why, another suggested, are credits made available for providing cycle storage that might not even be used, or for recycling facilities that are relatively very inexpensive compared with other means of gaining Code credits? Two interviewees disagreed with the very notion of having to weight different criteria. Why not, they suggested, simply show the performance of homes according to each individual criteria? In response to this argument, however, it could be pointed out that the very idea of considering multiple criteria to rank homes in terms of levels one to six necessarily implies a need for some form of criteria weighting.

Of course, one of the key functions of an assessment tool such as the Code is to provide information to the public about products they are purchasing. One interviewee commented that there is currently very little awareness of the Code amongst the public.

Several interviewees commented on how local authorities have often set ambitious target Code levels when defining requirements for social housing projects. They have, it is suggested, not always been fully aware of the cost of achieving Code levels 5 and 6 and the grounds for questioning whether these higher Code levels encourage the most sustainable approach. While it is beyond the scope of this report to assess these claims, the question of whether local authorities have the skills and capacity required to address the many sustainability issues associated with new housing projects has been a matter of considerable debate. For example, earlier research by NHBC found that developers favoured a consistent, nationwide application of Code requirements, rather than leaving this to the discretion of local authorities. NHBC found that "Nearly all housebuilders (86%) consider it unjust that local authority planners can bring forward Code level requirements ahead of the nationally agreed dates, with just 13% considering this reasonable".¹⁴⁸ One of the NHBC interviewees commented that: "The people who control building regulations are technical people, they know what they're talking about, they understand technology better than the local planners do. If you ask local planners the difference between renewable energy and reduction in carbon emissions, they wouldn't know the difference. The real goal which I think everybody is

¹⁴⁸ NHBC, Zero carbon: what does it mean to homeowners and housebuilders? , 79.

after is a reduction in carbon emissions, but the local authorities are often asking for renewable energy and the two do not mean the same thing."¹⁴⁹

¹⁴⁹ NHBC, Zero carbon: what does it mean to homeowners and housebuilders? , 79.

6.9 Is policy being put into practice?

The question of the extent to which new homes comply with Part L has been the subject of ongoing discussion in the industry. There is widespread concern amongst stakeholders about levels of compliance with part L of the building regulations, although there are different views about the degree of the problem of non-compliance¹⁵⁰. In 2004, research commissioned by the government, based on a sample of 99 homes, found that at least one third of new homes fail to meet building regulations.¹⁵¹ A 2006 study by the Energy Efficiency Partnership for Homes, based on interviews with 59 building control officers, found that the "vast majority of building control officers" did not consider Part L to be a priority because it is not a Health and Safety issue"¹⁵². The findings of the study about the level of compliance are summarised as follows: "75% of Local Authority interviewees claimed good compliance with the regulations but admit that compliance is never perfect. Some admit to there being unauthorised work that they don't know about, but due to time and resource constraints they can only judge the bits they see".¹⁵³ This study also found that there is a lack of specialist skills amongst building control officers in relation to energy efficiency.¹⁵⁴ More recently, a statement issued jointly by two industry groups in March 2008, the Heating and Ventilation Contractors Association (HCVA) and the Electrical Contractors Association (ECA), described the situation as "shambolic" and suggested that many building control officers are "turning a blind eye" to the enforcement of Part L.¹⁵⁵ Some interviewees for this project suggested that there is considerable anecdotal evidence to support such a claim. These claims received a measure of support from official figures released in April 2010 which show that 10% of new homes do not achieve an EPC grade C, which is the minimum required to meet part L.¹⁵⁶ Concern about these reported problems of compliance is evident in the response to the 2010 Part L consultation, in which it was found that only 19% thought that the existing building control system would be able to effectively enforce the proposals, while 64% felt further improvements were needed.¹⁵⁷

The claims made by HCVA and ECA are challenged by Local Authority Building Control (LABC), the member organisation representing local authority building control departments in England and Wales. In response, they ask these organisations to be more open about the evidence in support of their claims. LABC are also critical of the focus of some discussions about compliance on enforcement through legal action.¹⁵⁸ As emphasised in a recent DCLG report about the future of building control¹⁵⁹, LABC stress that ensuring compliance involves more than just adhering to formal legal procedures and taking cases to court. The role of building control is to provide a service, informing developers about how they can meet legislative requirements and intervening before actions are taken which infringe the regulations. Such 'pre-contravention interventions' are of integral importance to ensuring

¹⁵⁰ DCLG, Definition of Zero Carbon Homes and Non-Domestic Buildings: Consultation (London: HM Government, 2010b).

¹⁵¹ P. Grigg, Assessment of Energy Efficiency Impact of Building Regulation Compliance. A Report Prepared for the Energy Savings Trust/Energy Efficiency Partnership for Homes (Watford: BRE, 2004).

¹⁵² AEA Technology, Compliance with Part L1 of the 2002 Building Regulations (An investigation into the reasons for poor compliance) Final Report 3.5.06 (Energy Efficiency Partnership for Homes, 2006), 35.

¹⁵³ AEA Technology, Compliance with Part L1 of the 2002 Building Regulations (An investigation into the reasons for poor compliance) Final Report 3.5.06, 28.

¹⁵⁴ AEA Technology, Compliance with Part L1 of the 2002 Building Regulations (An investigation into the reasons for poor compliance) Final Report 3.5.06, 8., p.8.

¹⁵⁵ Michael Willoughby (2008) "Part L enforcement 'shambolic' claims industry body," Building magazine

¹⁵⁶ John Trinick, Elizabeth Elliott, Michael Green, Jack Shepherd and Malcolm Orme, EEPH/ CLG Research into Compliance with Part L of the Building Regulations for New Homes – Phase 2 Main Report (Faber Maunsell/ AECOM, 2009).

¹⁵⁷ DCLG, Part L consultation - Summary of responses, 8.

¹⁵⁸ E.g. An example of this focus can be found in a report by the Energy Saving Trust, Review of the interpretation and enforcement of Part L1B (2006), 15.

¹⁵⁹ DCLG, The Future of Building Control (London: HM Government, 2008b).

compliance. As one professional working in Building Control put it, “if you end up with a court case, arguably building control hasn’t done its job properly”. Surveys undertaken by LABC across four regions of the U.K. (Cornwall, East Midland, part of East Anglia and all of Wales) from January to November 2009 found that 16,831 PCIs were carried out in relation to all parts of the regulations.¹⁶⁰ 2,809 of these concerned Part L, which was second only to Part A on structure. This educative role for building control is particularly important when working with the many smaller developers who, unlike larger housebuilders, tend not to have the resources and expertise available to keep up to date with changes to the regulations.¹⁶¹

In the case of Part L in particular, which has recently been the subject of particularly significant change, there is even less scope for reliance on formal legal procedures to ensure compliance. There are nine stages of the building process at which developers must notify building control. None of these relate to insulation requirements, which are of course crucially important for achieving compliance with Part L. These stages are either at the very early stages of the build process, such as the digging of foundations and the digging of drains, or are at the very end after the building is complete, such as air tightness testing. It is of course impossible for officers to test the installation of insulation after construction has taken place, other than by using thermal imaging technology which is costly and itself involves practical difficulties. In order to test insulation at the time of installation, building control officers are, to a significant extent, reliant on having good working relationships with the building contractor. The building control professional referred to above suggested that such good working relationships do exist in the vast majority of cases. Even then, however, there are practical difficulties involved in ensuring compliance. As one interviewee for this research put it, it is not feasible for building control officers to be looking over the shoulder of the contractor during this stage of the construction process. Because of the importance of this stage, some building control officers favour making this a statutory inspection.¹⁶² Yet, increasing the number of inspections would increase the cost of monitoring each housing development and would therefore have important resource implications for local authorities.¹⁶³

Although a mandatory air tightness test was introduced in Part L 2006, there has been a requirement for only one of each dwelling type on each development to be tested.¹⁶⁴ Although developers might choose to conduct more extensive tests, there is scope for them to avoid consistently achieving regulatory standards across a whole development. For this reason, the current approach to testing in Part L was described by one interviewee as “flawed”. The requirement is to be made more stringent in the 2010 amendment to Part L and the number of buildings to be subject to such tests will approximately double.¹⁶⁵ Some stakeholders are of the view that the need to ensure there are sufficient building control officers with full training in Part L compliance, as highlighted back in 2004 by the Better Buildings task force,¹⁶⁶ has yet to be adequately met.

¹⁶⁰ The study was based on a one month ‘snapshot’ of all day-to-day interventions by all building control surveyors in each of these regions.

¹⁶¹ AEA Technology, Compliance with Part L1 of the 2002 Building Regulations (An investigation into the reasons for poor compliance) Final Report 3.5.06, 7.

¹⁶² AEA Technology, Compliance with Part L1 of the 2002 Building Regulations (An investigation into the reasons for poor compliance) Final Report 3.5.06, 37.

¹⁶³ AEA Technology, Compliance with Part L1 of the 2002 Building Regulations (An investigation into the reasons for poor compliance) Final Report 3.5.06, 37.

¹⁶⁴ ODPM, The Building Regulations 2000 L1A: Conservation of fuel and power in new dwellings (London: HM Government, 2006), 23.

¹⁶⁵ DCLG, Proposals for amending Part L and Part F of the Building Regulations – Consultation Volume One, 29.

¹⁶⁶ Sustainable Building Task Group, Better Buildings, Better Lives (2004), 6, 18.

The challenge for policy-makers of ensuring high levels of compliance extends beyond that of ensuring that sufficient resources are available for building control. Notably, the recent Zero Carbon Hub report on carbon compliance points to the urgent need for the methodology of these air tightness tests for Part L to be improved.¹⁶⁷ Policy makers have also identified other approaches to the challenge of ensuring compliance. Two notable examples are accredited details and competent person schemes. The 2010 Part L consultation contained plans to extend the use of both of these approaches. Accredited details, it is suggested by DCLG, can reduce the time it will take for building control officers to assess compliance because building control would only need to check that an accredited detail has been applied.¹⁶⁸ Similarly, where technologies and appliances are installed by certified competent installers, the need for checking by building control officers can be relaxed. However, the Consultation Response reveals concerns among some stakeholders, particularly about accredited detail schemes. It is questioned whether accredited detailed schemes would, in practice, save time for building control, given the need to check documentation on the details which have been used.¹⁶⁹ The consultation responses reveal that competent person schemes can, in practice, also involve problems, notably the need for rigorous audit procedures.¹⁷⁰

Part L 2010 has introduced a legal requirement for developers to demonstrate compliance by providing documentation of the proposed design and the calculated emissions prior to construction. The provision of such design-stage documentation had previously been recommended but was not a legislative requirement. This new requirement was introduced following a suggestion of LABC and received almost universal support from respondents to the Part L consultation.¹⁷¹ Research had previously found that building control officers considered overall compliance with Part L at the design stage to be good.¹⁷² However, this finding does not address the potential problems of non-compliance amongst those developers who did not submit design-stage documentation.

A further change introduced in the 2010 building regulations is a requirement for building control officers to undertake a risk assessment, which would include an assessment of the risk of non-compliance with Part L. Building control will be required to inform the developer about the result of the assessment. However, it would be left to the discretion of the developer whether to pay for a further assessment to establish more definitely whether or not compliance has been achieved. While the requirement for a risk assessment might be a welcome step forward, there is concern about the lack of incentives for developers to pay for any subsequent assessments which might follow.

Some stakeholders suggest that further difficulties arise from the current system of allowing developers to be inspected by private companies. The need for these companies to continue to win business could mean that there is less of an incentive for them to ensure compliance than there is for local authorities. One interviewee with extensive knowledge of the building control system questioned whether the Construction Industry Council is sufficiently active in its role of overseeing private companies, pointing out that they have yet to take any action against an approved inspector. Also, reflecting such concerns, the U.K. Association for the Conservation of Energy, in response to the Part L consultation, proposed the establishment of a central body for ensuring the enforcement of building regulations.

¹⁶⁷ Zero Carbon Hub, Carbon Compliance for Tomorrow's New Homes - A Review of the Modelling Tool and Assumptions 9.

¹⁶⁸ DCLG, Proposals for amending Part L and Part F of the Building Regulations – Consultation Volume One, 41.

¹⁶⁹ DCLG, Part L consultation - Summary of responses, 57.

¹⁷⁰ DCLG, Part L consultation - Summary of responses, 39.

¹⁷¹ DCLG, Part L consultation - Summary of responses, 13.

¹⁷² AEA Technology, Compliance with Part L1 of the 2002 Building Regulations (An investigation into the reasons for poor compliance) Final Report 3.5.06, 36.

Some interviewees also questioned the adequacy of current procedures for checking whether homes claiming to have achieved particular Code levels really do comply with the Code requirements. Until May 2010, there was a requirement for a Code certificate to be included in the Home Information Pack (HIP) for a new home (In May, the new government announced that HIPs are to be abolished). If a home had not been assessed in terms of the Code then a 'nil' certificate had to be included in the HIP. It fell within the remit of trading standards to ensure compliance with the legal requirements for HIPs. One interviewee suggested that Code certificates were not being included in Home Information Packs for new buyers. While this made them liable for a fine, (s)he did not think that trading standards were enforcing this. Another interviewee questioned who is currently responsible for compliance with the Code, suggesting that there is a need for local authorities to take responsibility for assessing that their target Code levels have been achieved in practice.

There was also a legal requirement for HIPs to include an Energy Performance Certificate (EPC) and the announcement of the abolition of HIPs made clear that this requirement to provide an EPC is to be kept in place. EPCs provide the results of an assessment of the energy efficiency of a home using RDSAP, a simplified version of SAP. While building control should not issue a compliance certificate until an EPC has been produced, only trading standards and not building control have legal powers to challenge where an EPC has not been produced. It has been beyond the scope of this research to consider the levels of enforcement of EPC requirements by trading standards. It has also been beyond the scope here to consider different stakeholders' views about the effectiveness of the methodology by which EPCs are produced. However, it can be noted here that there is significant evidence to suggest that there are problems with the accuracy of the RDSAP model used to produce the EPC assessments. (RDSAP is a simplified version of the SAP model and the 'RD' stands for 'reduced data'). This evidence is documented in a working paper published by the UK Energy Research Centre.¹⁷³

6.10 Is policy being informed by monitoring the performance of new homes?

It is often emphasised by experts in designing low carbon buildings that there is a need for more evidence about the performance of different construction methods and materials to inform policy. As is acknowledged by DCLG in their recent consultation on Part L, there is considerable evidence that the actual performance of buildings in terms of heat loss tends to end up being considerably worse than SAP-based calculation tools predict.¹⁷⁴ The evidence from the study by Leeds Metropolitan University at Stamford Brook in Cheshire is cited in relation to this issue. (This study had significant influence in relation to the issue of party wall heat loss, as explained in Section 6.2). As well as problems with the tools used to predict the energy efficiency of buildings, the performance gap is also partly a result of problems on site with contractors not constructing the building according to the design requirements. As explained above, the building regulations assess homes according to their design rather than their performance. The energy efficiency standard defined by the Zero Carbon Hub is also solely a design standard, rather than 'as built' standard. In its report, the Hub task group explain that there is not enough data currently available to set an 'as built' standard.¹⁷⁵

¹⁷³Nick Banks, Implementation of Energy Performance Certificates in the Domestic Sector (UK Energy Research Centre, 2008).

¹⁷⁴DCLG, Proposals for amending Part L and Part F of the Building Regulations – Consultation Volume One, 22.

¹⁷⁵Zero Carbon Hub, Defining a Fabric Energy Efficiency Standard for Zero Carbon Homes: task group recommendations, 23.

Given this significant potential problem of a 'performance gap', many stakeholders express regret, if not complete disbelief, at the lack of a more extensive, strategic approach to testing the performance of completed buildings. One reason for the lack of such testing in the building sector is resistance from house builders. After all, as one interviewee asked, what would happen to those companies whose buildings had been found to not be compliant? Also, testing has a cost, with developers keen to sell houses as soon as they are built. Furthermore, accurate post-occupancy testing could disturb the privacy of occupants once they have moved into a new home.

One interviewee commented that there is now a growing recognition in government of the importance of performance monitoring. This is reflected in the recent Part L Consultation document which states a commitment to strengthening research and development programmes. One interviewee explained that there are plans for an amendment to the Code that will make available three credits for agreement to take part in monitoring of gas and electricity use in the home and for installing a visual display of home energy use. However, representatives of developers involved in discussions about this amendment, this interviewee explained, have succeeded in opposing a suggestion that Code credits be given for testing the performance of homes, given the costs this involves.

Many still question whether sufficient resources are still available for performance monitoring. One stakeholder interviewed raised the idea to government of adding £10 to the cost of an EPC which would then fund such research. However, they found the civil servant concerned dismissive of the idea of such a 'tax' which they saw as not possible to 'sell' politically, given the need to get re-elected. Other similar suggestions such as an additional levy to be charged for each SAP assessment have also not been adopted.

In addition to some further studies which are currently being undertaken in the academic sector,¹⁷⁶ the government has provided financial support for some further performance monitoring projects. Firstly, a scheme run jointly by the Good Homes Alliance and the Energy Saving Trust, with funding from DCLG, has involved both post-construction testing and ongoing monitoring of several new build homes, including the first flats in the U.K. to be monitored in this way. The results of this research are due to be published in October 2010. Secondly, the Technology Strategy Board (TSB) are running an £8 million Building Performance Evaluation programme for monitoring a range of developments involving newly constructed buildings of different types. The TSB have invited applications for developers with current projects which they would like to be included in the scheme. The 'Carbon Challenge' scheme organised by the Homes and Communities Agency, which is providing support for at least four Code level six developments also includes provision for monitoring in all of its developments. It remains to be seen which schemes will be selected. One interviewee stressed the need to include examples of mass market housing, rather than focusing on exemplar schemes which are not so representative of the majority of homes built. The Energy Savings Trust also has a monitoring scheme under way. Their Homes Energy Efficiency Database is much broader in scope, though does not contain data on newly built homes.

The 2010 Part L proposals refer to the establishment of a research and development programme, an important goal of which will "be to establish improved site and in-use testing and measurement methods that are able to deliver robust results in a cost effective manner."¹⁷⁷ But there is a general view that there has been a need for funding to be made available to support a more extensive programme involving testing on a larger number of homes.

¹⁷⁶ Notable examples include the work of Fionn Stephenson at Oxford Brookes University and David Johnston at Leeds Metropolitan University.

¹⁷⁷DCLG, Proposals for amending Part L and Part F of the Building Regulations – Consultation Volume One, 33.

6.11 Does the industry have the skills?



Discussions about the challenge of delivering low and zero carbon homes, frequently point to the need for the development of new skills across the building industry. The industry is quite often described as “conservative”¹⁷⁸ and reluctant to adopt new practices.

There are a range of new skills required by contractors, such as building walls and installing insulation to meet higher energy efficiency standards. Evidence of the gap between the design and performance of buildings, as well as comments and anecdotes heard during the course of this research suggest that there could be significant scope for improving current skill levels of contractors working on-site. (Having said this, experts suggest that inaccuracies of current design tools could also be a cause of the performance gap).

The importance of project management skills was also highlighted, given the need to ensure effective coordination between contractors responsible for different stages of the build process. The approach to drawing up contracts typically taken in development projects has been described as “adversarial,” with contractors seeking to do the minimum work necessary to fulfil their contractual obligations. As a result, sustainability standards can be compromised and a more “collaborative” approach has been described as needed, starting from the early, design stage of a development project¹⁷⁹. Some practitioners have discussed the importance of having a manager on site to encourage such coordination and ensure that specified sustainability standards are delivered on site.¹⁸⁰

The skills and roles of designers and sustainability assessors are also undergoing a process of change. There is suggested to be a growing need for architectural skills to be combined with an understanding of engineering and building physics.¹⁸¹ The view of engineers that architects and other designers need to pay closer attention to the practical implications of their designs has, as two interviewees pointed out, been a longstanding subject of discussion. However, designers do now have a new set of issues to consider relating to energy supply, such as the installation of renewable energy technologies and other ‘allowable solutions’ in achieving low and zero carbon homes. Also now requiring consideration is the ‘feed-in’ tariff (see Section 6). One consultant interviewed described the challenge facing house builders of delivering allowable solutions as “incredibly complicated.” This consultant questioned not only whether this falls within the expertise of house builders but even whether there are currently enough consultants with the required expertise to provide them with advice. Developers themselves have suggested that greater responsibility for addressing such issues should be left to energy suppliers.

What should be the role of policy-makers in encouraging the development of such skills across the industry? One developer interviewed strongly regretted that the required skills, such as those relating to achieving high levels of air tightness, are not adequately incorporated into training courses for builders and that this needs to change. Another, with a

¹⁷⁸ Fulcrum Consulting, Definition of 'Zero Carbon Homes and Non-Domestic Buildings' Consultation (London: 2009a).

¹⁷⁹ Sustainability Now 2009 PassivHaus debate

¹⁸⁰ John Tebbit, Part F and L – what it means for product suppliers (London: 2010).

¹⁸¹ Doug King, “The great zero-carbon skills gap,” Construction Research and Innovation 1(1) (2010): 24-29.

background in building control discussed the need to ensure that developers, particularly smaller companies, be kept informed about how to meet Part L and the implications of recent changes. While large developers have the staff and resources available to ensure that regulatory changes are incorporated into their designs, smaller builders, this interviewee commented are often much less well informed. Here building control officers could have a potentially important educational role although some question the levels and availability of training for building controllers in relation to Part L. Research by the Energy Savings Trust reveals a widespread feeling amongst building control officers that there is a general need for more information and publicity to be provided by government relating to Part L changes, especially as so many new areas of work have been introduced¹⁸².

6.12 The zero carbon agenda – a party political issue?

The 2016 zero carbon target has been discussed widely across the building industry, in the industry press and at practitioner events. However, the issue has been the subject of relatively little wider debate involving the general public. Indeed, the issue has been the subject of relatively little discussion in Parliament. The general issue of the Labour government house building targets has been discussed in the House of Commons and the zero carbon target has been mentioned, as with John Healey's 2008 announcement on the zero carbon definition (see Section 6.1). However, research undertaken during the last parliament found that 72% of MPs were unaware of the 2016 target.¹⁸³ The details of policies for the zero carbon homes agenda have not been discussed by the DCLG and DECC Select Committees since these policies were introduced, as a search of their minutes reveals, although it is discussed in some memorandums submitted to select committees by organisations such as the Home Builders Federation and the Construction Products Association and Commission for Architecture and the Built Environment. Also, the general issue of changes to Part L of the building regulations was discussed at select committee in the years prior to 2007¹⁸⁴ even if the idea of a transition to zero carbon homes was not directly discussed.¹⁸⁵

The Labour Party 2010 election manifesto simply re-stated the target, with no discussion of the means by which this will be achieved. The zero carbon target and the issue of building low and zero carbon new homes is not mentioned in either the Conservative Party or Liberal Democrat 2010 election manifestos. Both the Liberal Democrats and Conservative manifestos do state a commitment to reducing emissions from the existing housing stock, an issue not discussed by the Labour party manifesto. The Green Party manifesto pledges to establish improved energy efficiency standards for new homes¹⁸⁶, although detailed proposals are not provided

¹⁸²Energy Saving Trust, Review of the interpretation and enforcement of Part L1B, 16.

¹⁸³ Stephen Kennett (2009) "Most MPs unaware of zero-carbon housing target," Building

¹⁸⁴ See the extensive discussion of Part L by the ODPM select committee UK Parliament, Office of the Deputy Prime Minister: Housing, Planning, Local Government and the Regions - Minutes of Evidence (London: 2004). The issue of off-site renewables was also briefly discussed, as documented in UK Parliament, House of Commons ODPM: Housing, Planning, Local Government and the Regions Committee (2004)..

¹⁸⁵ The only select committee report where policy for reducing carbon emissions from new housing is discussed is the DCLG Select Committee Report for 'Existing Housing and Climate Change' (2007-8). Here, it is argued that there is an over-emphasis on policy for new build housing, compared with policy for the existing housing stock that is receiving relatively little attention. The report does not discuss the challenges of defining policy for new homes, as discussed here.

¹⁸⁶ Green Party, (2010).

The two main opposition parties during the last Parliament did however discuss their policies for new housing in some other policy statements. In November 2009, the Conservative shadow Housing Minister Grant Shapps confirmed that his party shared the commitment of the government to the zero carbon target. Showing awareness of criticisms of the government regarding the delays in providing a definition of zero carbon, Shapps stated that he would provide confirmation of the definition of Code level 6 “within weeks” of coming to office¹⁸⁷. In their 2009 policy statement entitled ‘Zero Carbon Britain,’ the Liberal Democrats stated their commitment to strengthening the building regulations to incorporate the ‘GreenHouse’ standard no later than 2011,¹⁸⁸ a standard, they explain, which is modelled on Germany’s PassivHaus standard¹⁸⁹. This document also refers to the “complexity and lack of transparency” of the current building regulations, which “still make it hard for building control officers to assess if they are being met”¹⁹⁰.

Compared with other policy issues, including those relating to climate change, the zero carbon target has been the subject of little party political debate. Interviewees for this research question whether politicians understand the various technical issues involved in defining zero carbon. The questions discussed in this report about how to define and deliver this target have hardly featured on party political agendas.

¹⁸⁷Alex Hawkes, Tories make zero-carbon definition pledge (2009a).

¹⁸⁸Liberal Democrat party, Zero Carbon Britain – Taking a Global Lead (London: 2010), 2.

¹⁸⁹Liberal Democrat party, Zero Carbon Britain – Taking a Global Lead, 11.

¹⁹⁰Liberal Democrat party, Zero Carbon Britain – Taking a Global Lead, 11.

7 Summary of policy perspectives

This section provides a review of the perspectives of different stakeholders about policy and the policy process in terms of the analytical framework introduced in Section 4 above. As explained in Section 5, the aim here is not to offer a definitive evaluation of the policy process in terms of this framework but rather to report on the views expressed by stakeholders and relate them to the criteria highlighted.

7.1 Long term?

The U.K. government has firmly established the high-level, medium-term objective of ensuring that, by 2016, all new homes are 'zero carbon' and are not therefore net contributors to CO₂ emissions. There is a view, widely shared amongst the interviewees for this project, that this ambitious zero carbon target has served to galvanise the industry, encouraging the development of new technologies. Indeed, policies in England for the transition to zero carbon homes have been described as "world leading"¹⁹¹. However, as further discussed below, the extent to which policy makers have taken a clearly defined, strategic approach to achieving this policy objective is widely questioned within the industry. Many stakeholders are of the view that the government refrained from taking the long term decisions needed, such as commissioning the extensive research needed to inform policy, strengthening policy implementation and compliance, as well as developing the renewable energy infrastructure needed to achieve a transition to a low carbon economy.

7.2 Clear?

There are some concerns relating to the clarity of policy, which are further discussed in Section 7.9 on joining up policy-making. Here the focus is on views about whether sufficiently clear, advance *confirmation* of policy has been provided. Callcutt stated that a definition of zero carbon needed to be provided as soon as possible and by no later than the end of 2008.¹⁹² However, as several interviewees pointed out, a complete definition of zero carbon is yet to be provided, with the detailed definition of carbon compliance and allowable solutions still to be confirmed (See Section 6.1). The definition of allowable solutions was originally promised to be provided by December 2009. Concerns about these delays are reflected in the comment of one large developer interviewee that: "we've got no policy clarity. It's not just developers who've not been able to future-proof. It's manufacturers, suppliers and consultants as well." With the delays to confirming the definition, this interviewee added, developers will now be left with just a four or five year window to develop their approaches to achieving zero carbon, which "is not realistic or fair". However, a representative of a different section of industry had a different view, suggesting that we are "near enough" to having provided a definition of zero carbon for industry.

¹⁹¹ Baufritz, *Intelligent Thinking for the Future* (Cambridge: 2010).

¹⁹² The Callcutt Review, *The Callcutt Review of Housebuilding Delivery* (City: DCLG, 2007), 93.

The SAP model used to assess energy efficiency is a well-established method for assessing the energy efficiency of homes. However, the criticisms of SAP from some experts (see Section 6.2 -6.3) raise the question of whether the method provides a firm foundation for policy of the kind that the Callcutt report stressed is needed¹⁹³ and some expect that further significant revisions will be made. However, opinions about this are mixed and other stakeholders are of the view that SAP can serve as a suitable tool for this purpose.

The uncertainty and ongoing changes surrounding the definition of the Code, one consultant interviewee argued, also creates problems for house builders. For example, an interviewee from a medium-sized housing developer complained about the lack of advance warning about future changes to the Code. Another interviewee stressed that some of the changes to the criteria names and distinctions proposed in the 2010 Code consultation would create unnecessary confusion for developers (See Section 6.8). A consultant interviewed pointed out the difficulties that would be caused for developers and designers of developments to be built-out over several years in different phases, if revisions to the Code itself and Code requirements were to be made with relatively little forewarning. The time taken to gain planning permission can further compound such problems. For example, a designer involved in the design of a Code Level Six development in the UK, who had worked on detailed plans for the site prior to submission of the planning application, expected that, once permission is eventually granted, subsequent changes to the Code would create the need for significant revisions to the plans. This extra time and the costs involved can be seen as an example of the lack of clarity in policy creating a further burden for house builders.

7.3 Flexible?

The building regulations and the Code clearly do allow developers flexibility in that, as emphasised by government, they define general CO₂ emissions reductions targets and allow house builders to choose the technologies and designs they will use to achieve these targets. There is a wide acceptance of the need for such 'performance-based' regulation. However, as has been explored here, the specific ways in which these targets have been defined have in some respects been criticised for unnecessarily limiting the choices available to designers for achieving CO₂ emissions reductions and in that sense limiting flexibility. The requirement for on-site renewables has been the subject of particular criticism. The water calculator has also been criticised for having similarly distortive effects on design decisions. These concerns have been widely voiced by practitioners during policy discussions with government, as well as more widely at conferences, seminars and in the industry press. In response, some significant changes have been made to policy, notably the introduction of off-site allowable solutions which would count towards achieving zero carbon, as well as updates to the water calculator. The establishment of the Zero Carbon Hub in 2008 and the definition of the minimum energy efficiency standard it has provided has been widely welcomed. However, significant worries still remain about whether existing policy allows designers sufficient flexibility to choose the most sustainable solutions. Firstly, many, if not most, developers consider 70% carbon compliance to be too demanding. A lower minimum level of carbon compliance, they argue, would provide them with greater flexibility in deciding the on the most cost effective way of achieving CO₂ emissions reductions for each particular development. Indeed, two representatives of housing developers interviewed expected the carbon compliance level to be significantly reduced from the current 70% towards 44%. Secondly, the majority of experts from industry involved in the policy process disagree with the decision to adopt a 'flat' percentage reduction of CO₂ emissions for all dwellings, which does not account for the variation in abatement costs across different types of dwellings.

¹⁹³ The Callcutt Review, The Callcutt Review of Housebuilding Delivery, 94.

7.4 Outcome-focused?

The establishment of bold objectives such as the 2016 target might be seen as an example of 'outcome-focused' policy. However, as discussed above, a crucial challenge in achieving such a goal is that of defining the specific means of measuring outcomes in terms of CO2 emissions, as well as other sustainability criteria. This issue often arises and is of central importance to the debates across the industry about policy. As discussed here, there has been considerable uncertainty about exactly how the 2016 target is to be defined and assessed.

Many practitioners take issue with the way in which outcomes are measured in assessing progress towards the zero carbon target. They object to the current approach of calculating CO2 emissions reductions relative to the performance of a notional building, advocating that this be measured in absolute terms. When the SAP model needs to be revised, as was the case with the party wall issue, this can create a need to revise the notional baseline against which building performance is measured, in order to provide clarity about the actual outcomes being achieved by developments in terms of CO2 emissions reductions. This can make it harder to compare technologies and by contrast an absolute measure could be more easily comprehensible. Notably, the minimum energy efficiency standard adopts such an absolute approach and there is some expectation that the definition of zero carbon will eventually be defined in absolute terms. Similar debates have arisen in relation to the water calculator (see Section 6.6) and the Green Guide (Section 6.7) as tools for assessing the sustainability of appliances using water and building materials respectively. In defining these two tools, a key challenge has been that of achieving a balanced assessment in terms of multiple criteria.

House builders must inevitably focus on adopting the solutions required for them to satisfy the required targets and standards, whether it is to comply with building regulations or to attain a particular Code level, even where there is an understanding within their company that the solutions they adopt as a result are not necessarily the most sustainable. As part of this research, for example, cases were discovered where designers had specified water recycling or particular renewable energy technologies to comply with the Code, even while knowing that there is considerable scope for questioning whether this was the most sustainable option. It is implied that measuring CO2 emissions in absolute terms (see Section 6.2.1 above) would reduce the number of such cases. In the meantime, the need to keep costs down means that regulations and assessments run the danger of becoming what some practitioners criticise as being 'box ticking' exercises. This criticism is not necessarily an objection to the principle of a 'tick box' approach to assessing housing. After all, as was emphasised by some interviewees, a set of clear assessment criteria against which to measure a development can serve as an important aid to designers. Rather, this criticism is concerned about house builders focusing on satisfying the required standards at the lowest possible price, even where these standards do not encourage the most sustainable approach achievable for that price. The imperative to 'tick the right boxes' even where it could result in a less sustainable outcome is reflected in the comment of one consultant who said that "every call we receive asks us the cheapest way of achieving code level 4. They never ask what is the *best* way of doing it."¹⁹⁴

¹⁹⁴ This point about the 'tick box' approach has been expressed by George Martin (Willmott Dixon) and Craig White (White Design) as a distinction between target 'outputs' and *outcomes*, the latter being the actual goals towards which the targets purport to measure progress.

Some architects and consultants interviewed for this research did give examples of where they had incorporated extra features or criteria into their designs because they considered them more sustainable, even though they did not contribute to achieving a higher Code level or the building regulations. However, the concern of many stakeholders is that the way outcomes are defined for key areas of policy such as energy and water efficiency will tend to have a distortive effect on the decisions of designers seeking to achieve CO2 emissions reductions.

7.5 Innovative?

To assess fully the extent to which there have been innovations in the kind of processes through which policy for the zero carbon agenda is developed would require a broader, comparative study to be undertaken. Comparisons would need to be drawn with how building regulations have been developed in the past and with current policy processes in other areas. As mentioned in Section 9, this is one area with potential for future research.

One issue relating to innovation that often arose as part of this project is what might be referred to as the 'path dependency' of policy. This means the difficulty of changing the direction of policy once a particular path has been taken. Here, Part L is a key example. As discussed in Section 6.2 above, there is doubt about whether the current approach of assessing energy relative to a notional building, is the most appropriate tool for measuring the energy efficiency of homes. Yet this is now a well-established approach and, as suggested by one interviewee with a close involvement in the policy process, to switch to an absolute approach would entail a significant amount of extra work for government. If the government were to go back and seek to radically simplify the Code, as suggested by some stakeholders, it is argued that this would similarly result in a significant amount of extra work for policy makers. Some interviewees referred to the strong desire under the Labour government to avoid policy 'U turns.' Some further issues where innovation in the policy process was perceived to be required are further discussed below in relation to the theme of inclusiveness.

7.6 Inclusive?

The policy process can be considered inclusive in that the advice and opinions of a wide range of stakeholders are sought and that policy consultations provide an opportunity for industry and the wider public to express their views. The various working groups and advisory committees, which are integral to the policy process, provide various stakeholders the opportunity to air concerns of the kind discussed above. More senior participants in the policy process have the opportunity to air their views to senior civil servants and the housing minister. The 14 interviewees for this project who work for private sector companies or industry groups but have been directly involved in the work of policy committees within government clearly value their opportunity to participate.

In terms of the way in which discussions are organised and conducted, an in-depth assessment of views about inclusiveness is beyond the scope of this project. One issue that several interviewees considered important was the way in which civil servants respond to the views they express about policy. Here, mixed views are expressed by the 14 aforementioned stakeholders. Some emphasise that civil servants understood and were sympathetic to their view, sometimes requesting further written reports setting out their case. On the other hand, two interviewees each gave different examples of where they felt that significant concerns they had expressed were, in the words of one, "brushed aside." Four of the 14 interviewees volunteered the view that, on some occasions in policy strategy meetings, due to the technical nature of the case they were presenting, this case was not fully understood by some civil servants who did not have a technical background. As explained in this report,

much of the technical work on policy development is undertaken on behalf of the government by consultancies such as BRE. Government still needs to incorporate such advice into policy decisions. A few interviewees questioned whether the government in this respect even has the technical expertise required to act as an “intelligent client” in the way that the Cabinet Office report suggests is needed (see p.14).

A small number of stakeholders commented on how the interests of civil servants can be an obstacle to the development of policy. Two interviewees remarked that it is not necessarily in the interests of civil servants to respond to critiques of policy. For example, one civil servant was described as not wanting to “rock the boat” by supporting a proposed change to the direction of policy. One interviewee, who was particularly critical of what (s)he saw as the over-cumbersome Code, expressed concern that it was in the personal interest of civil servants with responsibility for the Code to preserve as many of its features as possible.

Some of the interviewees involved in the policy process suggested that, while their concerns might be understood by the civil servants present at meetings, whether they are communicated to ministers and then acted upon is quite another matter. Two specific examples were mentioned of decisions taken by the Housing Minister John Healy which ran against the opinions put forward to him which were held by the vast majority of stakeholders involved in the policy discussions with government. Firstly, the decision within the 2010 Part L Update to opt for the ‘flat’ rather than the aggregate approach to defining the emissions reduction target for different dwelling types. On this issue, the minister had received advice that the flat approach be adopted (see Section 6.5). A second case in point is the decision to not include in Part L a requirement for ‘consequential improvements’ (i.e. improvements to the energy efficiency of the rest of the home when an extension is built). This decision, whilst not directly within the scope of the current project, is mentioned because it caused much concern in the 2010 Part L consultation¹⁹⁵ and was mentioned by some interviewees for this project. The decision caused some significant controversy as the original intention was for the proposed requirement to be included in the Part L 2010 consultation but the minister decided to remove it.¹⁹⁶ A subsequent request under the Freedom of Information Act by the Association for the Conservation of Energy revealed that the measure was estimated to result in £705 million of energy savings, 2.3 times greater than the cost of the improvements.¹⁹⁷ The earlier ministerial decision by Yvette Cooper to establish the ‘100% on-site’ definition of zero carbon for the Code, can also be seen to have run against the concerns which were expressed from 2006 onwards about the potential difficulties involved in delivering homes which are ‘zero carbon’ in terms of the ‘100% on-site’ definition (see Section 6.1).

The establishment of the Zero Carbon Hub, as an organisation giving stakeholders the opportunity to work together to make recommendations to ministers, was welcomed by several interviewees and can be viewed as increasing the inclusivity of the policy process. In proposing the idea of the Zero Carbon Hub, Callcutt saw the benefits of establishing an independent body to oversee the development of a definition of zero carbon. Interviewees who had taken part in the work of the Hub on the energy efficiency standard mentioned what they saw as the benefits of their discussions having an independent facilitator, implying that this was preferable to what had sometimes been their experience of committees facilitated by government officials. One interviewee, for example, felt that the independent chair encouraged ‘openness,’ with stakeholders feeling that they did not have to “put on a show” for government. It was felt that the presence of observers from government at the working group was helpful as they were able to keep track of which issues were particularly contentious and keep the minister informed. The Hub’s work on the energy efficiency standard, which was eventually agreed on unanimously by the working group, is widely

¹⁹⁵ DCLG, Part L consultation - Summary of responses, 21.

¹⁹⁶ Andrew Warren (2010) "Britain pays a high price for personal prejudice," EIBI Magazine

¹⁹⁷ (2010) "Whitehall covered up £705m of Part L savings," Construction Manager

viewed by stakeholders as a positive step in the right direction. Two interviewees did suggest that, rather than only undertaking work as requested by government, there is scope for the work of the Zero Carbon Hub in general to be more proactive in leading the development of the zero carbon agenda. There is of course further work on the zero carbon definition currently in progress and it was pointed out by two interviewees with an involvement in the work of the Hub that there is a need to broaden the areas of expertise they cover in areas such as planning and land purchase.

The approach to policy-making under the Labour government, described by two interviewees as 'consensual,' reflected the value placed on openness in that it sought to bring together and establish common ground between various views.¹⁹⁸ Representatives of a wide range of organisations are now involved in key meetings, such as those of the Zero Carbon Hub and the Code advisory group. Some interviewees, including both governmental and private sector stakeholders, took a favourable view of how policy discussions developed over time with different parties developing some common understanding. As one interviewee commented, the early discussions about the Code during 2007 created "a greater willingness to work together" and created "a means for the department to bind together quite a few disparate people." A comment from one interviewee about policy strategy committees in general was that "Everyone is looking for the path of least resistance really". The Hub also sought to adopt such an approach, with one interviewee describing participants in the energy efficiency task group as a "broad church" and the task of the Hub as being to seek common ground between them. In the case of this task group, the approach can be seen to have achieved a considerable degree of success. Stakeholders interviewed were pleased that common ground was established, considering the diversity of the interests involved, ranging from the WWF to the Home Builders Federation (HBF) to the AECB. Having said this, one interviewee worried that stakeholders might soon revert back to "disagreement mode."

In spite of such achievements, some stakeholders expressed dissatisfaction with such a 'consensual' approach. One commented on the need for leadership and a clearer sense of direction from government, suggesting that this means taking decisions which are not necessarily accepted by all parties. Others spoke with regret about how committees on policy strategy mainly involve stakeholders "lobbying" for their particular interests, which, in the words of one interviewee "makes it difficult to achieve a joined up approach." A motivating factor in this can be the presence of very senior civil servants which means that different stakeholders have a "direct route to the top". For one interviewee, this contrasted with technical working groups which (s)he saw as tending to focus on problem solving according to technical criteria. However, another interviewee expressed dissatisfaction with the format of the Part L technical working group meetings as a way of fully addressing detailed, technical matters, given the number of people present and the time required to fully discuss such matters. This interviewee felt that individual meetings with government officials offered a better opportunity to present a case.

Formally, members of the Code advisory group are appointed as representatives of a particular organisation, whereas members of the Building Regulations Advisory Committee are appointed as individuals. This might, as one interviewee commented, mean that members of BRAC are able to speak with greater independence, though another interviewee suggested that in practice members of BRAC also act as representatives of the interests and views of their particular organisation, so there is little difference between the two committees in this respect.

The policy process can be considered to be informal in some important ways, a subject that was raised by a small number of interviewees. One interviewee with an active role in policy-

making expressed concern about the absence of any formal procedure for selecting participants on these various advisory groups, or of any selection criteria for selection. The view of this interviewee was that a more clearly structured approach to the formation of recommendations is needed. An example given was when a key decision was made within a Zero Carbon Hub meeting by an informal vote of those present, without consideration of those members who might not have been present at that particular meeting, or the relative level of expertise of different participants. Another interviewee commented that it is often easier to make a case to government officials in informal discussions, away from formal group meetings.

The concerns of stakeholders regarding the inclusivity of the policy process are reflected in their views about the public consultations initiated by government, such as those on Part L, the Code and the zero carbon definition. A potential problem with consultations is that they can be used “primarily as a means to flush out challenges to emerging policies” (8.4). Aside from this, some interviewees in this project viewed consultations as too restricted in their scope, asking very specific questions framed by government. Hence one commented on the need for a “real consultation,” while another pointed out that peoples’ views can change considerably, once you change the question.

Two interviewees suggested that the consultations were too open in the sense that the views of all stakeholders are counted equally in totalling the answers given to the multiple choice questions. They argued that the views of leading experts should be weighted more highly than those of individuals with potentially little technical understanding of the issues. It was however noted that this is to some extent counter-balanced by the opportunity for leading experts to become more directly involved in governmental committees and working groups.

Some stakeholders have commented that the current approach to consultations is better suited to addressing primarily technical issues, such as those concerning particular parameters in SAP for example. Such technical consultations, they suggest, need to take place within the context of a clear policy strategy, which is itself difficult to consult on, due to the diverse range of values and interests which shape the views expressed by stakeholders, as discussed above.

7.7 Accountable?

Government consultations, which have been undertaken prior to updates to Part L and SAP, as well as in relation to the zero carbon definition, provide the development of policy with an important element of accountability. Consultation documents indicate the reasoning behind policy proposals and give stakeholders an opportunity to express their views, which are then made publically available. Having said this, final decisions are ultimately taken by ministers and might not reflect the majority view expressed by respondents to a consultation.

As discussed in Section 6, much of the concern expressed by stakeholders relating to the issue of accountability particularly relates to the availability of data and information about methodology underpinning key policy tools. For example, the point has been made by some participants in the policy process that the management of updates to SAP has been relatively informal, with no published criteria for justifying changes made. A couple of interviewees commented wryly that by far the most effective way of achieving a required change to SAP is to phone Brian Anderson, the head of the SAP team at BRE. Another interviewee wished that queries and issues raised with BRE by industry stakeholders could receive an official written response, supported by clear evidence where required. Concern was expressed by another about the lack of available information about the fuel factor calculation methodology used for SAP. The accountability of the process through which the Code is developed has also been questioned. For example, some stakeholders are critical of the full methodology and data underpinning the Green Guide not being made available

and others would like more information about the reasoning behind the criteria weightings in the Code. What many stakeholders see as a lack of accountability on these issues is, for them, a reflection of these tools being administered by a private company. They consider it unsuitable to assign responsibility for the development of policy tools to private sector companies such as BRE. Given such concerns about outsourcing, some stakeholders call for an 'open source' approach to the development of SAP in which the reasons behind SAP updates is clearly documented.

One interviewee from BRE suggested that the quite widespread criticism of BRE is unfair, given that government is responsible for deciding on the direction of policy. Furthermore, this interviewee pointed out that it is government who specify the nature and level of the service required from BRE. Another interviewee, whilst recognising the problem of BRE lacking accountability, suggested that no other private organisation in BRE's position would be any more accountable. BRE, (s)he pointed out, has a charitable status which means that they are more likely to consider the public interest than a private company accountable only to private shareholders. As some interviewees pointed out, the service offered by BRE, including the provision of information and support for users of the policy tools they develop is also affected by the level of funding provided by government.

Some stakeholders favour a re-nationalisation of BRE in order to ensure greater accountability.¹⁹⁹ According to this view, the more transparent approach that a nationalised organisation might take to developing tools such as SAP and the Code would make the policy process potentially more inclusive. A consultant interviewed argued that this would facilitate a greater degree of knowledge sharing about the impacts of various building designs and associated technologies. It would, (s)he argued, also have economic benefits by preventing the need for various companies having to "reinvent the wheel" by privately conducting their own research. Others were of the view that, while the work of BRE sometimes lacks transparency, the cause of the problems is not its private ownership but the terms of the service level agreement between DCGL and BRE. Greater accountability could be achieved, (s)he argued, by changing BRE's contract, for example, by requiring them to provide more information about the evidence and methodology underpinning the policy tools they are developing.

Before the Code was introduced, the case for re-nationalisation of BRE was made by some key participants in the policy process. The response from government was that this was not politically feasible, given the policy shift of New Labour away from the nationalisation of industry. Nonetheless, it was successfully argued by these key participants that the Code should be owned by government, with the development and maintenance of the Code being undertaken by BRE through a contract with the government. This was in spite of BRE representatives strongly making the case for their having full ownership of the Code. Government ownership of the Code is viewed by the aforementioned interviewee as preserving a degree of accountability. The arrangements for the Code in this respect are different from those for BREEAM which is owned privately by BRE. One motivation behind the establishment of the UK Green Building Council, one interviewee suggested, was that it might serve as an alternative way of performing at least some of the functions of a nationalised BRE. UKGBC was established with the aim of representing a broad range of stakeholders from across the industry, or as one interviewee put it, serving as an "umbrella organisation". The extent to which the organisation is so broadly representative was questioned by some interviewees. One suggested that its research agenda is strongly influenced by a few of its larger, wealthier members and as such does not cover all of the key issues where there is a need for the industry to make a case to policy-makers. It was commented that the UKGBC does not have the research capacity of BRE. While UKGBC have produced a series of reports

¹⁹⁹ R Lowe and T Oreszczyn, "Regulatory Standards and Barriers to Improved Performance for Housing," *Energy Policy* 36(2008): 4475-4481, , May and Newman, *Critique of the Green Guide to Specification*.

that have had a strong influence on policy,²⁰⁰ UKGBC is not, as an organisation, directly involved in the development of policy tools and it is in relation to the detail of policy development that concerns about accountability lie, as discussed above and as indeed has been stated by UKGBC in a recent report.²⁰¹

7.8 Simple?

Most interviewees did not express a view on the issue of whether there are currently too many regulations and tools for assessing the sustainability of housing. However, three interviewees, including two representing developers, strongly held the view that current policy involves unnecessary duplication, with their comments particularly relating to the Code. By contrast several others indicated their support for the purpose of the Code as being a way of encouraging innovation and higher standards of sustainability beyond the minimum regulatory baseline.

Those stakeholders who were critical of what they saw as avoidable duplication in policy pointed to overlaps between the Code and some key areas of regulatory policy. One pointed to an overlap between planning policy statements relating to flood risk and biodiversity and the parts of the Code which cover these issues²⁰². Another expressed concern about what (s)he saw as the overlap between parts of the Code and the building regulations, now that water efficiency targets are included within Part G of the building regulations and Code levels 1 and 2 energy efficiency standards are now covered by Part L. What, this interviewee wondered, will be the role of the Code if and when these minimum standards in the building regulations are further strengthened? So, according to this view, the Code could become superfluous to requirements. Two of these interviewees did not consider the Code to make a worthwhile addition to the building regulations in terms of encouraging sustainable homes and thought it should be scrapped. After all, as another interviewee pointed out, the minimum water efficiency standards for Code levels 3 and above are more stringent than those for building regulations and so this is not currently a matter simply of duplication.

A different interviewee remarked on the current framework for assessing sustainable homes being too complex because there are a multitude of proprietary standards for assessing products and technologies. This interviewee was opposed to government funding some of these standards, as is current practice. This interviewee mentioned the need for more widely agreed standards that would encourage competitiveness of UK products. For the same reason, (s)he welcomed the prospect of further E.U. standardisation of regulations.

7.9 Joined up?

Stakeholders often question whether there is sufficient 'joining up' between the different policies which influence the levels of CO2 emissions of the built environment. A key challenge is, as one interviewee put it, to make sure that different areas of policy "mesh", or in other words, achieving a 'horizontal joining up' of policy. An important way in which many stakeholders consider current policy priorities to have been skewed is that, while an ambitious and wide ranging set of policies have been introduced for new build homes, the

²⁰⁰ E.g. The following report has been of particular significance in relation to the zero carbon agenda: UKGBC, Zero Carbon Task Group Report: The Definition of Zero Carbon (2008b).

²⁰¹ UKGBC, Making the Case for a Code for Sustainable Buildings.

²⁰² For example, SUR1 credits in the section on Surface Water Run-Off being picked up by PPS25 on Development and Flood Risk; the Ecology section of the Code being picked up by PPS9 on Biodiversity and Geological Conservation. I. Part G of the building regulations covers water efficiency and now includes the water calculator, while Code levels 1 and 2 are now covered by Part L.

Labour government introduced relatively little policy for reducing CO2 emissions in the existing housing stock.²⁰³ This is reflected in the support expressed by many stakeholders for the suggestion that developers be allowed to donate funds for refurbishing the existing stock as an allowable solution that would count towards achieving zero carbon. Such measures, they argue, are better value in terms of the emissions reductions achieved for a given amount of expenditure.

The question of whether there is a need for joining up the regulations for domestic and non-domestic buildings has also been the subject of debate. The Sustainable Buildings Task Group in 2004 recommended the establishment of a Code for Sustainable Building, to cover new and existing, domestic and non-domestic buildings.²⁰⁴ However, given the sheer scale of the existing housing stock alone and that reducing CO2 emissions within new homes was considered a more manageable problem, it was decided to focus on establishing a code for sustainable new homes. Some interviewees expressed concern about the prospect of 'zero carbon' being defined differently for domestic and non-domestic buildings, especially given the uncertainty this creates for developers of mixed use developments which are becoming increasingly common and are often viewed as the most sustainable type of development. There have been recent, similar discussions about whether there is a need to have a single Zero Carbon Hub which covers all building types.

Developers and designers faced with practical decisions in planning new housing developments can perceive anomalies or problems in the way current policy and assessment tools evaluate the sustainability of their plans. This can lead them to question whether a sufficiently robust, joined up approach to assessing sustainability has been established and cause a lack of confidence that policy is encouraging the most sustainable solutions. One key example, as professionals in the industry are well aware, is embodied energy not currently being accounted for in policy tools such as Part L and the Code, although the Green Guide does include a measure of embodied energy (see Section 6.7). This was not included in the Code because it was felt that insufficient data about embodied energy was available. A further example relates to the assessment of the carbon intensity of fuels. An architect interviewed, for example, expressed concern that the SAP rating for biofuel did not take into account the limited supply of biofuel nationally. Biofuel, (s)he suggested, could be used more cost effectively to reduce CO2 emissions if used for transport fuel. A developer interviewed questioned why wood chip biofuel is encouraged by the Code because of the CO2 required to transport it. Such comments, whether or not they are always entirely justified²⁰⁵, would seem to reflect a lack of confidence among some practitioners that the complexity of assessing the sustainability of different technologies is always adequately addressed by current policy.

²⁰³ UKGBC, Making the Case for a Code for Sustainable Buildings, 14., p.14

²⁰⁴ Sustainable Building Task Group, Better Buildings, Better Lives, 7.

²⁰⁵ In the case of the emissions caused by the transport of biofuel, a consultant with an involvement in policy-making pointed out that the research undertaken by government on the emissions factor for biofuel showed that this is a relatively very low carbon source of energy, even when transport is taken into account. However, concerns about the limited national supply of biofuel, (s)he pointed out, are a more justifiable concern. Another interviewee argued that the role of SAP should only be to assess the carbon intensity of a fuel. If other factors, such as the scarcity of the fuel need to be taken into account, (s)he argued, this should be achieved through other regulatory policies, not through SAP which is a compliance tool.

Another subject of comment from two representatives of developers interviewed is how part L can conflict with other sections of the building regulations. For example, sealing party walls as is now required for part L can make it difficult to achieve part E which covers acoustics. Also, the air tightness standards for Part L can potentially conflict with the ventilation requirements in Part F. While these conflicts can cause problems for designers and policy-makers, there was no suggestion from the interviewees mentioning these issues that they were not being addressed by the policy process and that they would not, in the main, be resolved by the technical working groups whose responsibility is to address them.

Beyond the regulations and tools for assessing new buildings, stakeholders strongly recognise the significance of a range of policy areas that have an impact on the sustainable built environment, including planning, energy supply and transport. The potential economies of scale which can be achieved by off-site renewables and the need for government to adopt a more active role in encouraging the development of such energy infrastructure are often emphasised. The inclusion of off-site measures as allowable solutions within the definition of a zero carbon home suggests that the delivery of such solutions is the responsibility of the developer. Some housing developers and consultants working for them question whether this responsibility should lie with them. Their expertise, they point out, lies in the design and building of new homes, not energy infrastructure.

The planning authorities, particularly through their power to refuse planning permission to a proposed development, have an important role in relation to decisions on energy infrastructure and the use of low and zero carbon energy generation technologies on housing developments. Of course, as is frequently discussed in practitioner seminars and as was mentioned by some interviewees, there are a range of other types of decision addressed through the planning process with an important impact on the carbon footprint of housing developments such as transport infrastructure and the location of other infrastructure and services such as schools and retail centres. It is beyond the scope of this research to develop a detailed analysis of the planning system. However it could be noted that some stakeholders, including some interviewees for this research, question whether the planners who must address these decisions have been trained to assess the full range of options and their impacts. A consultant interviewed with extensive experience of projects within different local authorities commented that planning departments capacity and skills for addressing these issues vary considerably with some addressing the challenge well and others, perhaps, a majority, significantly behind.

During discussions about policy for the 2016 target and the Code, practitioners often refer to the importance of the lifestyle and behaviour of housing occupants in affecting the carbon footprint of homes. The compliance system has been criticised for rewarding the installation of certain technologies, such as on-site renewables or water recycling, without giving sufficient consideration to how the occupants use and interact with these technologies in practice. The Code only assesses a home at the time of sale and does not consider maintenance. As a housing developer interviewee pointed out, you can gain credits under the Code for installing a biomass CHP generator without ever switching it on! Furthermore, in assessing the sustainability of housing developments, there is scope to consider issues such as food supply and fair trade. This is evident for example in the 'One Planet Living' approach advocated by WWF and adopted by Bioregional Quintain, a housing developer that is widely known for its involvement in the delivery of leading edge, low carbon developments. Currently, the issue of occupant behaviour is arguably only peripheral to the zero carbon homes agenda. Yet it is crucial, not only for adopting a holistic approach to assessing the

carbon footprint of homes but for ensuring that the actual performance of low and zero carbon homes reflects the projections at design stage.²⁰⁶

²⁰⁶ This point has been made evident and analysed in the work of some academics in the U.K., such as, Flonn Stephenson at Oxford Brookes University.

Related to the suggested need to join up different areas of policy is the challenge of joining up the process through which policy is developed. In relation to a new policy agenda such as the zero carbon target can be expected to take time. Some interviewees involved in policy making commented on the time that it took for working arrangements to be established leading up to and following the introduction of the zero carbon policy agenda and the Code. For example, three interviewees commented on the lack of clarity in the roles of different participants following the introduction of the Code. Uncertainty concerning the exact nature of the respective roles of the Code advisory group, ministers and BRE were referred to. Another interviewee suggested that, while more recently each has become more aware of their respective roles, this has resulted in 18 months of lost time.

It was further suggested that there is a need for clarification of the relationship between the updates to different areas of policy. The Code, being non-mandatory, was originally intended to be a vehicle for testing out innovative, more ambitious standards which would then feed back into the building regulations. One interviewee commented on how, in practice, the Code was, rather than serving as such a testing ground that would then inform revisions to the building regulations, having to be updated to reflect modifications to SAP (this point is discussed in section 6.2). Further evidence of a lack of 'joining up' is that, with the zero carbon definition intended to be confirmed in December 2008, this restricted the opportunity for it be informed by the 2009 SAP. Having said this, as explained above there have in fact been significant delays to confirmation of the zero carbon definition.

Concerns were expressed about the need for greater coordination between departments and work streams within government. As is frequently pointed out by professionals within the industry, SAP is administered by DECC, even though it is an integral part of the Code and Part L which are managed by DCLG. Even within DCLG there are divisions, as the Code and Part L constitute separate work streams. The Hub's work on the zero carbon definition is a further, separate process. Some private sector interviewees representing different areas and interests within industry commented on the lack of a 'joining up' between different departments and work streams. One said that "different departments tend to have their own objectives – they do not talk to each other as much as they might have done. Hence there is a risk of policy not going in the correct direction." Another referred to there being a "silo mentality," where each civil servant concentrates on their individual role. A different interviewee suggested that there is a lack of incentive for civil servants in these different work streams to talk to one another about policy.

The lack of joining up between the different parts of the policy process for the zero carbon agenda was commented on by three interviewees who had experience of working on the Code strategy group. One commented on a meeting where there was nearly a "mutiny" due to disillusionment with the lack of opportunity they had to comment on pieces of work that fell within the remit of different policy groups, such as building regulations and calculation methodology. Another example given by one interviewee referred to DECC wanting a national housing stock model to test out their policies. How, (s)he asked, does this tie with the current consultation on zero carbon for non-domestic buildings and the current work of DCLG on modelling of the housing stock? This interviewee added that DECC and DCLG are competing for funds which can militate against collaborative working between them. In relation to this challenge of 'joining up' policies for sustainable construction, August 2009 saw the appointment of a Chief Construction Advisor. Paul Morrell who was appointed to this post, acknowledges the need for an "integrated response that breaks through the silos that characterise so much of what we do."

There is of course a need to divide up different areas of responsibility within government and no conclusion can be offered here about exactly where any lack of communication between different areas of government has been a cause of a lack of coordination between areas of policy. In considering whether a joined up approach is being taken, there are, as well as communication between departments and work streams, other aspects of the policy process to consider. For example, 'joining up' can also be taken to be a way of thinking about problems. In relation to the zero carbon definition, two interviewees who have had close involvement with the work of the Hub on this issue commented that the decisions on the energy efficiency standard, the carbon compliance level and allowable solutions needed to be considered together given their close mutual inter-relationship. The discussions within the Hub had, they suggested, treated these two decisions sequentially, with the energy efficiency standard being announced before detailed consideration was given to carbon compliance and allowable solutions. Another interviewee disagreed, however, arguing that it was right to treat fabric efficiency as a separate issue and that to look at each of the three areas together would have compounded the complexity of the policy process.

Arguably, another important pre-condition for 'joining up' is political leadership. The relatively short term nature of ministerial appointments, it is often suggested (and as indicated by prior research on the policy process²⁰⁷), works against the establishment of a clear long term policy strategy. The large number of housing ministers under the Labour government is often the subject of comment. In relation to this issue, one interviewee remarked that it takes significant time for ministers to learn about some of the key issues in understanding sustainable housing policy, such as for example the problems of SAP. Ministers' lack of understanding of such key issues was referred to by several interviewees as a key causal factor in what they see as the problems of current policy.

As one interviewee commented, it is unrealistic to expect to reach a "perfect solution" to the problem of defining regulations for low and zero carbon homes. There is a wide general acceptance of the need for government to steer the market towards the delivery of low carbon homes and the focus of stakeholders' criticisms is not on the idea of regulation in itself but on the particular way in which policy in England has been defined and implemented. However, the problems with the current regulatory framework led some stakeholders to question whether government-defined assessment and regulatory tools can ever be the most effective policy approach. Some interviewees favoured more market-led approaches. One suggested stepped tariffs on fuel bills to encourage reductions in energy consumption. Another suggested that, instead of government sponsoring regulatory schemes such as the Code, the development of assessment schemes should be left to the market. According to this idea, house builders would be free to choose the assessment scheme they would use to demonstrate compliance with the general targets set by government. The role of government would be to ensure that different schemes assess homes in accordance with these targets.

²⁰⁷ For example, as explained in Section 4, this is an issue highlighted by previous research by the Cabinet Office.

As well as this challenge of 'horizontal' joining up between different areas of policy, views considered in this research question whether adequate 'vertical' joining up has been achieved between policy formation and the evidence from practitioners putting policy into practice. As discussed (See Section 6.4), there is widely agreed to be great scope for strengthening the provision of information to house builders about regulatory requirements and training for building professionals, including building control officers. Aside from the discussion of these issues elsewhere in this report a further illustrative example mentioned by one interviewee is that the demo version of SAP 2009 was not made publically available until six weeks after Part L consultation came out. This restricted the amount of time available to industry to use the new version in preparing their consultation responses and, according to one engineering consultant interviewed, caused considerable disquiet. The scope for stronger vertical joining up would also seem to be reflected in significant levels of non-compliance with Part L, although the exact extent of this problem seems to be unknown and is a matter of disagreement (See Section 6.9).

An issue closely related to that of vertically joining up policy, also discussed in the Cabinet Office reports (see Section 4), is policy evaluation. There are no formal processes for evaluating policy for energy efficient buildings and sustainable homes independent of the advisory and technical committees and groups outlined in this report. Yet responding to feedback about policy from a range of stakeholders is an integral part of the work of these latter groups. This is evident in the ongoing process of revising policy tools such as SAP (see Section 6.1), the water calculator and the Code.

7.10 Robust?

A range of arguments discussed in this report question the robustness of current policy. The issues discussed above concerning 'joining up' can be taken to have implications for the robustness of policy. Also of key significance for considering robustness are those key, strategic decisions and features of policy which then either need to be reversed or which are widely viewed as causing significant inconsistency, or having distortive effects. The most significant case in point is the decision to incorporate into the Code the Treasury definition of zero carbon as 100% on-site. The subsequent definition of zero carbon, with its inclusion of allowable solutions (the permissible level of which is still to be agreed) differs from the 100% on-site requirements of Code level 6 and this potentially gives conflicting signals to developers about the types of CO₂ emissions reductions they should aspire to. Another key example is the approach taken to measuring energy efficiency for Part L and the Code. Energy efficiency is modelled and then assessed relative to the 2006 building regulations minimum standard, which was itself a relatively defined target. As discussed in Section 6.1, the question of whether this baseline now requires substantial revision has been raised due to recent evidence concerning the heat loss from party walls. There are numerous ways in which policy tools have been revised in response to feedback received by government via the advisory and technical groups. Notable examples discussed in this report include the revisions to SAP 2009 (see Section 6.1) and the water calculator (see Section 6.4). In relation to the problems of the water calculator, one interviewee said that some required changes had been made in a six month period, which is a relatively short period of time. In relation to SAP, some argue that there is a need for a longer cycle of updates (e.g. six years), to allow more time for evidence from performance monitoring programmes to be assessed. According to this view, the policy process is trying to move too quickly and this could jeopardise the robustness of policy.

Some other policy decisions such as the adoption of the flat rather than the aggregate approach for calculating target CO₂ emissions reductions for domestic buildings might in future need to be revisited (See Section 6.5). In view of the recent Zero Carbon Hub report, it also looks possible that concerns expressed by interviewees about the robustness of SAP could lead to substantial further development and testing of this tool. Some interviewees even suggest that the absolute approach to measuring energy efficiency might be adopted, as has since been proposed by the Zero Carbon Hub in a recent report.²⁰⁸

Of course, revising policy in light of the experience of its practical application can be seen as an inevitable feature of the policy process. As one interviewee put it, while the policy process “could be described as a bit of a mess,” actually, the approach of learning from engagement “with industry and hard life experience” is much better than “pontificating on a theoretical level, which is a danger in policy development.” However, the views of several interviewees from industry for this project with an involvement in the policy process suggest that the adjustments and possible future revisions to the zero carbon agenda discussed above are reversions to an approach which should have been adopted earlier. Notably, in relation to the incorporation of the 100% on-site definition of zero carbon into the Code, stakeholders at the time warned of the potential problems that might be caused and emphasised the need for more evidence to inform policy (See Section 6.1). Also, an interviewee for this project stated that concerns about how to design buildings that avoid the potential problem of over-heating was an issue that was raised in discussions with government before the Code was even introduced. This is an issue that many argue has still to be adequately addressed by the policy process (See Section 6.2).

7.11 Evidence based?

A widespread concern, closely related to the perceived need to join up policy, is the need for policy to have a stronger evidence base. The introduction of allowable solutions into the zero carbon definition has been widely welcomed, as indeed has the energy efficiency standard (See Section 6.2.2). However, several interviewees have questioned whether the decisions concerning the minimum energy efficiency and the announcement of an intention to set the target carbon compliance level at 70% were based on adequate evidence. Indeed, the report of the Energy Efficiency Standard working group acknowledges the need for further related research. There is also a related concern amongst many stakeholders that there is a need for a stronger evidence base to support updates to SAP and there remains a significant amount of uncertainty about the performance of some low and zero carbon products and technologies. Some participants with a close involvement in the policy process point out that since the 1980s there has not been a consistent programme of monitoring of energy use in homes to provide the evidence needed to inform SAP. Updates to SAP have therefore been based on the results of small studies, where these have been available. Many of the responses to the consultations on these issues highlight the need for more extensive monitoring of the performance of buildings and technologies and the effects of occupant behaviour. Such monitoring, it is emphasised, must then feed back into the policy process.

²⁰⁸ Zero Carbon Hub, Carbon Compliance for Tomorrow's New Homes - A Review of the Modelling Tool and Assumptions

An important train of thought in the comments of some experts involved in the policy process is that there is a need for government to define the overall policy objectives, including a target level of CO2 emissions reductions, and then be guided by technical experts and evidence to ensure the most effective means of delivery. One interviewee, commenting on how policy is currently made, said that you “can’t start by saying we want micro-generation,” given that such technology is simply a means to achieving a broader objective. Instead, (s)he explained, you need to have a clear policy objective established before addressing the technical issue of the most effective means of achieving it. Yet, as this interviewee added, you “sometimes have to nail the technical (detail) before understanding what sort of policy is achievable.” This alludes to the need for an iterative process in which objectives are refined as new technical evidence becomes available.

In an academic paper, Lowe and Oreszczyn discuss the current lack of research to support policy development.²⁰⁹ They comment that “a number of engineering and design consultancies in the UK are world leading and highly innovative.” “However”, they explain “this innovation is not well supported by research as the large companies do not have research facilities, undertake most of their research through the mechanism of consultancies, and lack a culture of peer review and publication.” As discussed above, even where evidence is available, a further part of an evidence-based approach to policy-making is ensuring that such research informs government decisions.

7.12 Outward-looking?

It has been beyond the scope of this project to provide a detailed analysis of how far policy-makers in Britain have been influenced by developments overseas. It can be noted that the development of the PassivHaus approach to building design in Germany and Austria has started to have significant influence on the U.K. industry (as discussed in Section 6.3). U.K.-based advocates of the PassivHaus approach can, in turn, be seen to have had an influence in the shaping of the ‘fabric first’ philosophy underpinning the U.K. energy efficiency standard, even if this standard was considerably less than was wanted by some advocates of a PassivHaus approach.

A second aspect of an ‘outward-looking’ approach to policy-making is the need to communicate policy to the wider public effectively. Respondents to the public consultations have primarily been industry professionals. While many of the wider public do have a general awareness of the need to move towards energy efficient buildings, anecdotal evidence such as the comments of stakeholders interviewed, suggests that levels of public awareness about the tools by which new homes are assessed, such as the Code for Sustainable Homes and the definition of zero carbon are very low. The comments of stakeholders suggest that CO2 emissions of a home do not rank highly as a priority for most consumers. Hence some spokespeople from industry emphasise the need to market low and zero carbon homes in terms of energy cost savings and increased comfort levels, rather than CO2 emissions per se.²¹⁰

²⁰⁹ Lowe and Oreszczyn, “Regulatory Standards and Barriers to Improved Performance for Housing,”

²¹⁰ This is evident in a report published by the Zero Carbon Hub which suggests that rather than marketing ‘low carbon’ or ‘zero carbon’ homes, the emphasis should be on their positive features that represent a “new way of living.” Zero Carbon Hub, *Marketing Tomorrow’s New Homes - Raising Consumer Demand for Low and Zero Carbon Living* (London: 2010a).

7.13 Conflicting interests?

In understanding the interests which seek to influence policy for new homes, we might typically expect to find a tension between, on the one hand, resistance amongst house builders to increased regulation and particularly the costs this entails and on the other concerns of environmental groups about current industry practice. There is indeed evidence of such a tension. For example, one interviewee with a close involvement in the policy process at the time the Code was established characterised the discussions as involving two polarised groups: the housing industry on the one hand and the green lobby on the other, notably WWF. There was, (s)he suggested, “no commonality of purpose,” with the green side having a “mistrust” of industry and industry being mainly worried about costs. However, while such a division of interests clearly remains, there is an increasing recognition amongst house builders of the need to achieve CO2 emissions reduction targets.²¹¹

One interviewee credits ministers with having played an important role in brokering solutions between these different parties during the early policy discussions about the zero carbon agenda. The same is reported by participants in the Zero Carbon Hub working group on the energy efficiency standard. For example, one interviewee expressed how pleased (s)he was that agreement was reached between the stakeholders, given that they were previously “poles apart.” Three interviewees who participated in the working group suggested that an important reason for a unanimous agreement being reached is that such an agreement would be much more likely to be accepted by the minister, as indeed proved to be the case. Reflecting on what has been achieved, Neil Cutland argues in *Building* magazine, “(n)ever before has the house building industry been so positive about higher environmental standards”²¹².

The future trajectory of regulations towards the 2016 target, as set out so far, has been sufficiently strong to indicate to at least some developers that starting to make progress on the delivery of low carbon homes can help to future proof their business. House builders interviewed for this project, while of course being concerned about keeping costs down, also expressed a strong commitment to effectively addressing the wider range of practical choices involved in achieving more sustainable housing designs. This is a matter of especially strong interest for consultants and designers involved in the delivery of developments with especially high level and prominent sustainability objectives (in terms of the EcoHomes, Code or other rating systems). These stakeholders often distinguish themselves from what they refer to as the ‘environmental’ lobby, including environmental NGOs such as WWF. Their views about how to achieve a sustainable built environment tend to differ from these latter groups, especially in relation to the relative emphasis that should be placed on on-site and off-site renewables and the extent to which allowable solutions should count towards achieving zero carbon. In relation to these issues, these practitioners feel they have had a strong case to make about the need to re-balance the current priorities of the zero carbon agenda towards what they consider to be a more sustainable approach. Another said that it is “difficult to not be seen as industry dragging their heels” when criticising current policy priorities. “But,” (s)he added “we think we have some exciting ideas which will outstrip the zero carbon agenda.” (Here the zero carbon agenda is being referred to in terms of the original emphasis on achieving zero carbon on-site).

The comments of a range of interviewees involved in the policy process suggest that housing developers and industry consultancies have a key influence in shaping policy. Having said this, some interviewees, reflected on whether there is a need for industry to have a stronger, more unified voice in policy negotiations. Their comments reflected the wide dissatisfaction

²¹¹ DCLG representative The Road to Zero Carbon conference.

²¹² Neil Cutland (2008) “Coded message,” *Building* magazine

of industry with the strong emphasis of the zero carbon agenda on achieving CO₂ emissions reductions on-site. For example, one developer interviewed expressed regret that the housing industry and the range of different practitioners involved in it does not have a voice as strong as other comparable industries through which these concerns could be expressed. One of them, commenting on what s/he saw as the shortcomings of current policy, said: "if this was banking, aeronautical or transport industry, they would have taken the government to task. Basically, the development sector is a bunch of well meaning individuals who don't sit into one voice." Another expressed similar regret with reference to the engineering profession, pointing out that engineers do not have the same kind of representation in the policy process as certain sections of industry (e.g. boiler or heat pump manufacturers) or NGOs such as WWF.

Nonetheless, there are important examples of the UK Green Building Council exercising important influence on policy, such as their presentation of evidence that influenced the government decision to review the '100 % on site' definition of zero carbon. One interviewee suggested that this organisation carries particular weight as it represents a broad range of companies. Additionally there are other membership organisations representing industry, such as the Good Homes Alliance and AECB that do not seek to be so all-encompassing but aim instead to take a lead in the design, development and testing of new, sustainable homes. Both of these organisations have a significant role and voice in the policy process.

The aim of allowing house builders flexibility in their design decisions creates a need for a policy framework that provides an impartial evaluation of the various different building products and related technologies according to their performance. There is, as we have seen, a process in place for testing the performance of various low and zero carbon technologies, leading up to the update of SAP (see Section 6.2). While it is suggested that there is scope for the rigour of this process to be further strengthened, the aim is clearly to establish objective evidence about performance. However, some decisions involved in defining regulations, while having a technical dimension, involve an important political element, where lobbying by industry can have a significant influence. The decision on the methodology for calculating CO₂ emissions factors for some technologies has been an important case in point (see Section 6.2).

These issues are of course not unique to the zero carbon agenda and can arise in relation to other areas of the building regulations in general. Neither need the influence of industry necessarily be viewed negatively, given that government are reliant on the knowledge of manufacturers about their potential to deliver products of a particular standard within a certain time frame. Yet there is considerable wariness amongst civil servants about such lobbying by industry and the potential for it to undermine the aim of impartiality.

7.14 Sufficient resources?

Providing the kind of evidence-based policy that many stakeholders suggest is needed requires government to provide significant levels of new resources, as needed for testing building performance, low and zero carbon technologies and training and supporting building control to achieve improved levels of compliance. Evidence from the interviews undertaken also suggests that increased resources are needed within government to support the development of policy. Three interviewees with a close involvement in the development of the Code suggested that currently only a very small team work on the Code within DCLG and that more staff are needed. Policy development work, on the government side, it was pointed out, is very time consuming. These resource limitations can mean that, where government receives advice relating to potential problems with policy, it is not always possible to act on this, or to conduct the further research that might be required. For example, one interviewee for this project suggested that in 2007-8, policy-makers were aware of the need to consider the energy impact of hot water and water recycling systems.

However, the work on this could not be undertaken at that stage due to there being more pressing policy issues to address.

With substantial cuts to the DCLG budget having recently been announced, there would seem to be no prospect of such extra resources being available. Yet it can be pointed out that not all potentially beneficial initiatives require huge resources. The provision of online guidance about how to build low and zero carbon homes are, for example, highlighted by some as being relatively good value for money considering the potential benefits of such knowledge-sharing for a wide range of people, from designers and builders, to building control officers . Such government expenditure, as two interviewees pointed out, could potentially save companies money in terms of their own research and development budgets.

7.15 On course for 2016?

There are mixed views about whether the 2016 zero carbon target will be met. Stakeholders do expect building regulations to be further tightened in 2013 and 2016 in accordance with this goal. The wait for the definition of zero carbon to be confirmed is creating uncertainty and there is demand for greater clarification of the future regulatory framework. Having said this, the day to day work of developers remains focused on the implications of the 2010 revisions to the building regulations, SAP and the Code. In terms of forward planning, much of their attention is currently on the further update to Part L due in 2013, rather than on how the 2016 target will be defined. The widespread perception that building regulations and the Code are not adequately assessed and enforced creates some scepticism regarding policy development. Some interviewees view the 2016 timescale as unrealistic, given the amount of time needed for house builders to adapt their designs and business processes to the new regulations and to train people sufficiently to gain the new skills required.

8 Concluding Remarks

The conflicting arguments between industry and environmental groups about the *extent* and *pace* of greenhouse gas emissions reductions is just one dimension of the debate about sustainable housing. As this research has explored in the case of housing, just as central to debates in the building sector are questions concerning the *means* by which emissions reductions are to be achieved. This includes questions about the policy frameworks through which emissions reductions will be enforced and encouraged and the tools to be used to assess the sustainability of new homes.

The term 'zero carbon' was not only a politically appealing sound bite but also emphasised by many stakeholders to have helped focus minds on how to reduce CO₂ emissions in the new build sector. However, in the view of many practitioners, it glossed over some important, complex questions about how ambitious emissions reductions targets for new homes were to be achieved. Some environmental groups and practitioners supported the 'zero carbon' goal and the priority of on-site solutions this entailed, which they saw as reflecting the urgency of the challenge of climate change. However, a majority of stakeholders have argued that the current systems of compliance push developers to more expensive ways of achieving emissions reductions. They argue that there is a need for policy to allow greater flexibility for designers to achieve the most cost-effective solutions for particular sites. This includes financial contributions towards 'allowable solutions,' including off-site renewable projects.

There is a related concern about whether the planning system enables these often complex choices and trade-offs to be effectively addressed and whether there is currently sufficient consistency, or 'joining up' between policy for new homes and policies covering other areas of the built environment such as existing homes and non-domestic buildings assessment tools. A further important challenge, the subject of considerable debate, is how to define the criteria in terms of which the sustainability of new homes is assessed. As has been discussed here in relation to issues such as energy and water efficiency, there is a danger that assessment tools will be defined in a way that fails to capture important information about the outcomes achieved. Stakeholders from industry often stress the need for clearer, more consistent policy on these issues that encourages a holistic approach to design decisions, achieving a balance between the environmental, social and economic criteria.

The UK Government has established a set of key criteria for assessing the effectiveness of policy-making in addressing complex policy challenges. In relation to policy for sustainable new homes, the views of stakeholders with a direct involvement in the policy process provide significant cause for questioning the extent to which these criteria are satisfied. Many suggest that there is a need for government to be more pro-active in establishing a stronger evidence base, as required to encourage the development of more robust policy. There is a related debate about the accountability of the process through which policy tools are developed, for example in relation to the work of the private company BRE working under contract to the government on SAP and the Code. The need for more resources to support policy implementation, such as in support of training programmes, detailing schemes and ensuring compliance with regulations, is also often stressed.

It was made clear by the Labour government that the delivery of the zero carbon homes target was to be through the market. Yet, according to these views, there is arguably a need for a more substantive role for government in supporting industry towards the transition to low and zero carbon homes. Meanwhile the 2016 target, though widely welcomed for its ambition and encouraging innovation, is viewed by some practitioners as seeking to move too quickly. There are also some areas of policy, such as the tools used to assess energy efficiency where it is often thought that a more radical break from current policy is needed. Dissatisfaction is expressed about the lack of a clearer sense of the future direction of policy.

Each of these issues raise the question of whether there is a need to change the way in which policy-makers within government draw from and respond to technical and scientific evidence. The involvement in the policy process of organisations from a range of different sectors, with different kinds of expertise, is of clear importance in providing government with feedback on policy ideas and proposals. However, some stakeholders with experience of such involvement argue that, rather than always seeking 'consensus' or 'compromise' between these groups, there is a need for government to define a clearer, consistent route for policy. This might involve resisting more strongly the lobbying from some groups. Such an approach, they suggest, needs to be more strongly grounded in evidence, and requires clear leadership.

9 Future Research

Research for this project will be used as a basis for peer-reviewed academic publications in the fields of political economy, policy analysis and the politics of energy transitions. Furthermore, there are several ways in which the research undertaken in this project can be extended and further developed:

Detailed case study research, analysing the impact of current policy on particular housing developments. Such research would necessarily be inter-disciplinary, combining policy analysis with disciplines such as architecture, engineering and economics.

Placing the findings of this research in the context of historical changes in the policy process. One important area for analysis is the changing relationship between politics, policy and markets and the implications of environmental challenges for these relationships. Another interesting issue raised by this project with considerable scope for further research is the relationship between the policy process and different kinds of expert knowledge, particularly technical and scientific knowledge.

Analysing the problem of achieving coordination between different policies which have an impact on the sustainability of the built environment. For example, as well as the regulations and codes for assessing new homes studied here, policies for existing and non-residential buildings could be analysed in greater detail. There is also scope for exploring the relationship between the built environment, planning policy, energy supply and transport.

Larger-scale projects comparing policy for sustainable housing in different regions and countries. Policy for England could be compared with policy and policy processes for the devolved regions of the UK: Wales, Scotland and Northern Ireland. Scotland could be an especially interesting point of comparison because, of these three regions, policy in Scotland is most markedly different from in England. There is also potential for cross-national comparative studies to be undertaken. For example, Northern European countries such as Sweden and Germany are often referred to as being ahead of the UK in terms of the transition to a low carbon built environment. Comparing the systems of governance and policy frameworks in these countries to the UK would give important insights into their relative effectiveness in addressing this complex policy challenge. Such comparative research could be supported by detailed, select case studies, as discussed above.

10 Appendices

10.1 Appendix One: Comment on developments under the Conservative/ Liberal Democrat Coalition Government

As Conservative party opposition housing spokesperson, Grant Shapps was critical of the delay in the government providing a definition of zero carbon. In November 2009, he stated that his party would confirm the definition "within weeks" of coming into power.²¹³ In May, soon after taking up the post of housing minister, Shapps did confirm the commitment of the coalition government to the 2016 zero carbon homes target.²¹⁴ However, in July he was forced to admit that confirmation of the zero carbon definition would be delayed. At the time of writing, although the government have stated their support for the previously established minimum energy efficiency standard, other key parts of the zero carbon definition such as the carbon compliance target and the details of allowable solutions remain to be confirmed. The details of future changes to the Code also require confirmation since the consultation was issued in December 2009.

In a statement issued on 27th July, Shapps confirmed that the government supports a community energy fund to facilitate the achievement of zero carbon, an idea discussed in section 6.1.1 of this report. This proposal, by allowing developers to set up community-scale off-site developments such as renewable energy and district heating schemes complements the agenda of 'localism' that has been emphasised by ministers within DCLG since the coalition government was established.

Neil May, chairman of the Good Homes Alliance, commented in July 2010 on the course of the policy process during the previous 12 months. He observed that wide agreement had emerged, "amongst major house builders, leading academics and the leading people in building regulations" on the case for an absolute approach to measuring energy efficiency and that current policy is overly "complex". Following the recent change of government he thought there was a real opportunity for him and his fellow members of groups such as the Zero Carbon Hub advisory group and the Code advisory group to speak out on these issues in meetings with government. He added: "Its not that people disagree with current policy because of cost. Its because its not an environmental way of doing things. Its not the best way to do things. We're getting ourselves into all kinds of difficulties because of the unwillingness to speak out clearly about the need for a radical simplification of policy. Its a kind of cowardice on the part of the industry and the civil servants." There was, he said, the same unwillingness to speak out under the previous Labour government. "Then", he added, "I could understand because they (the government) were so afraid of doing U turns and no one wanted to say anything. It had been going on for years. Now, it's an opportunity and people are still not doing it."

10.2 Appendix Two: Interviewee details

Category	Number
Total interviewees	36
Area of expertise	
Engineer	11
Architect	4
Project consultant (other)	5

²¹³ Alex Hawkes (2009b) "Tories make zero-carbon definition pledge," Construction News

²¹⁴ Isabel Hardman (2010) "Government to commit to 2016 green target," Inside Housing

Training/ education	2
Sector of current occupation	
House builder	5
Industry group	6
Construction products	4
Private sector (other)	17
Other NGO	3
QUANGO	2
Local government	4
Government	4
Nature of relevant experience	
Direct involvement in the policy process	21
Direct involvement in the delivery of low/ zero carbon housing developments	19

Note that most interviewees fall into multiple categories.

© Dan Greenwood, University of Westminster, 2010.

Photos

Cover photo: Code level 6 home at Upton, Northamptonshire. This is the first home to be certified as Code 6 in the UK.