Exploring discourses of decarbonisation:

The social construction of low carbon housing

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Abstract

With the UK committed to reducing greenhouse gas emissions by 80%, and British households accounting for around 25% of national carbon emissions, decarbonising the domestic sector is central to achieving this target. Promoted as part of a solution to climate change, UK low carbon housing policy has developed rapidly over the last decade, leading to the development of a range of policies aimed at decarbonising the housing stock. Understood as socially constructed, the way in which social and environmental issues are interpreted and communicated can have an important influence on the success or failure of policy responses, as well as on public understandings. This thesis explores the discourses surrounding low carbon housing as they exist within different sectors of society. Employing an interpretive qualitative methodology, this analysis utilises discourse and thematic analysis to explore low carbon housing discourse, investigating the policy, media, expert and public representations in turn.

Rooted in *Ecological modernisation*, low carbon housing discourse is shown to adopt a techno-economic approach to reducing carbon emissions from housing; an approach that is embedded within policy, media and expert discourses. In contrast, public understandings of low carbon housing draw on broader discourses of *Environmental concern*, whilst understandings of low carbon housing are based around resource use and the embodied carbon within the material housing. Through investigation of the assumptions surrounding the incentives and mechanisms for change embedded within the discourses, this thesis highlights the socially constructed nature of low carbon housing, demonstrating the important role that environmental and everyday values play in public understandings of what is often considered to be a purely technological entity. This alternative understanding of low carbon housing within the public sphere opens up a new discursive space and may provide a new direction from which to approach the issue of reducing carbon emissions.

For Dr. Leslie E. Martin
Your lifelong love of learning inspired me

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Author's note

Focusing on the discursive storylines identified within the UK broadsheet press, the findings discussed within Chapter 5 have since been published:

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CHAPTER 1

Introducing the thesis:

Exploring the meaning of low carbon housing

1.1 Introduction and context

The year 2006 marked the beginning of a radical transformation in UK climate change and energy policy. Despite the scientific consensus linking anthropogenic greenhouse gas emissions with changing global climate observations (*IPCC*, 2001, since superseded by the Fifth Assessment Report – *IPCC*, 2014), the issue of climate change had previously remained relatively low on the political agenda as just one of a number of environmental problems to be addressed. Following mounting criticisms of climate change and energy policy (*RCEP*, 2000; *SDC*, 2003), concerted campaigning by environmental NGOs (*e.g.*, Friends of the Earth's Big Ask Campaign) and increasing public awareness and concern over the issue (*Downing and Ballantyne*, 2007; *Pidgeon*, 2012; *Capstick et al.*, 2015), the then Labour Government began a programme of rapid policy development aimed at tackling national carbon emissions and raising climate change up the international political agenda (*Carter*, 2014). The culmination of this shift in environmental policy making came in the form of the Climate Change Act 2008. This ground-breaking legislation requires an 80% reduction in national greenhouse gas emissions by 2050 and led to the formation of the Committee on Climate Change, whose role it is to advise the UK Government on the adoption of national carbon budgets aimed at achieving

this target.

Accounting for 23% of national carbon emissions (*CCC*, 2014), as well as 29% of total energy consumption (*DECC*, 2013a), households in Britain currently represent a significant contribution to national greenhouse gas emissions. However, it is predicted that the domestic sector will need to reduce carbon emissions to almost zero by 2050 if the overall 80% target is to be met (*CCC*, 2010), shouldering a disproportionate burden due to the relative difficulty of reducing emissions within other sectors. Since 2006, a range of policies have been developed that aim to reduce carbon emissions and/or energy use from the UK housing stock. These include policies aimed at improving the energy efficiency of existing homes, such as the Green Deal and Energy Company Obligation, and increasing uptake of domestic renewable energy sources, such as the Feed in Tariff and Renewable Heat Incentive schemes, as well as commissioning public awareness and behaviour change campaigns, such as the Act on CO_2 campaign. A flagship policy of this low carbon agenda, the Code for Sustainable Homes was launched in 2007 with the aim of improving the sustainability of new build housing in the UK (*DCLG*, 2006); simultaneously, the Zero Carbon Homes target announced the requirement for all new build homes to be 'zero carbon' by 2016.

One feature of this period of rapid policy change was the proliferation of the terms *low carbon* and *zero carbon*, which were uncommon within climate change and energy policy (and non-existent in relation to housing) prior to the early 2000s (*Nerlich*, 2012). In relation to housing, *Lovell* (2004) demonstrated how the concept of low carbon housing emerged within policy discourses, with the existing concept of sustainable housing reframed as a solution to climate change. Emerging as part of the sustainable housing movement of the 1970s, sustainable housing embodied the often radical environmental values of this movement and was represented as a solution to a range of different social and environmental problems. However, by the late 1990s, this concept had begun to be appropriated by a number of discourse communities, focussing on domestic energy efficiency, renewable energy and construction industry modernisation to promote

low carbon housing as a technological and economically viable solution to climate change (*Lovell*, 2004; *Pickvance*, 2009). Thus, despite beginning as an expression of deep environmental values and the desire for radical lifestyle change, the concept of sustainable housing was eventually narrowed down to a range of technical options, designed to reduce carbon emissions by changing buildings rather than lifestyles.

However, despite this attempt to frame low carbon housing in technical terms, excluding social and behavioural understandings, the concept remains contentious, subject to continuing debate and redefinition by policy makers and professionals. As such, the meaning of both the term and concept of low carbon housing is ambiguous, presenting multiple definitions and understandings, each of which has implications for the technological and design configuration of low carbon houses, and thus the lifestyles of occupants living within these homes. This research investigates the range of meanings associated with the concept of low carbon housing within the policy, media, expert and public discourse, considering how, and why, these have been constructed.

Particular attention is paid to investigating how social and behavioural considerations are incorporated or marginalised within conceptualisations of low carbon housing as a technical solution to climate change, the extent to which lifestyle change is envisaged within this, and the role of environmental values in achieving carbon emissions reductions within the housing sector.

1.2 Rationale and research objectives

It is a central tenet of this thesis that meaning matters, as the way in which social and environmental problems (*e.g.*, how to reduce carbon emissions from the housing sector) are constructed and communicated can have an important influence on the success or failure of actions taken to address the problem, as well as on public understandings of the issue (*Kurz et al.*, 2005; *Forsyth*, 2009). As such, Chapter 2 argues that through the social construction of environmental issues, such as climate change, language and dis-

course play an important role in influencing both the problems and solutions identified and addressed within environmental policy.

Discourses surrounding climate change and sustainability have been shown to often be dominated by *Ecological modernisation*, a discourse which encourages the use of economic and technological responses to climate change, marginalising calls for radical democratic or lifestyle changes (*Hajer*, 1995; *Dryzek*, 2005). This framing is particularly apparent within existing conceptualisations of low carbon housing that are primarily described as a technological and economically viable solution to reducing emissions from the housing stock. However, despite the extensive research conducted regarding discourses of climate change more broadly (discussed within Chapter 2), very little research has investigated the discourses surrounding specific mitigation options, with that which has focused primarily on energy supply technologies such as nuclear power or renewable energy sources, rather than demand side options such as low carbon housing; a deficit which this thesis seeks to address.

Despite the importance of public perceptions and understandings, previous research has primarily focussed on discourses as they exist in the media or political spheres, failing to consider these discourses as they are (re)produced within the public sphere. Whilst the link between political, media and public discourses is hard to pin down, the way in which social and environmental problems such as these are constructed can be seen to have an important influence on public understandings of an issue. Public understandings are particularly relevant to investigating the conceptualisation of low carbon housing, as despite the strong technical and economic paradigm dominating the field, any attempts to reduce carbon emissions from the housing sector are likely to impact, to some degree, the homes and everyday lives of ordinary people. The ways in which the public understand and interact with low carbon housing will thus have an influence, not only on the uptake of low carbon housing, but also its effectiveness. With the public discourse surrounding climate change reflecting quite different concerns to that of the current policy understandings of the issue, investigating the public meanings

of low carbon housing is thus also likely to vary significantly from expert and policy understandings.

The purpose of this research is thus to address these gaps, through an exploration of the discourses surrounding low carbon housing as they exist within different sectors of society. In order to achieve this, this research is based around the following research questions:

1. How do the media construct and represent the concept of low carbon housing?
    (a) How has the concept of low carbon housing been represented within media?
    (b) Have these representations changed over time?
    (c) What storylines are used to understand low carbon housing and how are these constructed?
    (d) What discursive practices are used to promote these storylines?
2. How do experts construct and understand the concept of low carbon housing?
    (a) How has the concept of low carbon housing been constructed?
    (b) How have the social and behavioural aspects of low carbon housing been understood?
    (c) How have the public (and their role in reducing emissions) been conceptualised within this context?
    (d) How is the concept of low carbon housing framed and understood in relation to the broader problem of reducing carbon emissions from housing?
3. How do the public construct and understand the concept of low carbon housing?
    (a) How is the concept of a low carbon house understood (if at all) within the public discourse?
    (b) What discourses are drawn on in understanding low carbon houses and the

issue of reducing emissions from housing more broadly?

(c) How publicly acceptable are current low carbon housing options and how are these options understood and assessed in this context?

(d) How is the concept of low carbon housing framed and understood in relation to the broader problem of reducing carbon emissions from housing?

4. How do constructions of low carbon housing vary between these discourses and what are the implications of these differences?

Based on an interpretive qualitative design, the research presented within this thesis adopts a grounded approach to discourse analysis, and answers these questions through three stages of empirical research, each of which addressed the discourses of low carbon housing within a different sphere:

- **Phase 1:** Media discourses of low carbon housing, investigated the representations of low carbon housing within the British broadsheet media, analysing a total of 234 newspaper articles that appeared within *The Times*, *The Telegraph*, *The Guardian* and *The Independent* between January 2006 and December 2013.

- **Phase 2:** Expert discourses of low carbon housing, explored expert understandings of low carbon housing as both a physical and conceptual entity, through a series of 22 interviews with housing and energy experts from a range of different backgrounds.

- **Phase 3:** Public discourses of low carbon housing, explored existing understandings of this concept within public understandings, as well as perceptions of specific low carbon housing options, through a series of five focus groups with participants from a range of backgrounds and locations.

1.3 Structure of the thesis

Chapter 1, Introducing the thesis: Exploring the discourses of low carbon housing, provides an introduction to this thesis, presenting the rationale and aims of the research, as well as a number of key definitions. With households now accounting for 23% of national carbon emissions (*CCC*, 2014), the domestic sector will need to dramatically decarbonise if the overall 80% carbon emissions reduction target set out within the Climate Change Act 2008 is to be achieved. Initially emerging from the UK policy discourse (*c.*2000), the term low carbon housing frames this concept as a technical solution to climate change (*Lovell*, 2004); this thesis thus investigates the different ways in which this concept has been understood within different discursive domains, exploring the policy, media, expert and public discourses surrounding low carbon housing.

Chapter 2, Discourse, the environment and low carbon housing: An introduction, then presents a detailed review of the existing literature that supports this research, considering discourses of the environment, climate change and low carbon (and sustainable) housing in turn, and where possible, covering the different discursive domains (*e.g.*, policy, media, expert or public) in which research has been conducted. The discourses surrounding climate change and sustainability are shown to primarily reflect *Ecological modernisation*, a discourse which encourages a techno-economic response to climate change and marginalises calls for radical lifestyle change (*Dryzek*, 2005); an approach which is echoed within the existing conceptualisations of low carbon housing, but has, as yet, been little explored within the existing literature.

Chapter 3, Methodology, epistemology and methods: Adopting a grounded approach to discourse analysis, discusses the methodological and epistemological underpinnings of this research, highlighting the interpretive qualitative approach adopted within this thesis. Following this, details are provided of the specific methods employed in the data collection involved in each phase of the research, as well as

providing a full explanation of the grounded discourse analysis utilised to explore the media, expert and public discourses of low carbon housing. Finally, a reflexive account of the research process as a whole concludes the chapter.

Chapter 4, Low carbon housing in UK policy: Tracing the discourse of decarbonisation, provides the context from which low carbon housing discourses have developed, analysing the development of the low carbon housing discourse within UK Government policy. Tracing the rise and fall of the Code for Sustainable Homes and Zero Carbon Homes target over time, the shifting discourses surrounding the need to reduce carbon emissions from housing were found to increasingly marginalise environmental values in favour of a techno-economic conceptualisation of low carbon housing options.

Chapter 5, Media discourses of low carbon housing: The marginalisation of social and behavioural dimensions, addresses Research Question 1(a-d) and describes how low carbon housing has been represented within the British broadsheet media. Three key storylines, *Zero carbon housing*, *Retrofitting homes* and *Sustainable living* were identified within the discourse, each of which constructs the concept of low carbon housing differently. Throughout the media discourse, low carbon housing was found to be presented as a desirable ideal that can be achieved through technological, rather than behavioural, change, again marginalising the social and behavioural aspects of low carbon housing and posing no challenge to current lifestyles.

Chapter 6, Expert opinions of low carbon housing: Defining socio-technical configurations, investigates the different ways in which housing and energy experts understand the concept of low carbon housing and addresses Research Question 2(a-c). Whilst the definition of the term zero carbon house is shown to be associated primarily with policy development and the Code for Sustainable Homes, the broader concept of a low carbon house is found to be embedded within expert visions of the future. Passivhaus and Smart home visions of future housing were envisaged as technological solutions to reducing carbon emissions from the housing sector, thus attempting to

bypass the need for lifestyle change.

Chapter 7, Public constructions of low carbon housing: The influence of terminology, addresses Research Question 3(a&b) and explores the different meanings of the terms low energy, low carbon and eco- house within the public discourse. Demonstrating how broader discourses of energy and the environment are drawn upon to construct meanings around these often little known terms, constructions of the concept of a low carbon house were seen to contrast expert understandings, focusing instead on resource use and the embodied carbon within the materials, transport and construction of housing.

Chapter 8, Changing socio-technical configurations of home: Public perceptions of low carbon housing, explores public perceptions of existing low carbon housing options to address Research Question 3c specifically. Highlighting the importance of the social and technical configurations of low carbon housing in relation to public preferences, concerns over homeliness, neighbourhood configurations, technological risk and environmental credibility, were seen to embody the broader social values of comfort, control and security, which were influential in forming perceptions surrounding the acceptability of low carbon houses.

Chapter 9, Discourses of decarbonisation: Placing low carbon housing in context, addresses Research Questions 2d and 3d simultaneously, investigating the context within which expert and public conceptualisations of low carbon housing should be understood. The expert discourse focused on the benefits of tackling climate change and fuel poverty, creating a case for low carbon housing that addresses the problem from multiple directions. In contrast, exploration of the public discourse identified an increasing divide between discourses of the environment and energy; highlighting the different ways that low carbon housing is contextualised within these two discourses.

Chapter 10, The social construction of low carbon housing: A synthesis of low carbon housing discourse, synthesises the empirical findings of this research,

exploring the socially constructed nature of low carbon housing and providing a reflexive consideration of the implications and limitations of this thesis, before highlighting opportunities for further research. Addressing Research Question 4, the policy, media, expert and public discursive domains are each mapped in relation to the assumptions embedded within the discourse, and are explored in relation to the incentives and mechanisms for creating change advocated within them. Whilst the policy, media and expert discourses can be seen to remain within the techno-economic paradigm of *Ecological modernisation*, an alternative public understanding of low carbon housing also emerges, opening up a new discursive space that connects technological change with broader environmental values, and may provide a new direction from which to approach the issue of reducing carbon emissions.

1.4 Definitions

Finally, it is important at this stage to provide brief definitions for a number of important terms that are used throughout the thesis, as set out in Table 1.1. A wide variety of terms can be used to describe housing which produce fewer carbon emissions, or have lower energy consumption, including low carbon, low energy or zero carbon housing, as well as eco-, environmentally friendly, green or sustainable housing, many of which are often used interchangeably. Investigating the concept of low carbon housing more broadly within a range of discourse domains, none of these terms were excluded from consideration within this research where they arose naturally within the data.

Table 1.1: Definitions of commonly used terms and concepts within this thesis

Term	Definition
Low/zero carbon housing	Within UK policy, the concept of a zero carbon house has been (re)defined a number of times. Discussed further in Chapter 4, the definition originally included unregulated emissions (those related to the use of the home, *e.g.*, through cooking or appliances), but has now been downgraded, only considering the regulated emissions associated with the heating, lighting and hot water of a house. Currently, three elements are required for a house to be classified as zero carbon: 1) the energy demand must be reduced to comply with the Fabric Energy Efficiency Standard (FEES); 2) any remaining carbon emissions must be below the Carbon Compliance Level; and 3) any remaining carbon emissions must be offset through investment in Allowable Solutions projects such as offsite renewable energy sources (*ZCH*, 2014). However, focusing on the meaning and use of terms low carbon and zero carbon, this thesis adopts a broad understanding of these terms in order to ensure that all meanings and understandings can arise within the data. In order to prevent prescribing a narrow definition to what is already a highly contentious concept, this thesis thus draws on *Lovell*'s (2005) broad definition of a low energy house (as outlined below). As such, the term low carbon house is understood to be any dwelling that produces lower carbon emissions, while a zero carbon house produces zero carbon emissions, in comparison to the average UK house.

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Term	Definition
Low/zero energy housing	A low energy house is understood within this thesis to be 'any dwelling which exceeds the current energy efficiency requirements of the UK building regulations' (*Lovell*, 2005, 4). Whilst the terms low and zero energy house are ambiguous and often left undefined, within European policy, the term nearly-zero energy (defined within the EU Energy Performance of Buildings Directive) has a specific meaning, referring to a house or building is 'that has a very high energy performance [...]. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby' (*European Council*, 2010, Article 2).
Passivhaus	The concept of a Passivhaus was repeatedly referred to within all stages of this research, although not all participants were aware of the specific meaning of the term. However, as a technical housing standard, a Passivhaus is defined as 'a building, for which thermal comfort can be achieved solely by post-heating or post-cooling of the fresh air mass, which is required to achieve sufficient indoor air quality conditions [...] meaning the heating requirement in a Passivhaus is reduced to the point where a traditional heating system is no longer considered essential' (*BRE*, 2015a).
Sustainable housing	The term sustainable housing has a more specific meaning within this thesis, referring to the broader understanding of the concept supported by the sustainable housing advocacy coalition identified by *Lovell* (2004). As such, unless otherwise stated, this term refers to 'housing that has environmental and social benefits above those of an average UK house' (*Lovell*, 2004, 36).

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Term	Definition
House/home	Whilst it is acknowledged that these terms are often used interchangeably, the meaning of the terms house and home, although related to each other are not equivalent and need to be differentiated (*Blunt and Dowling*, 2006; *Mallett*, 2004). Within this thesis, the term house is taken to mean the physical structure of the dwelling itself, and can refer to the material, technical and architectural elements of the building. In contrast, the concept of home is broader and understood as multidimensional, incorporating both personal and social meanings that connect the material with the imaginative and emotional, as well as with identity and culture. These terms are used differently within this thesis to refer either specifically to the technical and physical elements of low carbon housing, or more broadly to the understandings and meanings associated with making a low carbon house a home.
The public	Throughout this thesis, terms such as public understandings and public discourses are used in relation to the broader UK public, as seen within the broader literature surrounding public meaning-making. However, within this thesis, the public are not considered to be a homogenous category, but instead is constituted of multiple publics, which emerge in relation to specific issues and are inseparable from their contexts. Whilst the unwieldy term 'publics' is not used within this thesis, this position is reflected in the use of plurals to stress that there are multiple public understandings, rather than one public understanding. In addition, when referring to the findings of Phase 3 of this research, the term public is avoided, stressing the meanings and understandings of participants within this study, which of course draw on wider political, media and public discourses, rather than assuming a broader public understanding of the subject.

CHAPTER 2

Discourse, the environment and low carbon housing: An introduction

The aim of this chapter is to summarise and review the broad literature base on which this research is predicated. Beginning with the argument that meanings matter in relation to the social construction of environmental issues, the importance of attending to language and discourse in understanding environmental problems and their solutions is presented. An overview of previous empirical research that informs this thesis in then provided, focusing on the broader discourses of the environment and sustainability, before considering the political and public discourses of climate change. The role of language in influencing and constraining discourse is then briefly touched upon, before a more detailed discussion of the research specifically investigating the language and discourses of low carbon housing is considered.

2.1 Conceptualising environmental issues through discourse

'Environmental issues do not present themselves in well-defined boxes labelled radiation, national parks, pandas, coral reefs, rainforest, heavy metal pollution, and the like. Instead [...] they are interconnected and multidimensional; they are in a word complex' (*Dryzek*, 2005, 8). Sitting at the juncture between ecological and social systems, environmental problems are thus not self-evident, but are instead the product of social

and political struggles over meanings and interpretations (*Hajer and Versteeg*, 2005). Whilst acknowledging the material existence of threats to the environment (see Chapter 3 for more details on the epistemological position adopted in this thesis), concepts such as climate change can therefore be understood as fundamentally socially constructed, rather than arising from 'a collection of facts' that provide an objective description of an external reality (*Onuf*, 2013). As such, the development of environmental issues over time must be interpreted by society, with problems bounded and given meaning through a process of claims-making (*Hannigan*, 2006); this process of collective sense-making can be understood through the concept of discourse.

Discourses represent a shared way of understanding the world. They describe a common sense of knowledge, reflecting the changing nature of social values, beliefs and understanding (*Dryzek*, 2005). Belonging within the constructivist tradition, theories of discourse hold the view that there is no one version of reality and that particular 'truths' are socially constructed. In this way discourses represent a fundamental constituent of cultural politics, the processes through which meaning is continually (re)constructed (*Boykoff*, 2009). For this reason, while particular meanings may gain discursive hegemony, social understanding is continually developing and as a result, this dominance can be unstable and short-lived (*Rogers-Hayden et al.*, 2011). Through investigating discourse and the socially constructed nature of environmental concepts and problems, it is thus possible to understand how meaning is shaped by social and political factors (*Fischer*, 2012). Whilst discourse has been conceptualised differently within a variety of different disciplines (discussed further within Chapter 3), there are still many commonalities, which together provide the foundations of this research and the theoretical background to the empirical research presented within this thesis.

As well as being socially shared, discourse is also patterned, made up of an 'ensemble of ideas, concepts and categories' (*Hajer*, 1995, 264) that are (re)produced through language to give meaning to concepts and problems. As *Harré et al.* (1999, ix) argue, language matters, as it 'reflects and records but also shapes, distorts and

even creates realities'. The construction of environmental problems has consequences, placing boundaries on understandings, constraining what can be thought or said, and naturalising certain definitions and framings of a problem, while excluding other ideas and solutions (*Forsyth*, 2009). As 'products of a dynamic social process of definition, negotiation and legitimation' (*Hannigan*, 2006, 31), discourses thus act to shape and delimit the environmental policy agenda, as well as public understandings and practices (*Kurz et al.*, 2005).

Whilst this understanding of discourse implies connections between discourses within different spheres (*e.g.*, public, political and media discourses of climate change), relatively little research has been conducted investigating the links between discourse domains. One area in which this issue has been considered more thoroughly is within the literature surrounding media discourses. As not only a voice in its own right, but also as a mediating agent between different discourses and communities, the media weaves cultural, political and scientific meanings and information together within their explanations of issues and events (*Boykoff*, 2009), as well as providing an arena for debate and discussion between different groups of actors (*Doulton and Brown*, 2009). Through its ability to decide what constitutes 'news', and its framing and contextualisation of issues to privilege particular discursive viewpoints over others (in part through its power to provide a voice for selected actors), while denying that opportunity to others, the media can influence the public agenda and thus also shape political possibilities and broader social understandings (*Boykoff*, 2009; *Carvalho*, 2010).

However, whilst social and political understandings are clearly linked with media discourse, it is important to understand that the relationship between the media and public perceptions is complex and cannot be explained as the passive uptake of information by various publics (*Gamson et al.*, 1992). Differences and contradictions in the depictions of issues, due to the subtleties and contextualisation within media representations, can thus often have a significant influence on perceptions and understanding sometimes leading to audience confusion and misunderstanding (*Boykoff*, 2009). Trust and le-

gitimacy of sources and actors has also been found to be an important influence on public perceptions, with members of the public discursively examining information in the context of their own knowledge and experiences before incorporating it within their understandings (*Davies*, 2001). It is, therefore, important to note that individuals' perceptions (and social understandings more generally) are shaped not only by prominent discourses and norms, but also through their social interactions and the lived experiences of individual lives (*Burgess*, 1990; *Carvalho*, 2010), with media influences described as a 'weak force' in comparison to these factors, as well as demographic characteristics and personal experiences (*Newton*, 2006).

Whilst most work has focused primarily on news production (*e.g.*, the journalistic norms of novelty, dramatisation, personalisation, balance and authority-order highlighted by *Boykoff and Boykoff*, 2007), a number of models have been put forward which attempt to explain the relationships and interactions between media production and consumption. Early models, such as the Issue-Attention Cycle (*Downs*, 1972), have been criticised for adopting too linear a framework, which does not account for the multi-scale influences that have been found to influence news construction, and thus the cultural politics of social meaning making (*Boykoff*, 2009). The Public Arenas Model (*Hilgartner and Bosk*, 1988) goes some way to addressing these issues, through the consideration of the 'arenas' where the construction of social problems and understandings take place, incorporating various factors which shape media influence on policy and public perceptions.

More recently, *Carvalho and Burgess* (2005) have attempted to address the issue through the adaptation of the Circuits of Culture model. The model again rejects the informational model of knowledge transmission from dominant suppliers to passive publics (receivers). Through considering the dynamic process of media production and consumption over time from a cultural-political perspective, the profound role that the media play in modern life is demonstrated, through a focus on the issue of climate change coverage in the UK broadsheet press. Media messages are shown to move

through a repeating cycle of three phases (or circuits), from production (the construction of content, structure and context of information), to analysis (the deconstruction of the discursive and persuasive components of the text) and finally to consumption (the reconstruction of meaning and understanding), with discourses and meanings influenced at each stage of the cycle (*Carvalho and Burgess*, 2005). In this way, both media representations and social understanding are continually being (re)constructed, through dynamic interactions between competing discourses and the constantly shifting relationships between politics, society and the media.

2.2 Discourses of the environment and sustainability

Introducing the concept of the social construction of environmental problems, the previous section aimed to highlight the importance of attending to discourse and language in the construction of meaning around complex environmental problems such as climate change. The remainder of this chapter is dedicated to reviewing the empirical research that has built upon this perspective, drawing primarily on broadly discursive research, to provide the context within which this thesis is situated. As is generally the convention within discursive research, discourses identified within the literature are italicised for clarity. Whilst there is now a significant body of research investigating the social construction of environmental issues and climate change, especially in relation to media representations and policy formulation, there have been fewer discursive investigations of public understandings. Where relevant, in addition to discursive work, qualitative thematic research is thus also included to support the discussion surrounding public understandings of climate change and the environment.

As highlighted above, climate change is fundamentally a socially constructed issue that is imbued with meaning and value through both culture and history (*Hulme*, 2009; *Pettenger*, 2013), our understandings of which are the product of multiple discursive struggles (*Oels*, 2005). As an environmental concern, understandings of climate change

are fundamentally linked with human constructions of nature and the environment (*Pettenger*, 2013). Focusing on the nature/society divide that is common within environmental discourse, *Macnaghten and Urry* (1998) discuss how a variety of different 'natures' exist, with the concept of environment constituted through socio-cultural practices, and describe how recently nature has become synonymous with 'the natural environment'. This section thus begins with a discussion of the broader discourses of the environment, before considering how this is linked with discourses of climate change and, more specifically, low carbon housing.

Arguing that prior to the 1960s 'the environment' was not conceptualised within politics, or society more widely, *Dryzek* (2005) traces the development of four broad discourses of the environment, each of which can be classified as either reformist (favouring the maintenance of the socio-economic status quo) or radical (favouring a radical restructuring of society). *Environmental problem solving* is a reformist discourse, focusing on the need to make adjustments to current social and political systems in order to cope with environmental problems, advocating a range of policy options such as intervening in the market (to place an economic value on environmental harms) and institutionalising environmentalism within existing Governance structures. In contrast, *Green radicalism*, rejects the status quo of modern industrial society, advocating a fundamental reimagining of society. This discourse incorporates a range of positions, each of which holds different visions of the right way to live, be that through making changes to individual lifestyles and beliefs, or through the greening of politics and collective decision making. Emerging following the Club of Rome's (*Meadows et al.*, 1972) seminal treatise 'The Limits to Growth', the second radical discourse, *Survivalism* responds to the idea that ever increasing economic and population growth is unsustainable as we reach the limit of Earth's resources and its capacity to support human civilisation.

Finally, the discourse of *Sustainability* (also classified as reformist) is of particular interest to this thesis. Gaining prominence in the 1980s, sustainable development refers to the need to integrate environmental, social and economic concerns, and is most

famously defined as 'meeting the needs of the present without compromising the ability of future generations to meet their own needs' (*Brundtland Commission*, 1987). Rooted in the United Nations Conference on the Human Environment in Stockholm 1972, this discourse acts to reconfigure the relationship between human society and nature, conceptualising the environment as a closed global system within which all human society has an equal right to the Earth's finite resources (*Macnaghten and Urry*, 1998). Using the metaphor that we are all in the 'same boat', this discourse aims to find win-win solutions to environmental problems for both North and South through a process of global environmental management.

Sustainable development can be broadly divided into two categories, strong sustainability (as described above) and weak sustainability, often termed ecological modernisation (see *Carter*, 2007). The concept of ecological modernisation originates within the literature surrounding environmental governance (for more information on Ecological Modernisation Theory see *Spaargaren and Mol* (1992); *Hajer* (1995); *Mol and Sonnenfeld* (2000)). Whilst the theory itself is a prescriptive attempt to reconcile environmental and economic concerns and is thus beyond the scope of this review, an understanding of this concept and the discourse which it has inspired (and that is the subject of increasing academic research) is essential for this research. Evolving in part as a challenge to *Schumacher*'s (1973) critique of the Western economic system 'Small is beautiful', *Ecological modernisation* essentially advocates a large-scale restructuring of capitalist industrial/economic systems to protect the environment while maintaining limitless 'green growth' (*Dryzek*, 2005). It thus supports the status quo through a process of modernisation using a market driven approach, centred on the ability of financial mechanisms and technological innovation to provide economically effective solutions to environmental problems.

These discourses of the environment, and in particular those of sustainable development, are particularly important in understanding the development of climate change discourse over time. Building on the work of *Dryzek* (2005), a simplified typology outlines

three meta-discourses of climate change (*Oels*, 2005; *Bäckstrand and Lövbrand*, 2007). *Green governance* (advocating a top-down, international and evidence based approach to the governance of environmental issues) and *Ecological modernisation* (as described above) are shown to dominate political discourses of climate change (*Bäckstrand and Lövbrand*, 2007). These discourses act to constrain the policy debate, defining what is considered an 'appropriate' solution to climate change, and marginalising *Civic environmentalism*, which challenges these discourses through a focus on equity and ecological sustainability through bottom-up citizen and community engagement, and more radical changes to behaviours and lifestyles.

Oels (2005) describes how a complex environmental issue such as climate change has been rendered governable, through the discursive struggles between these competing discourses. Whilst to some extent co-existing, a shift in the construction of climate change mitigation discourse, from *Green governance* to *Ecological modernisation*, has occurred within the last 15 years, opening up different solutions and possibilities for action. She argues that this shift from a focus on the power of the state to address climate change, to that of market-based and technological solutions, acts to reduce the moral responsibility of tackling climate change, instead basing decisions on cost-benefit analyses. Whilst to some extent these approaches overlap, it is clear that climate change policy, in the UK at least, can be viewed as in part an ideological project, fundamentally based on concepts embedded within *Green governance* and *Ecological modernisation* discourses, acting to marginalise more radical criticisms of western industrial society (*Janković and Bowman*, 2014).

Whilst it is clear these meta-discourses of climate change are broadly comparable with *Dryzek*'s (2005) *Environmental problem solving*, *Sustainability* and *Green radicalism* discourses, this thesis will adopt the terms *Green governance*, *Ecological modernisation* and *Civic environmentalism* as signifiers of these ideas and discourses from this point onwards when referring to the discourses surrounding solving the problem of climate change through governance, techno-economic, or lifestyle responses respectively.

2.3 Discourses of climate change: Defining the problem and solutions

With climate change understood as a socially constructed phenomenon, this section aims to review the different ways in which this problem, and the solutions to it, are understood within society. As this thesis is concerned with the discourse surrounding low carbon housing as a solution to climate change, this section focuses primarily on discourses surrounding how best to tackle climate change, particularly focusing on the debate surrounding whether mitigation through governance, economic, technical or lifestyle change is most appropriate. However, prior to this, a brief overview of the development of climate change discourse in the UK provides the context for this discussion through its introduction of how climate change has been conceptualised as a problem in the first place.

2.3.1 Climate change discourse in policy and the media

Focusing on the analysis of critical discourse moments that have led to discursive shifts within media representations of climate change, *Carvalho and Burgess* (2005) describe three distinct 'circuits' (as described above) of the climate change problem that arose between 1985 and 2003. Spanning 1985-1990, the first of these circuits saw the reframing of climate change from a scientific issue, to a global political concern. Gaining increasing prominence following the creation of the Intergovernmental Panel on Climate Change (IPCC) in 1988, a scientific discourse first dominated media reporting, with climate science simplified and strengthened to present a consensual and confident representation of climate change as a scientifically defined environmental issue. However, echoing the findings of *Weingart et al.* (2000), despite the confidence shown in scientific evidence for anthropogenic global warming, no discussion of the social and economic causes and consequences of climate change were reported during this time, and the question of

responsibility for the problem remained unaddressed.

However, in 1988, this discourse was transformed in the UK following Margaret Thatcher's speech to the British Royal Society (*Thatcher*, 1988). From this point climate change was reconceptualised as a major risk to human security; now seen as a political as well as a scientific concern, scientists lost their previous definitional rights over climate change. Thatcher's framing of climate change as a global existential threat, for which all were equally responsible, acted to marginalise calls for personal, local and even national action on the problem (*Carvalho*, 2005), and through the rhetoric of *Green governance*, firmly focused attention on the emerging international politics of climate change (formalised within the United Nations Framework Convention on Climate Change (UNFCCC) in 1992); emphasising a neoliberal approach to addressing climate change, and thus actively marginalising radical proposals for action, such as Contraction and Convergence (*Meyer*, 2000).

Between 1990-1996, the second circuit saw the prominence of climate change recede within the press, with only minor, factual coverage of key events within climate change politics arena, likely in part due to issue fatigue, a reduced political focus on environmental issues and economic recession in the UK (*Carvalho and Burgess*, 2005). However, with increased political attention surrounding the adoption of the Kyoto Protocol in December 1997, as well as the publication of the IPCC's Third Assessment Report in 2001, media interest in climate change substantially increased during the third circuit of climate change reporting (1997-2003). During this time the then Labour Government, under Prime Minister Tony Blair, presided over a further discursive shift, which recognising the danger of climate change, adopted a strong rhetoric around sustainable development (discourses of which had begun to dominate the policy arena). Proposing a weak form of sustainable development, this reframing drew on *Ecological modernisation*, to advocate a market-based neoliberal approach to tackling climate change, focusing on win-win policy options and the possibility of green growth, again diffusing the responsibility of the state (*Carvalho*, 2005).

More recently, *Lovell et al.* (2009) demonstrate how climate change and energy discourses have converged since this time, through the emergence of four related, but independent storylines which frame both the problem of, and solution to, climate change differently. *Climate change as a problem of energy supply* centres on the need to reduce the carbon intensity of energy supplies, through changes in the UK's energy mix and technological innovation. Interestingly, this storyline is used to support often conflicting mitigation options, ranging from promoting centralised energy systems and nuclear power to decentralised renewable energy sources. Framing carbon emissions as the result of consumption rather than production practices, *Climate change as a problem of energy demand* advocates the need to reduce demand for energy, primarily through energy efficient technology and financial incentives to encourage personal behaviour change. Connected to this, *Climate change as a market efficiency problem* primarily revolves around the need for the market to take the social and environmental costs of carbon emissions into account through placing a price on carbon.

In contrast to those discussed above, the fourth storyline, *Climate change as an international problem* frames climate change as the result of a global environmental problem, rather than the result of national carbon emissions. Positioning the UK as a relatively minor contributor to global carbon emissions, this storyline advocates the importance of international agreements to tackle climate change, acting to deflect attention from the need to drastically reduce national emissions, and as *Lovell et al.* (2009, 98) point out, it is perhaps 'no coincidence that this storyline emerged at the same time as the evidence mounted for rising domestic carbon emissions'. Crucially, all four storylines are found to be largely compatible, coexisting within the broader discourse of climate change rather than struggling for discursive dominance, and allowing a wide range of actors to draw on multiple storylines as appropriate. However, while these storylines have allowed for a convergence between energy and climate change policy within the UK, this compatibility is primarily due to the fact that it is *Ecological modernisation* that underlies all four storylines, uniting them in support of the status quo, and further

marginalising criticisms of western lifestyle and the existing energy system.

Similarly, *Rogers-Hayden et al.* (2011) provide a particularly good example of how discourse has been mobilised to promote specific solutions to the climate change problem, generally acting to support the dominant techno-economic paradigm and marginalise any challenge to modern lifestyles. They show how the dominant discourses of climate change and energy security within energy policy have led to the naturalisation of the need to build new nuclear power stations. With climate change framed as a global environmental issue, and energy security conceptualised primarily as an energy crisis due to a growing gap in national gas supplies, nuclear power has thus been constructed as technical fix to both climate change and energy security concerns; marginalising alternative discourses that consider climate change to be the result of unsustainable consumption practices and energy security as a lack of diversity in energy supply systems, both of which point towards significantly different solutions.

As discussed above, the question of whether technological or social change (or some combination of the two) is the most appropriate way of tackling environmental change is thus a key theme throughout much of the research into discourses of climate change. *Kurz et al.* (2010) use the example of the Australian Parliamentary elections to investigate how the issue of climate change was rhetorically managed within the political discourse through appeals to national interest and lifestyle maintenance. They show how any suggestion that lifestyle change may be required is deemed to be both politically and socially unacceptable, and even 'damaging', leading to the proposition of a number of technical fixes (such as carbon capture and storage (CCS)) to reconcile concern for the environment with the need to maintain current lifestyles (and thus levels of energy use). Politicians were then able to reconcile environmental concerns with the maintenance of mainstream lifestyles through a discursive appeal to practicalities, common sense and the 'sensible middle ground' in support of a technological approach to tackling climate change.

Through their investigation into the linguistic repertoires (the systems of language used to make sense of phenomena – see Chapter 3) of climate change within UK policy, communications and media, *Ereaut and Segnit* (2006) (later followed by *Segnit and Ereaut*, 2007) highlight how this need to reconcile climate change with the question of behavioural and social change has translated into a discourse of *Small actions*, which argues that cumulatively, the small actions (*e.g.*, such as turning off lights or washing clothes at a lower temperature) of many individuals can have a large effect on reducing carbon emissions. This practical approach to emissions reductions retreats from engaging with the question of belief in climate change, instead focusing on the easy steps people can take and the agency that individuals have in tackling this problem. This discourse is seen to dominate campaign communications, reinforcing the assumption that technology alone can solve the problem, whilst still marginalising calls for radical lifestyle change.

In relation to this, one final point to consider is the ways in which discourses of climate change and the solutions to it are embedded with assumptions regarding the role and characteristics of the public. *Besley and Nisbet* (2011) describe how scientists often characterise the public as a homogenous group (or small set of homogenous groups), lacking in information, interest and trust, arguing that a deficit model approach to communication is required to provide a one way flow of information from policy makers and scientists to the public, which are often assumed to be resistant, if not hostile, to taking action (*Maranta et al.*, 2003). However, these imaginaries of the public can have a significant influence on both policy and design, shaping socio-technical systems and again highlighting the importance of discourse in society (*Walker et al.*, 2010a).

2.3.2 Public understandings, climate change and the environment

As has been discussed, the way in which social and environmental problems are constructed can be seen to have an important influence on public understandings of the

issue, as well as on the success or failure of actions taken to address the problem (*Kurz et al.*, 2005; *Forsyth*, 2009). Public life is thus full of competing discourses, which individuals draw on in understanding and communicating about the world around them. Whilst, still relatively minor in relation to considerations of the political and media discourses of climate change (*Koteyko et al.*, 2013), there is now a growing body of qualitative research exploring public discourses of climate change and the environment (see *Wolf and Moser* (2011) for a detailed review). This section summarises the main findings and themes that have arisen through qualitative research into public discourses and understandings of climate change and the environment from a range of different backgrounds, combining research from discursive, framing and thematic traditions as appropriate, to outline the current state of knowledge surrounding public understandings of the problem of, and solutions to, climate change.

Considering climate change specifically, research can be broadly separated into three largely distinct categories, considering public understandings of climate change as scientific issue (focusing primarily on the public acceptance or scepticism of climate change science), climate change as a social and political issue, and climate change as a personal and behavioural issue (*Capstick*, 2012). Early work surrounding public perceptions of climate change focused primarily on ascertaining levels of knowledge and acceptance of the science of climate change (*e.g.*, *Bostrom et al.*, 1994; *Kempton*, 1997). As highlighted by *Capstick* (2013), despite their qualitative perspective, these early studies tended to approach the problem from a positivist perspective, using the information deficit model (which proposes that public attitudes, and specifically scepticism towards science and technologies are based on a lack of knowledge or understanding – see *Sturgis and Allum*, 2004) to highlight inconsistencies between public and expert understandings of climate change and identify ways to address these misunderstandings.

Although much of the recent work that has built on this has focused on public perceptions of climate change in relation to risk, uncertainty and scepticism (*e.g., Bickerstaff et al.*, 2008a; *Stoll-Kleemann et al.*, 2001; *Norgaard*, 2006), as well as in relation

to media discourses of climate change and extreme weather (*Butler and Pidgeon*, 2009), one recurring theme that is of interest to this thesis has been around public conceptualisations of climate change as an environmental problem. There is evidence to suggest that public understandings conceptualise climate change as just one part of much broader concern around the need to protect nature and the environment (*Darier and Schüle*, 1999; *Fischer et al.*, 2012; *Corner et al.*, 2013; *Butler et al.*, 2015). This in itself is interesting, highlighting a disconnection between public understandings, which often frame climate change as less relevant than a broader environmental imperative to 'save the planet' or as part of concern over peak oil and resource scarcity more widely, contrasting that seen within the policy discourse, where climate change is often framed as a single or discrete issue (*i.e.*, simply as the need to reduce national carbon dioxide emissions).

Moving away from the debate surrounding climate change as a phenomenon, the remainder of this section considers the findings of previous research investigating public discourses surrounding the social, political and personal dimensions of climate change mitigation options. Over the last decade, many studies have investigated public perceptions and understandings of a variety of specific climate change mitigation options, including: nuclear power (*Bickerstaff et al.*, 2008b; *Pidgeon et al.*, 2008), renewable energy (*Walker and Devine-Wright*, 2008; *Walker et al.*, 2010b), geoengineering (*Corner et al.*, 2013) and most recently, broader energy system transitions (*Parkhill et al.*, 2013; *Pidgeon et al.*, 2014; *Butler et al.*, 2015). Whilst it is beyond the scope of this review to discuss these individual options in their own right, these findings, combined with research considering the possibilities for action on climate change and environmental issues more broadly, provide a number of important insights into public understandings of climate change. Together they highlight how climate change is constructed as a moral issue, and investigate how tensions between care for the environment and a range of other concerns, such as risk, responsibility and fairness, are incorporated within public discourses around this issue.

Constructing personal identity around a sense of care and duty towards the environment, public discourses surrounding what to do about climate change are often predicated on concern about climate change and the environment more broadly (*Phillips*, 2000; *Kurz et al.*, 2005; *Parkhill et al.*, 2013). Focussing on border discourses of the environment, *McGregor* (2004) describes how three discourses, *Sustainable Development*, *Survival* and *Naturalism* are present within public understandings. Interestingly, his research highlights the mismatch between public understandings of environmental problems and solutions. *Survival* and *Naturalism*, which together create a discourse of fear and concern for the future of the planet and the need to protect nature, are used to demonstrate awareness and concern for environmental issues such as climate change. However, these discourses are only drawn upon when they do not clash with the discourse of *Sustainable development* that surrounds discussion of the political, societal and personal action that are required to address these environmental issues. Through the use of familiar terms and narratives of environment, which generally construct the environment as separate from the rest of society (*e.g.*, *Corner et al.*, 2013) and in need of 'management', *Ecological modernisation* has permeated into public understandings, marginalising less anthropocentric understandings. According to *McGregor* (2004), this discourse thus acts to naturalise personal 'environmentally friendly' actions, either as energy efficiency or a form of green consumption, and thus doesn't challenge existing lifestyles.

By far the strongest themes to emerge from this body of research are those of responsibility and fairness. *Capstick* (2013) describes how climate change can be conceptualised as a social dilemma, in which a conflict exists between the societal and individual benefits of climate change mitigation (such as that presented in *Hardin*'s (1968) seminal work 'The Tragedy of the Commons'). Exploring public discourses of climate change longitudinally, *Capstick et al.* (2015) demonstrate how, while public opinion can often be seen to swing rapidly in response to changing social and political contexts, public perceptions of the ethical dimensions of climate change have become culturally

embedded within public understandings. In particular, discourses surrounding the our shared responsibility to protect the environment have remained constant over time, allowing for the normalisation of some green behaviours, such as recycling, with the issue of climate change slowly becoming more personally relevant to everyday lives and practices. Considering these issues in more detail, an increasing body of research has now been conducted investigating the moral and personal aspects of climate change within the public discourse.

With national and international Government seen as primarily responsible for tackling climate change, members of the public were seen to struggle with the issue of personal responsibility (*e.g.*, *Butler*, 2010), demonstrating a lack of trust in both Government and 'other' members of the public to take action to reduce emissions. Sometimes termed the 'free-rider effect' (which operates at a personal, national, and international level – *Lorenzoni et al.*, 2007), concerns about the fairness and effectiveness of requiring individuals to make sacrifices in order to reduce national carbon emissions are often used to challenge this narrative of 'doing your bit', with personal emissions construed as a 'drop in the ocean' in comparison to other nationals, institutions and even individuals (*Capstick*, 2013). Highlighting the connection with understandings of personal agency, responsibility to reduce emissions is thus understood to be relational, depending on individual perceptions of the actions of these multiple 'others' (*Macnaghten and Urry*, 1998; *Bickerstaff et al.*, 2008a); a finding that is particularly relevant in relation to climate change communications, which are commonly framed around the *Small actions* repertoire, advocating the reduction of emissions through small purchasing and behavioural changes in the home (as seen in the then Labour Government's Act on CO_2 campaign – *DECC*, 2010).

Closely connected with this, concerns over fairness and equity infuse the public discourses. Social justice and fairness are seen as crucial elements of any deliberation over action to tackle climate change. In their research into public rhetoric of environmental sustainability, *Myers and Macnaghten* (1998) highlight a focus on the relationship

between fairness, responsibility and blame in relation to both the self and others. The metaphor of the Earth as a lifeboat was seen to link strongly with this theme, as well as with considerations of intergenerational equity that question the rights and responsibilities of living and future individuals. Highlighting the tension between the ideals of environmental discourse and everyday lifestyles, these arguments led again to a focus on the small, practical actions that individuals could undertake. Additionally, *Hobson* (2002) investigated how efforts to encourage such lifestyle change (through the UK based Global Action Plan scheme) were impaired by the lack of consideration of equity and fairness within messaging around sustainable actions at home. With many participants using the scheme as a platform to explore 'the right way to live', the scheme's call for lifestyle change, thus alienated rather than recruited many individuals to the scheme.

Phillips (2000) describes how discursive negotiations around these social and political aspects of climate change coalesce around a discourse of *Everyday constraints* that limits the possibilities for personal lifestyle change. These generally focus on the routines and practices of everyday life, including time pressure, family dynamics and personal economic possibilities. Echoing this, *Butler* (2010) highlights how Government efforts to link climate change with everyday behaviours and routines, has permeated through public understandings and led to the moralisation of previously mundane household activities through the labelling of behaviours as 'good' or 'bad'. Whilst individuals professed a desire to act morally and 'do the right thing', group negotiations surrounding the responsibility and fairness of such action led back to a debate around personal efficacy. This struggle to reconcile personal moral responsibility for acting on climate change with the small impact such actions would have on overall emissions thus led to the deferral of responsibility from a personal to the national or global level.

A number of other social and cultural influences on public understandings of climate change have also been identified. In their study of public discourses of water and energy consumption in suburban Australia, *Kurz et al.* (2005) draw similar conclusions, finding

that in contrast to water consumption, which is constructed as a public good that shouldn't be wasted, energy is seen as essential to leading a good life, and reducing its use is thus actively positioned as outside the scope of personal responsibility. Interestingly, the role of personal and cultural identity as a justifying strategy for resource use was highlighted (*Kurz et al.*, 2005), demonstrating the importance of energy related behaviours in the creation of personal identities and a common reluctance to step outside mainstream behaviours (*Isenhour*, 2010). In addition, the role of personal and social values in shaping public perceptions of both technological and behavioural responses to climate change has recently been investigated and is particularly useful to this research. In their qualitative research investigating public perceptions of energy system transitions, *Parkhill et al.* (2013) discuss how the acceptability of a range of mitigation options is built upon the wider cultural and personal values of participants. In particular, in addition to environmental concern, participants also commented on the importance of: security, in terms of the affordability and availability of energy; control, and the significance of personal autonomy and choice; and justice, which echoing the discussion above focused on the requirement for fair, honest and transparent systems.

One further comment to make in relation to the debate surrounding the role of governmental, economic, technical or lifestyles change, regards the current academic debate surrounding the concept of behaviour change. There are many different models that attempt to explain the nature of 'behavioural' change, including behavioural economic models of individuals as rational decision makers, and psychological approaches to investigating the values and beliefs behind behaviours and habits (see *Wilson and Dowlatabadi*, 2007). In relation to personal energy use, a contentious debate has arisen regarding whether a focus on the behaviour of individuals is the most appropriate way to conceptualise behavioural change, with analysis of the transmission of social practices instead favoured by many (*Shove*, 2010; *Whitmarsh et al.*, 2011; *Shove*, 2011). As this research focuses on the construction of meaning and understandings of low carbon housing, rather than their material form, interaction with occupants or technological

effectiveness in reducing emissions, this thesis does not take a position within this debate. Instead, these debates are taken as essential context in which to understand the different ways in which both experts and various publics conceptualise the need for, and meaning of, behavioural change.

This section has focused on the public discourses of climate change, focusing primarily on the understandings of how to address this issue, highlighting the key elements of public discourses, and the deeper values on which these are based, such as fairness and responsibility. Both *Hinchliffe* (1997) and *Hobson* (2002) highlight how a discursive distance between political and public understandings can influence the effectiveness of policies and campaigns if the public fail to identify with the narratives presented. This lack of salience, should however, not be dismissed as a misunderstanding, but investigated in its own right in an attempt to understand how multifaceted public understandings draw on a rich variety of discourses, as well as personal values and experiences, to give meaning to ideas and phenomena (*Fischer et al.*, 2012).

2.4 Low carbon language

As mentioned previously, it is a central premise of this thesis that '[l]anguage not only reflects and records but also shapes, distorts and even creates realities' (*Harré et al.*, 1999, ix). Recently, a growing body of research has documented how climate change has now developed a language of its own, which frames the debate and thus also acts to constrain understandings of how to address it. A particular focus of this research has been around the development of carbon compounds, the 'lexical combinations of at least two roots around 'carbon' as the lexical hub' (*Koteyko et al.*, 2010, 26), such as the now common term *carbon footprint*. Utilising the media as a record of wider social discourse, the emergence and evolution of these terms can be tracked over time. Seen to reflect the broader discourses of climate change over the past two decades, this research thus provides a useful insight into how this debate has been produced and

contested, and its possible influence in framing public discourses (*Koteyko et al.*, 2010; *Nerlich and Koteyko*, 2009; *Koteyko*, 2012). Echoing the scientific discourse of the 1980s, initially only technical terms such as *carbon emission*, *carbon sink*, and *carbon sequestration* were common within the climate change discourse. However, following the discursive shift towards climate change as a social and political issue described above, new terms proliferated rapidly. Building on the economic framing of climate change that dominated the discourse post Kyoto, finance based compounds emerged between 1990-1999. These included now common terms such as *carbon tax*, *carbon trading* and *carbon budget*, all of which served to reinforce the dominant framing of climate change mitigation as a form of environmental accounting (*Koteyko*, 2010).

More recently, a new range of terms has evolved, emerging from the growing discourse around climate change as the result of everyday actions of individuals, businesses and organisations. Based around the *Small actions* discourse, this shift focused on the need to reduce carbon emissions at all levels, with the terms *carbon footprint* and *carbon neutral* embedded within it. Between 1999 and 2005, this focus on reducing emissions led to the growing use of *low* as a modifier, used in terms such as *low carbon lifestyle*, *low carbon living* and even the idea of a *(low) carbon diet* (*Koteyko*, 2012). *Koteyko* (2010) highlights the importance of these terms in raising awareness and increasing a sense of personal responsibility, further reinforcing the link between personal lifestyle choices and the more abstract concept of global climate change. Since 2005, a further lexical shift has been recorded, echoing research on the moralisation of climate change (*Butler*, 2010) and leading to the emergence of terms emphasising guilt and judgement such as *carbon sinner* and *carbon indulgence* through the religious connotations of the language (*Nerlich and Koteyko*, 2009).

Describing these compounds as the result of 'collective linguistic creativity', *Nerlich and Koteyko* (2009) consider how these metaphors form part of symbolic cultures that shape the discourse of climate change. The value of this research thus lies in highlighting the complexity of climate change as a socially constructed phenomenon,

adding depth to the thematic and discursive understandings of climate change problem and solution argumentation. This research demonstrates the influence that the use of terms and compounds can have in defining and communicating meanings, entering the language quickly and providing a mechanism for the shared understanding of concepts and ideas. Gaining prominence over the last decade, the term *low carbon* has now gained meaning in its own right (as opposed to as a modifier of other words) (*Koteyko*, 2012), and has now become a more common prefix than *eco* when used as a signifier of environmentally friendly ideas, behaviours and objects (*Nerlich*, 2012). Strongly associated with the political discourse of climate change discussed above, and specifically *Ecological modernisation*, the semantic associations of *low carbon*, as well as the other compounds discussed above, inherently act to support the techno-economic paradigm of proposed mitigation options (*Koteyko*, 2010), and reinforce dominant understandings and framings within the wider climate change discourse.

2.5 Understanding low carbon housing

The final section of this review focuses more specifically on previous research investigating the meanings and discourse surrounding sustainable and low carbon homes and buildings. Whilst significant research efforts have gone into investigating the technical classification and definitions of low or zero carbon houses (*e.g.*, *Marszal et al.*, 2011; *Marszal and Heiselberg*, 2009), as well as on assessing or modelling the effectiveness of specific definitions in achieving emissions reductions (*e.g.*, *McLeod et al.*, 2012), further discussion of these primarily quantitative approaches to investigating definitions of low carbon housing are beyond the scope of this research. Focus is instead placed on the interpretive meanings of these terms (*Guy*, 2005), highlighting the high level of interpretive flexibility that has led to the debate surrounding the definition of a 'zero carbon home' (discussed further within Chapter 4).

Focusing specifically on the concept of sustainable architecture more broadly, the high

level of interpretive flexibility around the term 'sustainable' has been described as at the heart of the fractious debate surrounding the meaning of sustainable housing (*Guy*, 2005). *Guy and Farmer* (2001) identify six 'logics' (broadly comparable to frames) of sustainable architecture, each of which acts as a site of redefinition of the concept itself, incorporating both interpretations of nature, as well as the debates surrounding techno-centric *vs.* behaviour-centric approaches. At this time, the *Eco-technic* logic, which reflects *Ecological modernisation* through its focus on energy efficient and high-tech housing, is seen to dominate understandings when compared with the *Eco-centric* logic, which echoing the values of the sustainable housing coalition identified by *Lovell* (2004), incorporates a holistic and value laden approach to sustainable architecture that focuses on small-scale decentralisation and non-interference with nature. Four other logics: *Eco-aesthetic*, with its focus on idealism and postmodern, sensual values; *Eco-cultural*, which aims to encourage a diversity that reflects local context, place and identity; *Eco-medical*, with its focus on health and humanist values within a natural built environment; and *Eco-social*, which centres around equality, community and the democratic process; are found to be almost completely marginalised.

More recently, *Pickvance* (2009) highlights how the use of the conceptually complex term *sustainable housing* within policy can both promote and conceal a range of meanings, both abstract (*e.g.*, the conceptualisation of energy use as a result of either technology use or everyday life) and physical (*e.g.*, the specific designs and technologies required). Within the UK policy context, the concept of sustainable housing can thus also be seen to be rooted in *Ecological modernisation*, emphasising the technical and economic elements of the concept, whilst marginalising social and behavioural aspects of living within a sustainable home. These findings have also been replicated in Sweden and Denmark, where the discourse surrounding sustainable housing was seen to conceal environmental values behind a discourse of standardisation and energy efficiency (*Stenberg and Raisanen*, 2006; *Ole Jensen and Gram-Hanssen*, 2008). More specifically, the UK Government's Zero carbon homes target (discussed further in

Chapter 4), has also been shown to have emerged from the dominant discourse of *Ecological modernisation* within environmental policy making (*Goodchild and Walshaw*, 2011).

Investigating the discourse of low carbon housing in more detail, *Lovell* (2004) demonstrated how a discourse coalition (involving actors from within local and national Government, the construction industry and the renewable energy sector) used two key storylines to discursively re-frame existing understandings of sustainable housing as low carbon housing, and thus claim the concept as a solution to climate change within the dominant climate change mitigation paradigm. The *Life cycle* storyline centres itself on the economic costs and benefits of constructing low carbon housing, presenting them as a sensible and economically rational option for reducing carbon emissions from housing. In doing so, the storyline moves away from the strong environmental values previously associated with the sustainable housing movement. In contrast, the *Smart housing* storyline frames low carbon houses themselves as a technological solution to reducing carbon emissions, with smart technologies and high levels of energy efficiency minimising the need for any changes to behaviours and lifestyles within the home. Together these storylines create a rationale for low carbon housing that attempts to appeal to the interests of both politics and industry and distracts from the social context in which the concept was originally developed (*Lovell*, 2004).

From a thematic perspective, a small number of studies have investigated expert opinions (specifically architects and construction industry professionals) surrounding low carbon housing options (*Osmani and O'Reilly*, 2009; *Davies and Osmani*, 2011; *Heffernan et al.*, 2015). However, while these studies do provide some interesting insights into the perceived drivers of (ranging from the financial case for increasing efficiency to sustainable development) and barriers to (such as costs, inappropriate regulation and the overall complexity of the problem) low and zero carbon housing opportunities, they do not access the deeper meanings associated with the concept. Similarly, a recent study investigating public perceptions of low carbon housing aimed to identify

barriers to adoption, leading to a somewhat over-simplistic claim that members of the public aren't interested in low carbon housing (when provided with images of high-tech demonstration homes at the BRE Innovation Park – see *BRE*, 2015a) and want more traditional homes (*NHBC*, 2012). However, again this fails to investigate the deeper questions and assumptions embedded within these findings, an issue that this thesis intends to address.

As highlighted in Chapter 1, it is argued throughout this thesis that through the social construction of environmental issues, such as climate change, language and discourse play an important role in influencing understandings of both the problems and solutions to be addressed within environmental policy (*Kurz et al.*, 2005; *Forsyth*, 2009). Throughout this chapter, the discourses surrounding climate change and sustainability have been seen to primarily reflect *Ecological modernisation*, a discourse which encourages economic and technological responses to climate change, marginalising calls for radical democratic or lifestyle changes; a framing which is particularly apparent within existing conceptualisations of low carbon housing. However, despite the extensive research conducted regarding discourses of climate change, little work has, as yet, investigated the discourses surrounding specific mitigation options, such as low carbon housing. Given the relative lack of research in this area, this thesis attempts to address this gap, exploring how the concept of low carbon housing has been understood within the policy, media, expert and public spheres, and in the context of wider discourses of climate change and the environment.

CHAPTER 3

Methodology, epistemology and methods: Adopting a grounded approach to discourse analysis

As discussed in Chapter 2, the aims of this thesis are to explore the discourses of low carbon housing as they exist in a range of different discursive domains: the media, experts and the public. In order to investigate the research questions set out within Chapter 1, a qualitative research approach is adopted, developing a bespoke method for analysing the discourses present within the qualitative data collected for each research phase. This chapter first introduces the methodological approach of this research, discussing the approach to discourse analysis adopted within this thesis and the constructivist epistemology that accompanies the qualitative research approach. Following this a detailed method is provided, describing the design of each phase of the research, the ethical considerations and procedures that were incorporated and the sampling and recruitment strategies undertaken. The process of analysis is then expanded on and discussed, and followed by a reflexive account of the research as a whole.

3.1 Methodological approach and epistemology

3.1.1 Analysing discourse: Approach and definitions

This thesis adopts a discourse analytical approach, drawing on the literature discussed in Chapter 2. The study of both language in use and of broader human meaning-making (*Wetherell et al.*, 2001), discourse analysis covers a wide range of practices, across various disciplines, which differ both in terms of their epistemological premise and their methodological foundations (*Feindt and Oels*, 2005). In relation to the complex nature of environmental issues, *Hajer and Versteeg* (2005) review the value of discourse analysis. They highlight three key strengths which lend it to the study of environmental policy making: its capacity to reveal the role of language in environmental policy and decision making; its capacity to reveal the embedded nature of language and discourse within the different layers of social practice; and its ability to illuminate the mechanisms by which certain understandings become accepted within the broader discourse. Whilst an exhaustive review of the full range of discursive approaches to data analysis is beyond the scope of this discussion, a brief overview of the key theoretical perspectives utilised to investigate environmental discourses, and on which this thesis draws, are outlined here.

Approaches which adopt a Foucauldian approach to discourse analysis, *i.e.*, a focus on the relationships between discourse and power, and the systems of knowledge, practice and governance that support them (see *Hall*, 2002), are particularly relevant in considering political discourses of the environment (*e.g.*, *Hajer*, 1995; *Litfin*, 1995; *Oels*, 2005). From this perspective, the construction of storylines plays an important role in defining environmental discourses. Storylines provide a 'generative sort of narrative that allows actors to draw upon various discursive categories to give meaning to specific physical or social phenomena' (*Hajer*, 1995, 56) and generally include aspects of problem definition, causation, responsibility and moral arguments. Importantly,

storylines can be used and manipulated to re-order understandings and gain discursive credibility and can be taken up by diverse actors, forming a discourse coalition. This group of actors make shared use of these narratives for their own purposes, although they may not share the same motivations (*Hajer*, 1995). A key focus of this research area is to investigate how some storylines gain discursive hegemony, and the way in which discourse structuration (when credibility of a speaker requires them to draw upon a specific discourse) and institutionalisation (when this discourse is translated into the institutional structures of governance) occurs.

Described as an analytical tool for deconstructing meaning within discourse, critical discourse analysis (CDA) represents another method by which discourse analysis can be conducted (see *Carvalho*, 2008 for a detailed review). Based on the work of *van Dijk* (1993) and *Fairclough* (1992), CDA again takes a Foucauldian approach to discourse analysis, viewing social practice as a form of discourse in itself and language as integral to the formation of discursive realities. Similar to that described above, CDA attempts to gain an understanding of the relations between the text, social relations, values and ideologies, and the distribution of power within the discourse. Particular focus is thus placed on the struggles and tensions between dominant and minor meanings within the discourse and how these are formed, upheld and challenged (*Rogers-Hayden et al.*, 2011). CDA is thus not neutral in its research agenda, often aiming to give voice to marginalised and oppressed meanings and understandings.

In contrast to approaches that focus on the power of discourse within specific, and often political, circumstances, *Dryzek* (2005) outlines an alternative approach to discourse analysis that aims to describe and track the development of different traditions within broader environmental discourses. Dryzek describes his analysis as based around four criteria against which he assess environmental debate: ontology (the basic entities, ideas and concepts, whose existence is recognised within the discourse), assumptions (regarding different entities and the relationships between them), agents (the actors and motivations associated with the discourse) and metaphors and rhetorical devices (and

their purpose within the discourse). Combining this approach with CDA *Carvalho* (2008) further develops this methodology to analyse how climate change has been represented within UK broadsheet media, with a particular focus on how discursive strategies are used by particular actors to achieve specific goals. This includes assessing documents based upon their morphological character and structure, the content and themes present, the use of linguistic and rhetorical devices, the actors which they represent, ideological viewpoints and the discursive strategies employed, as well as considering the wider socio-political context in which the text was produced. This, and similar, approaches have now become particularly common within media studies of climate change, *e.g.*, *Carvalho and Burgess* (2005); *Carvalho* (2005); *Doulton and Brown* (2009).

Social representation theory provides a further perspective worthy of mention, building on a discursive psychological approach to investigate social (and specifically public) understandings of environmental issues. The concept of interpretive repertoires is used to consider the 'recurrently used systems of terms used for characterising and evaluating actions, events and other phenomena' (*Potter and Wetherell*, 1987, 149). Developed from a psychoanalytic perspective (*Moscovici*, 1976, cited in *Smith and Joffe*, 2013), social representations theory 'is concerned with how people make sense of unfamiliar information' (*Smith and Joffe*, 2013, 17) and similarly to discourse approaches, understands social representations as shared sets of beliefs. While, this approach has been used successfully in investigating social understandings of the environment (*Castro*, 2006) and climate change (*Smith*, 2012; *Höijer*, 2010; *Wibeck*, 2012), there are a number of divergences, which make this approach incompatible with the discursive approach developed for this thesis. This approach focuses primarily on the question of how social understandings are constructed, using two psychological concepts, anchoring (the classification of new information) and objectification (the rendering tangible of abstract ideas) to explain how public knowledge is constructed from visual, media and expert sources of information. The cognitive level on which this approach focuses thus makes

it incompatible with the discursive approach adopted within this thesis, as it is the role of language and discourse in meaning-making (rather than the psychological processes by which individuals make sense of these discourses) that is under investigation within this thesis.

The discourse analysis conducted within this research does not however, adhere to any one of the specific approaches outlined above. Instead a bespoke analytical approach is adopted that is appropriate for addressing the research questions set out for each phase of this research, whilst still remaining broadly comparable and relevant within the context of the existing literature. With the specific analytical method set out below, the purpose of this discussion is simply to provide a brief explanation of the terms and definitions used within this thesis. Two definitions of discourse are drawn upon within this thesis, to understand discourse as both socially shared and linguistically patterned:

> [Discourses are] a shared way of apprehending the world. Embedded in language it enables subscribers to interpret bits of information and put them together into coherent stories or accounts. Discourses construct meanings and relationships, helping to define common sense and legitimate knowledge.
>
> ***Dryzek* (2005, 9)**

> Discourse refers to a specific ensemble of ideas, concepts and categories that is produced, reproduced and transformed in a particular set of practices through which meaning is given to physical and social realities.
>
> ***Hajer* (1995, 264)**

With language not seen as neutral, but instead used actively to 'do things', discourses are also understood to be functional (*Potter and Wetherell*, 1987, 32). Whilst this concept is most prominent within psychological approaches to discourse analysis, it is important within this research to acknowledge the range of discursive strategies

employed within discourse at all levels to legitimise and promote particular positions and understandings of an issue. The relevance of this concept in relation to each phase of this research is discussed below.

A number of other terms are also used within this thesis, for which a brief explanation is required. The terms frame, or framing, are often used interchangeably with discourse, and broadly refers to 'the process of constructing and representing our interpretations of the world around us' (*Gray*, 2003, 12). However, there is no unified understanding of the concept, with different disciplines utilising it a range of ways and at different social levels. This can range from a psychological approach, investigating the cognitive structures (or 'schemas') which allow individuals to make sense of the world, to an exploration of higher social-cultural constructs that provide a shared understanding of the world (*Carvalho*, 2008). Within this thesis, a broader understanding of framing as an element of wider discourses is employed, based around *Gamson et al.*'s (1992, 384) definition of a frame as a 'central organising principle that holds together and gives coherence and meaning to a diverse array of symbols'. Frames thus present a particular understanding of a topic, allowing complex issues to be simplified through the emphasis and de-emphasis of particular concepts, opinions or ideologies.

Frames are therefore seen as somewhat closer to *Hajer*'s (1995) 'storylines', or *Gamson and Modigliani*'s (1989) 'packages', and can incorporate problem definitions, causes and consequences, a level of moral evaluation, as well as some prescription for further action (*Entman*, 1993). For this reason, the concept of a storyline is generally adopted within this thesis, and constitutes a primary unit of analysis within the Phase 1 of this research. Whilst the concept of storylines is particularly appropriate to the investigation of political and media discourse, the broader term 'narrative' has been used within this thesis when referring to the stories created by participants within the expert interviews and public focus groups (described below). This distinction is made in order to separate the shared storylines that can be identified within textual data, from the more personal understandings of individual participants. Individuals are thus understood to draw on

themes, metaphors and storylines within broader social discourses, from which they construct their own narratives around which to understand the world.

3.1.2 Social constructions and interpretive qualitative research

Adopting a discourse analysis approach in the way described above, requires consideration of the epistemological foundations upon which this research is based. Epistemological concern considers the question of 'the nature of the relationship between the knower or the would-be-knower and what can be known?' (*Guba and Lincoln*, 1994, 108). Linked within ontological understandings of the nature of reality, a continuum of epistemological positions can be seen between the extreme empirical (or naive) realism, which 'acknowledges a reality independent of the senses' that is accessible, and objectively observable through research (*Bryman*, 2008, 698) and interpretivism, which understands knowledge creation and research as a process of subjective meaning making (based on the constructivist ontological position in which 'reality is seen as the result of constructive processes' *Flick*, 2014, 535).

The broad range of discursive approaches has allowed for a range of epistemological positions to be adopted within discourse analysis research. However, considering the construction of meaning through language, the majority of approaches, including that adopted within this research, are based to some extent on a constructivist-interpretivist framework. Intense debate has arisen regarding the use of social constructivism in the study of environmental issues (see *Hannigan*, 2006), with some researchers criticising this position and suggesting that it leads to the denial of the existence of environmental problems, assisting those who would choose to deny these issues for political or cultural reasons (*Soule and Lease*, 1995; *Crist*, 2004). In response to this argument, *Dryzek* notes that:

> Just because something is socially interpreted does not mean it is unreal. Pollution does cause illness, species do become extinct,

> ecosystems cannot absorb stress indefinitely, tropical forests are disappearing. But people can make very different things of these phenomena and especially their interconnections, providing grist for political dispute.
>
> ***Dryzek* (2005, 12)**

From this perspective, the role of environmental sociology is to demonstrate how discourses surrounding environmental issues are 'products of a dynamic social process of definition, negotiation and legitimation' (*Hannigan*, 2006, 31), highlighting the ways in which this may have influenced the construction of solutions to these issues, as well as environmental policy making.

While this thesis does not in itself address questions of the social construction of environmental issues, focussing instead on the shifting constructions of a specific policy solution, an explication of the epistemological position adopted within this research is still essential. Framed as a solution to climate change, constructions of low carbon housing and the need to reduce emissions from the housing sector are intricately linked with the understandings of the environmental issue to which they are considered a solution. Within this thesis, a weak, or moderate (*Woolgar*, 1988; *Irwin*, 2001), form of constructivism is thus taken up, with the understanding that while the material world does of course exist outside language, social processes of interpretation mean that there is no shared access to this reality outside of discourse.

In keeping with the constructivist approach discussed, this thesis adopts a qualitative approach that is appropriate for investigating the meanings and interpretations through which the social world is constructed. Interpretive qualitative research is thus an attempt to access these subjective meanings and the discourses that they constitute. While, an in depth discussion of the development of this methodological tradition is beyond the scope of this review (see *Denzin and Lincoln*, 2000), a key feature of this approach is in recognising the researcher as part of the research process and

acknowledging that any attempt to produce an objective or factual account of the research topic (such as that demanded from a realist perspective) is not possible. Acknowledging the subjectivity of both the researcher and the researched is therefore important, with interview participants seen not as a passive source of information to be collected by the interviewer, but instead playing an active role in the co-construction of meaning in situ (*Gubrium and Holstein*, 2002). For this reason, developing a reflexive approach to the research process is a key element of conducting high quality qualitative research.

The remainder of this chapter details the specific qualitative methods used to investigate the discourses of low carbon housing and provides a detailed account of the process of data collection and analysis. Three research phases were designed to allow a full investigation of the three domains of media, expert and public discourse, while ensuring that the data remained broadly comparable. Phase 1 investigated the discourses of low carbon housing within the media sphere, with the aim of charting the changes in the framing of this concept since 2006. Phase 2 then moved on to explore the current expert discourses, aiming to understand how experts from a range of housing and energy backgrounds conceptualise low carbon housing and the narratives they use to support this concept. Finally, the ways in which the public currently understand and frame the concept of low carbon housing was investigated within Phase 3, with the aim of gaining a deeper understanding of the discourses that the public draw on when constructing an understanding of the concept.

3.2 Phase 1: Media discourses of low carbon housing

The first phase of this research investigates the discourses of low carbon housing within the British broadsheet press, with the aim of addressing the following research questions:

1. How do the media construct and represent the concept of low carbon housing?

(a) How has the concept of low carbon housing been represented within media?

(b) Have these representations changed over time?

(c) What storylines are used to understand low carbon housing and how are these constructed?

(d) What discursive practices are used to promote these storylines?

3.2.1 Investigating media discourse: Data collection and sampling

Due to their central role in both policy and public discourse (and in keeping with the conventions of media discourse research), analysis was restricted to the British quality press: *The Guardian*, *The Independent*, *The Times* and *The Telegraph* (and their Sunday equivalents). While most research conducted on broadsheet newspapers focuses exclusively on the first three of these sources, *The Telegraph* was also included within this research, following the argument that without it, these papers alone do not constitute a full representation of the British political spectrum (*Doulton and Brown*, 2009) . While the inclusion of the British tabloid press (as advocated by *Boykoff* , 2008) would also have been interesting, this would have led to a substantial increase in data, which was beyond the scope of this research.

Articles from January 2006 to December 2013 were selected, to correspond with the new wave of low carbon housing policy (discussed in Chapter 4), including the Code for Sustainable Homes. In addition, this restricted time period allowed for a full analysis of all articles during this period and a deeper focus on the discourse and terminology surrounding decarbonisation of the home, preventing the need for further sampling from within the corpus of articles. While a longer time period could have been justified in terms of assessing changes in this discourse over time, few articles pre-2006 made use of the search terms set out below. The online newspaper database, Nexis UK, was used to collect all articles that met the defined criteria.

Discussed throughout this thesis, the concept of low carbon housing is ambiguous, with a wide variety of terms used to describe different types of housing. In addition, many articles that focused on this topic did not make use of the full terms at all. For example, the phrase 'low carbon housing' was uncommon in comparison to the combinations of terms such as 'low carbon' and 'housing'. For this reason combined search terms were designed, using the '&' function to combine 'carbon' based terms with 'housing/house/home', generating the following search terms:

- 'low carbon' & 'housing/house/home'
- 'zero carbon' & 'housing/house/home'
- 'carbon zero' & 'housing/house/home'
- 'carbon neutral' & 'housing/house/home'
- 'reducing carbon emissions' & 'housing/house/home'

In total, the corpus was comprised of 234 articles for analysis, many of which included more than one of the search terms above.

During analysis (discussed below), it became clear that, despite their explicit focus on low carbon housing (*e.g.*, through links to policy or specific housing projects), other terms were also being used interchangeably within the discourse. For this reason, an additional media search was conducted to find articles which made use of less technical terms for low carbon housing such as 'sustainable'/'green'/'eco' with 'housing/house/homes' (within the same sources and time period). Again, the search was narrowed down to only those articles containing 'carbon' related terms. This left an additional 181 articles containing one or more of the new search terms. An initial assessment of these articles was conducted and it became clear that these new articles fell broadly within the discourse previously identified (and presented in Chapter 5). It was, therefore, deemed that saturation of the discourse had been reached and this sample was not analysed fully.

3.3 Phase 2: Exploring expert discourses of low carbon housing

In keeping with the qualitative approach adopted within this research, semi-structured interviews with experts from the housing and energy sectors were utilised to explore the current expert discourse surrounding low carbon housing. Also termed elite or specialised interviewing, expert interviews are often used where the interviewer hopes to learn about the nature of the problem, question or situation under research (*Dexter*, 2006). *Bogner and Menz* (2009) present a typology of the expert interview comprising of: exploratory; systematising; and theory-generating interviews. Exploratory interviews focus on sounding out the nature of the topic under discussion and systematising interviews make comparisons between the content of expert knowledge (both methods can be either qualitative or quantitative in nature).

Building on *Meuser and Nagel*'s (1991) (cited in *Bogner and Menz*, 2009) classification of the expert interview as belonging to the interpretivist social research paradigm, the third category, the theory-generating interview, is however the most relevant to this research. As *Bogner and Menz* (2009, 52) describe, the goal of the theory-generating expert interview is in the 'communicative opening up and analytical reconstruction of the subjective dimension of expert knowledge'. The aim is to enable the formulation of a theoretically rich understanding of the construction of expert knowledge and could be described as particularly relevant in accessing and analysing the shared representations and discourses of low carbon housing experts within this research. With this in mind, Phase 2 was designed with the specific aim of accessing these shared representations and answering the following research questions:

2. How do experts construct and understand the concept of low carbon housing?
    (a) How has the concept of low carbon housing been constructed?
    (b) How have the social and behavioural aspects of low carbon housing been

understood?

(c) How have the public (and their role in reducing emissions) been conceptualised within this context?

(d) How is the concept of low carbon housing framed and understood in relation to the broader problem of reducing carbon emissions from housing?

3.3.1 Conducting expert interviews: Design and structure

Semi-structured interviews were designed to be approximately 1 hour long (although in practice this varied between 45-90 minutes). Following brief introductory questions regarding each expert's position and area/extent of expertise, the interview was flexibly structured around a number of specific topics, designed to answer the research questions for this phase of the research. These included the issue of decarbonisation and reducing energy use in housing; options (and responsibility) for achieving emissions reductions; the conceptual and practical meaning of the term low carbon house; opinions regarding current policy and Government discourses; and the future of the UK housing stock. Questions were broad and open-ended, designed to give space for a range of different perspectives and, as far as possible, avoid pre-framing responses.

Appendix A provides an example of the interview protocol, highlighting all the topics covered within the interviews. However, as discussed above, this protocol was primarily used as a guide to ensure that key topics were covered within the conversation. Given the diverse backgrounds of the participants within this research, it was important to consider carefully the type and form of questions that would be relevant for each interview. This was an important step in the research design, both to ensure the collection of relevant and reliable data, and to maintain the respect of expert interviewees who may not respond well to irrelevant questions (*Stephens*, 2007; *Zuckerman*, 1996). For this reason, each interview proceeded in a different direction, with many experts covering topics without prompting, while others required a gentle steering of the conversation

following off-topic digressions.

It was initially intended that all interviews would take place in the participant's offices, in part for their convenience, as well as because it provides a personal and comfortable space for conversation. In most cases, a suitable location was easily identified, although on a small number of occasions this proved more difficult and the interview had to take place in a more public space, where increased noise levels affected both the ease of conversation and later transcription. Face-to-face interview were chosen as they are generally seen as the gold-standard of interviewing practice, more closely resembling 'normal' conversation, and allowing a greater rapport between the interviewer and the participant (*Flick*, 2014).

While much of the methodological literature surrounding expert interviews has focused on the difficulties of gaining both access to, and establishing a good rapport with elite participants of a significantly different status to the researcher (*Odendahl and Shaw*, 2002), a focus on the similarities and differences between myself as a researcher and my participants was a helpful way of reflecting on my role within the interview (*Aldridge*, 1993, cited in *Stephens*, 2007). As my participants fell primarily within the category of professional elites (*Odendahl and Shaw*, 2002), a professional and respectful manner was crucial in building rapport and gaining honest and credible data. While my age (28 at the time) and relative inexperience in the field could be considered a barrier, I would argue that in fact on many occasions these factors acted to my advantage, with participants taking time to explain their opinions more clearly and providing me with richer and more comprehensive data. In addition, I found that a shared interest in environmental issues provided common ground with many of the interviewees.

Although face-to-face interviews were preferable, this was not always possible and following difficulties in arranging meetings, three telephone interviews were arranged at the request of the interviewees. This method of data collection did raise some additional issues to be overcome, including interruptions due to lack of signal, the increased need

for clear articulation of questions (due to the lack of visual cues and communication), and a lower quality of audio recording. However, despite these disadvantages, the quality of the data collected did not appear to be reduced, as gaining a rapport with participants did not prove to be a problem and in some cases may have actually led to a greater willingness to share information due to the lack of a formal setting for the interview.

3.3.2 Conducting expert interviews: Ethical considerations

Considering the ethical issues surrounding social research is essential, protecting both the interests of participants and the integrity of the study more broadly (*Bryman*, 2008). Throughout this research, I followed the ethical procedures outlined within the British Psychological Society's Code of Human Research Ethics (*BPS*, 2010), and all phases of the research were approved by the School of Psychology Ethics Committee within Cardiff University. Of the ethical principles (harm to participants; lack of informed consent; invasion of privacy; and deception) identified by *Diener and Crandall* (1978), issues of informed consent and anonymity were the most important and relevant for consideration within this research. Due to the topical focus of the interview, the expert status of participants and the lack of any sensitive/personal questions, this research was not deemed to pose any risk to participants. Despite this, a number of situations did later arise which required re-consideration of these issues; for example, one participant provided an 'off the record' account of a new business model they were developing, which should I disseminate in any form, would not only be a breach of ethics and trust, but also may have implications for the participant and organisation involved.

The question of expert anonymity was extensively considered, as it had been initially suggested that providing a list of expert contributors would lend the research findings with increased weight and credibility. For this reason, the consent form was initially designed to include the option to both opt-in and opt-out of anonymity. However, as

the interviews progressed, it became clear that a number of participants, (especially those in less senior positions) were not willing to be named within the research or act as a spokesperson for their organisation. For this reason it was decided that within this thesis, and any subsequent academics publications, all participants would remain anonymous, to avoid any ethical questions regarding the identification of some participants and not others, as well as the practicalities of needing to gain approval for any quotes presented. All participants were thus provided with an identifying code, along with a generic indicator of their area of expertise that could be used to identify any quotes included within this thesis. Particular care was also taken to ensure that any quotes utilised did not inadvertently identify participants. For this reason, while care was taken not to alter the meaning of any data presented, any possible identifiers, such as organisations and names, were replaced with generic terms.

In order to guarantee informed consent, each participant was provided with detailed information regarding the interview process, including information on confidentiality and anonymity within the research, data collection and how the data will be used (Appendix A). Following the organisation of a time and location for the interview, participants were then provided with the project's consent forms (Appendix A) for their consideration. Before the interview commenced, this information was reiterated and they were informed of their right to withdraw at any point within the study. Participants were also asked for permission to record the interview using audio equipment and informed of the confidentiality procedures for storage and use of the data, which was managed in line with the ethical procedures of the British Psychological Society (*BPS*, 2010) and the Data Protection Act 1998.

3.3.3 Conducting expert interviews: Sampling and recruitment

The question of who counts as an expert is an important consideration for this research. There is not universally agreed definition of what constitutes an 'expert' on any partic-

ular field or topic (*Lowe and Lorenzoni*, 2007), and with increasing public engagement and interest in many areas, it has been argued that the barriers between experts and the public have begun to dissolve (*Collins and Evans*, 2002). *Collins and Evans* (2002) also argue that an expert could be defined not only through the expertise, knowledge or experience of working in a certain area, but also through their lived experience of it. However, a more practical approach was adopted within this research, on the basis that sampling should proceed on the basis of who is best able to answer the research questions of the study. For this reason a diverse sample of experts was deemed most appropriate, based on their experience of housing and energy issues in one or more of the following categories: Government Policy; Industry and Architecture; Academia and Research; or Environmental Non-Governmental Organisations (NGOs).

With the aim of recruiting a broad range of relevant experts from housing and energy sectors, an initial list of around 30 relevant organisations was drawn up. From this it was then possible to begin to identify individual experts to contact via a range of different methods, including utilising personal contacts and recommendations, searching organisational websites, and attending industry events. A flexible theoretical sampling strategy was then used to identify the expert participants that would allow the sample to evolve over time in response to emerging themes within the interview data (*Koerber and McMichael*, 2008). Developed by *Glaser and Strauss* (1967), theoretical sampling is strongly associated with the analytical grounded theory method utilised within this research (see below). This strategy involves the simultaneous collection and analysis of data, with the aim of continuing to increase the sample size until theoretical saturation is reached and no new themes or relationships are arising within the data (*Bryman*, 2008). Considering the broad range of experts identified as relevant to this research topic, it was difficult to know if full saturation had been reached (as it would always be possible to broaden the sample further). A periodic assessment of the data collected was thus made to identify whether any major new themes were arising, and eventually allow for the assumption of data saturation and confidence that the data set collected

was suitable for answering the research questions posed. For this reason, during the later stages of the process, the interview sample was broadened to incorporate a small additional sample (3 participants) who had extensive personal experience surrounding the issue of reducing emissions from housing, but who may not have been included had the sample remained focused only on industry and policy related professionals (following *Collins and Evans*, 2002).

Each expert was initially contacted via email, which included an official letter of invitation to participants within the research (Appendix A), as well as a detailed project information sheet (Appendix A). Whilst this strategy was ultimately effective in achieving a diverse sample of experts, it was also extremely time consuming, requiring continuous assessment of the sample and consideration of additional options and opportunities for recruitment, as many of my initial enquiries received no reply. In addition, it was important to ensure the sample remained as balanced and diverse as possible. Specifically, this concern led to a reassessment after conducting around half the total interviews, as it became clear that a number of areas of expertise may have been neglected, including experts in retrofitting existing homes, the social housing sector and sustainable living more broadly. However, some biases were inevitably introduced into the sample due to difficulties in gaining access to certain organisations, the most prominent of these is the Department for Communities and Local Government, who despite repeated efforts, were not available for interview. In such cases, a special effort was made to include the organisation's publications within the review of policy documentation, in order to balance this absence in the interview data.

In total, 22 expert interviews were conducted over a period of 9 months from May 2013 to February 2014. Of these, 10 experts were recruited following recommendations from my supervisors, Prof. Nick Pidgeon and Dr. Christina Hopfe, due to their extensive contacts in the field. In some cases, this involved them acting as gatekeepers to enquire as to the possibility of an interview on my behalf, while in others I initiated contact myself via email. Further to this, I was able to identify and contact 7 relevant

Table 3.1: Participant's primary areas of expertise (secondary areas of expertise included in brackets).

Areas of expertise	Experts
Housing and energy policy	6 (3)
Industry and architecture	6 (1)
Academia and research	3 (1)
Campaigning and lobbying	4 (3)
Sustainable Living	3 (0)

individuals via their online contact details. I was also able to gain access to a further 3 organisations, which had previously been unresponsive, through my attendance at the EcoBuild conference in March 2013. Snowball sampling, where participants are asked to suggest other appropriate experts, was also employed, leading to a further 2 interviews.

The areas of expertise covered by the participants within this research are summarised in Table 3.1. Many participants could also be described as experts in more than one field, and held secondary areas of expertise. Whilst for some this was due to a cross-over within the boundaries of their position, many participants had extensive experience working in their field (commonly 20-30 years) and had previously held positions that were also of relevance to this research. Although it was not possible to ensure that true theoretical saturation was achieved, due to the broad and complex nature of the issues of decarbonisation and low carbon housing, at this stage, the broad cross-section of professionals interviewed was deemed to be sufficient to answer the research questions posed.

3.4 Phase 3: Exploring public discourses of low carbon housing

The third phase of this research used focus groups to explore the concept of low carbon housing within the public discourse. Morgan (1988) describes how focus groups are particularly useful in gaining insights that may not otherwise be accessible from a single participant. Building on this, *Lunt and Livingstone* (1996, 9) discuss how focus groups can act as simulations of the everyday discourses, accessing the 'important processes in the production and reproduction of meanings in everyday life'. For these reasons, this method was deemed particularly suited to investigating the construction of shared meanings around the concept of low carbon housing and thus addressing the Phase 3 research questions:

3. How do the public construct and understand the concept of low carbon housing?
    (a) How is the concept of a low carbon house understood (if at all) within the public discourse?
    (b) What discourses are drawn on in understanding low carbon houses and the issue of reducing emissions from housing more broadly?
    (c) How publicly acceptable are current low carbon housing options and how are these options understood and assessed in this context?
    (d) How is the concept of low carbon housing framed and understood in relation to the broader problem of reducing carbon emissions from housing?

3.4.1 Focus group research: Design and structure

The focus groups were designed to remain as true to a 'normal' conversation as possible. Following *Kitzinger*'s (1995) recommendation that focus groups include between 4-8 participants to allow both a varied discussion and ensure all participants have space to

give their views, the protocol was designed with groups of 6 in mind. Where possible the focus groups were conducted in a place that was common to the participants such as in a community hall or in the home of one of the participants, as this was thought to put participants at ease, as well as providing a more natural and comfortable setting for the discussion. Despite this ideal, one group (Focus Group 4: Grangetown local community, Cardiff) was conducted within the more formal setting of a University seminar room, as no other suitable option was available.

The focus group protocol (Appendix B) was designed to ask open ended questions, probing public understandings of low carbon housing, before presenting a range of low carbon housing options for discussion. Each group lasted approximately 3 hours (including a half hour break). Discussion began with a round of introductory questions regarding the personal meanings of home, what it meant for a house to be homely and individual's visions of an ideal home. This was designed to focus participant discussions away from the purely material and technical descriptions and towards the more personal meanings associated with home and everyday life.

Initially, participants were asked if they had heard the terms 'low energy house' and 'low carbon house' before and what they might mean. Whilst the focus of this thesis has generally been the discourses surrounding low carbon housing, the term low energy house (which was discussed within a number of expert interviews) was also used within the focus groups as it was likely that it would be a more relatable concept for many participants. Whilst initially incorporated for practical reasons, this strategy provided an interesting insight into the ways that participants brought meaning to the different terms. Following this discussion, a photo elicitation exercise was conducted, aimed at probing the assumptions made around the concept of low carbon housing and its suitability as a possible future home, by stimulating the familiar process of searching for a new place to live (*Harper*, 2002). Seven photographs of existing low carbon housing options were presented Figure 3.1, chosen to demonstrate the broad range of housing types available.

No.1 Passivhaus - Solar Decathlon Winner 2010, Darmstadt, Germany[a]

No.2 Code Level 4, Social housing estate, Cardiff, UK[b]

No.3 Code Level 6, Passivhaus, Ebbw Vale, UK[b]

No.4 Code Level 4 – low energy housing, Newport, UK[b]

No.5 Code Level 4 – Low energy apartment block, Newport, UK[b]

No.6 Lammas eco-village, Pembrokeshire, UK[c]

No.7 PlusEnergy community (Passivhaus), Vauban, Freiburg, Germany[a]

Figure 3.1: Photographs of low carbon housing options used within photo elicitation exercise (Permission obtained for use of all photographs with this thesis: copyright [a]Dr. Christina Hopfe, [b]Catherine Cherry, [c]Understanding Risk Group).

Whilst utilising these photographs was effective in stimulating further discussion regarding existing pre-conceptions of a low carbon house, they were clearly not appropriate for providing participants with a more detailed understanding of the options for low carbon housing. In order to stimulate discussion of the material and technological features of low carbon houses, as well as the implications these may have for everyday life within these houses, a video elicitation exercise was designed.

Video tours of 5 individual low carbon houses were also presented (Table 3.2), chosen to represent as broad a range of options as possible, focusing on demonstrating a range of different technological systems, as well as a split between new build and retrofitted properties. All videos were freely available online and with one exception, were played in full via the internet. A link to each video is provided within Appendix B (correct at time of writing), as well as a full transcription of each video.

3.4.2 Focus group research: Ethical considerations

As with Phase 2, the ethical procedures outlined within the British Psychological Society's Code of Human Research Ethics were followed (*BPS*, 2010), and Phase 3 was again approved by the School of Psychology Ethics Committee within Cardiff University. Similar to those described above, there were a number of important ethical considerations to address before conducting this phase of the research. Focusing as described on topics such as the meaning of home, opinions of low carbon housing options and the issue of reducing emissions from housing, the focus groups were not of a sensitive nature and there was not deemed to be any risk to participants. However, due to the personal and emotional connections between people and their homes, care was taken during the course of the discussion to ensure that participants felt comfortable throughout. For example, one issue arose when one participant responded to the question 'What makes a house homely?' with 'Jesus', to which a number of the other participants laughed. It was thus my responsibility to refocus the group, assuring the

Table 3.2: Videotours of low carbon houses.

Title	Description	Source
Video 1: Inside the 'zero carbon' future home	Video tour of a 'zero carbon' house meeting the highest Level 6 of the Code for Sustainable Homes. Includes discussion of the biomass boiler and ventilation (MVHR) system used to provide heating and other sustainable features of the house.	BBC News website
Video 2: BRE Smart House	Video tour of the BRE Smart Home at the BRE Innovation Park in Watford: Including detailed description of the smart house system, including automated energy monitoring, innovative solar glazing system and passive features.	BRE YouTube Channel
Video 3: Inside the 'green' energy house of the future	Video tour of a new Passivhaus social housing development. Includes discussion of the key features of the home including insulation and ventilation (MVHR) system. Interview with occupant highlights the comfort and low energy bills in the house.	BBC News website
Video 4: Saving money through energy efficiency	Video tour (guided by owner) of a retrofitted Victorian terraced house in Highgate, London: Discussing retrofitted features include increased internal insulation, the installation of solar PV and hot water panels and the purchase of low energy LED light bulbs. Highlights the 50% reduction in energy use from these measures.	BBC News website
Video 5: Is this Britain's most energy efficient house	Video tour (guided by owner/architect) of the first Passivhaus retrofit in the UK. Includes details discussion of the efficiency features of the house including high levels of insulation and passive solar gain from the design of the house. Highlights the complete lack of gas and electricity bills in the house due to these features.	BBC News website

participant that this was valid response and moving the discussion on.

Of the other ethical issues, informed consent and anonymity were again the most relevant. Prior to conducting the group, each participant was provided with detailed information regarding the focus group process, including information on confidentiality and anonymity within the research, data collection and how the data will be used (Appendix B). Participants were provided with the project's consent forms (Appendix B) prior to the start of the focus group, as it was not always feasible to provide these prior to the group taking place. However, ample time was provided for questions regarding the consent process, to ensure all participants understood their rights and gave their informed consent. Participants were again asked for permission to record the discussion using audio equipment and informed of the confidentiality procedures for storage and use of the data, which was managed in line with the ethical procedures of the British Psychological Society (*BPS*, 2010) and the Data Protection Act 1998. While full anonymity was not possible (due to the face to face nature of the group), all data collected was treated as confidential and upon transcription, was anonymised using pseudonyms to ensure participants were not identifiable to anyone other than myself.

3.4.3 Focus group research: Sampling and recruitment

As with the majority of qualitative social science research, this sample was not selected to act as a representative sample. Instead the aim was obtaining a sample of participants that would provide a rich and meaningful dataset regarding public understandings of low carbon housing from a range of perspectives and thus some level of generalisability and transferability of the findings (*Macnaghten*, 2010). A focus group is different from a group interview in that it actively aims to prioritise and encourage group interactions (*Kitzinger and Barbour*, 1999), and it was therefore also essential that dynamics of the group were taken into consideration in the sampling process. *Stewart*

et al. (2007) highlight the many factors that can influence the dynamics within a focus group discussion, including age and gender, individual personality and socio-economic status, and which need to be considered when recruiting participants, especially if participants are unacquainted with each other prior to the group meeting.

For this reason, it was decided early on that pre-existing groups or communities would be sampled, rather than recruiting individual participants to specific focus groups. Whilst, due to the guided and artificial nature of focus groups, it is not possible to recreate a truly 'natural' setting for group discussion, the use of pre-existing groups still provided a greater approximation to everyday conversation with family, friends and colleagues (*Kitzinger*, 1994). Using participants who already knew each other was advantageous for a number of reasons, including the greater ease of conversation and the ability to relate to their everyday lives, thus providing an insight into shared sense-making of novel concepts and technologies such as low carbon housing. A deeper level of probing than may have occurred otherwise was also achieved, with many participants questioning the opinions and beliefs of others, and reducing the need for me to intervene in the conversation.

The number of focus groups to be conducted was also an important consideration. *Morgan* (1997) discusses the influence of group homogeneity, discussion structure, participant availability in determining the number of groups required, as well as the associated time and financial costs, with 4-6 groups (above which data saturation is likely to be reached – *Zeller*, 1993) generally seen as a useful rule of thumb when conducting qualitative focus group research. This research thus conducted five homogenous groups with members of (a group of postgraduate students; a farming community; a church group; an inner-city, local community; and an environmental group), selected to represent a broad range of backgrounds and provide a diverse mix of participants in terms of gender, age, socio-economic status and living arrangements (Table 3.3). In most cases, contact with each community was initiated via a gatekeeper member within that community, who would then invite other members of their group to participate. If

Table 3.3: The key characteristics of each community, including location, gender split, age range, living arrangements and range of occupations.

	Group characteristics
Focus Group 1	2 Female and 3 Male participants, aged 25-33
Postgraduate students	Living in rented accommodation (flats or shared houses)
Cardiff	Postgraduate students
Focus Group 2	4 Female and 2 Male participants, aged 27-56
Farming community	Homeowners (houses, cottages and farmhouses)
Newcastle Emlyn	Farmers and veterinary staff
Focus group 3	2 Female and 2 Male participants, aged 26-87
Church group	Homeowners (houses and bungalows)
King's Lynn	Machine engineers, a teacher and retired individuals
Focus Group 4	5 Female and 1 Male participants, aged 26-81
Grangetown local residents	Mixed homeownership (houses) and renting (flats)
Cardiff	Housewives, a cleaner and a builder
Focus Group 5	3 Female and 3 Male participants, aged 60-68
Environmental group	Homeowners (Houses, bungalows and cottages)
Barmouth	Retired professionals

interested in taking part, a project information leaflet and/or poster (Appendix B) was then provided to assist in recruiting participants to the group. In one case I attended an open community event (Focus Group 4: Grangetown local community) to personally invite participants to the study, as a suitable gatekeeper within the community could not be identified.

3.5 Data analysis: Conducting a grounded discourse analysis

This section provides a detailed and transparent description of the analytical process conducted within all three Phases of this research, beginning with the process of transcription. A grounded approach to discourse analysis was adopted (for other examples of this approach see *Mazza and Rydin*, 1997; *Capstick*, 2012). This required the analysis to be conducted in two stages. The first of these entailed an open coding of the transcripts

(and media articles), adopting a grounded theory approach to ensure that the coding system developed was, as far as possible, grounded in the data. Following this, a second stage of analysis then focused on identifying the component parts of low carbon housing discourses within the data, a process which was varied between Phase 1 and Phases 2 & 3 due to the different nature of the data collected (described below).

3.5.1 Transcription

As discussed above, all 22 expert interviews and 5 public focus groups were audio recorded, leading to an extensive period of transcription for both phases of the research (approximately 185,000 words were transcribed as part of Phase 2, with an additional 90,000 words within Phase 3). Whilst this was a time-consuming and often painstaking task, there are a number of advantages to performing this task myself. Often described as the first stage of data analysis, transcription increases familiarity with the data to an extent that cannot be easily achieved simply through reading, leading to a number of important theoretical insights. In addition, personal transcription was less likely to lead to errors in the data due to my familiarisation with both the context of each interview/focus group and the field of study more generally.

More importantly, control over the transcription of data is essential to the integrity of the research and subsequent findings. Transcription can be seen to have a powerful effect on the ways in which the data, and thus the representations of participants' meanings and understandings are interpreted (*Oliver et al.*, 2005), as the reality and context of the interview is converted into text. Two extremes of transcription protocol can be identified between naturalistic, or verbatim, transcription (which ensures that all possible details are captured within the transcription process) and denaturalistic transcription (where all additional features of the recording are removed and grammar is corrected to create a standardised and fluent text), each of which presents the same original data differently and will thus lead to different interpretations and conclusions

(*Oliver et al.*, 2005). However, despite the limitations of converting the social experience of the interviews into textual data, the process of transcription is valid in providing a mechanism that allows access to the content and meaning of the data via the reconstruction of reality, and thus as *Flick* (2014, 392) states 'is the only (version of) reality available to researchers during their following interpretations'.

Primarily adapted from that provided by *McLellan et al.* (2003), Table 3.4 displays the key elements of the transcription protocol adopted throughout this research. Within this research a protocol somewhat in between the extremes presented by *Oliver et al.* (2005) was adopted, with the aim of remaining as true to the voices of participants as possible. As these phases of the research were investigating the shared representations and understandings of the issues and concepts surrounding low carbon housing, rather than the interpersonal and linguistic features of the unfolding discourse, many of the paralinguistic and prosodic features (such as emphasis, tone or stress) of the recordings were omitted. However, despite the aim of reducing the data to a manageable and analytically appropriate form (*Lapadat*, 2000), where relevant, important features of the recordings such as pauses, laughter, filler words and interruptions were recorded. Whilst errors in grammar were transcribed verbatim (to ensure participant's voice was still heard within the analysis), at times this was corrected within quotes in order to increase the impact and meaning of the statement when presenting and discussing findings (*Halcomb and Davidson*, 2006).

3.5.2 Grounding the analysis

In order to facilitate the discourse and thematic analyses conducted within Phase 1 and Phase 2 & 3 respectively, an approach derived from grounded theory (*Glaser and Strauss*, 1967; *Henwood and Pidgeon*, 1992; *Strauss and Corbin*, 1997; *Charmaz*, 2006) was used as the basis for analysis of all data collected within this research. This approach was chosen in order to ensure that analysis is grounded in the data, rather

Table 3.4: Transcription protocol for Phases 2 expert interviews and Phase 3 public focus groups.

	Protocol
Pauses	Transcribed: [**Pause**] if significant to flow of conversation or a signifier of confusion or thought processes
Emphasis	Transcribed: in italics
Inaudible speech	Transcribed: [**Inaudible**]
Interruptions in speech by participant	Transcribed: [**Interrupts**]
Interruptions in speech by non-verbal sounds	Transcribed: only when relevant to progress of the interview *e.g.*, [**Coffee machine obscures discussion**]
Laughter	Transcribed: [**laughs**] for specific participant or [**laughter**] for multiple participants
Word or phrase repetitions	Transcribed: verbatim where meaningful
Incorrect grammar	Transcribed: true to participant dialogue unless it is unclear what is meant
Space filling words (*e.g.*, hmmm, err, um)	Not transcribed: except where meaningful in the context of the conversation
Irrelevant or off-topic conversation	Not transcribed: description provided *e.g.*, [**discussion of walking their dogs**]
Gestures and non-verbal communication	Not transcribed: except where meaningful *e.g.*, [**gestures hands as to indicate size**]
Sensitive or 'off record' information	Transcribed: but preceded by [**OFF RECORD**] and bolded to ensure this feature of the text is not lost during coding

than imposed from pre-existing ideas or concepts from either the literature, or myself as a researcher. The grounded theory method has developed significantly over recent decades, leading to a number of different versions of the theory. Thus while initially, the theory emerged from a more positivist perspective regarding the 'discovery' of theory within a field of enquiry, more recent authors (*e.g.*, *Charmaz*, 2006) adopt a constructionist approach, with the aim of constructing theory that is grounded in the data (*Flick*, 2014). In line with the interpretivist qualitative approach to social research adopted within this research, this version of grounded theory was selected as the basis for data analysis due to its more reflexive nature and sensitivity to the negotiated

realities produced within the expert interview and public focus group data collected.

Henwood and Pidgeon (2003) provide a comprehensive list of (to some extent overlapping) steps for conducting a grounded theory analysis, which was utilised within this research. Initially, open-coding was conducted, generating codes at different levels of theoretical complexity (from simple descriptions to conceptual categories). Open-coding divides and categorises the data within codes representing the content and concepts within the data and represents the first stage of 'disentangling' the data (*Flick*, 2014; *Starks and Trinidad*, 2007). Throughout this process, constant comparison between and within codes is conducted to ensure a good 'fit' with the data, and theoretical memos are produced, keeping track of emerging thoughts, insights and concepts that may influence the selection of further data sampling and the direction of the analysis more broadly. Building on this initial coding, the analysis for each phase of the research proceeded through a process of grouping these codes within broader and more theoretically relevant meta-codes. This process was continued until theoretical saturation was reached and no new codes, themes or insights were being generated. Further strategies such as defining each code, creating models/diagrams of the relationships between codes and writing further research notes and memos were also helpful in producing more theoretically relevant analyses.

Following this approach, a grounded theory analysis was conducted to develop a coding framework that was grounded in the data for each phase for the research. Each transcript was uploaded into the Computer Aided Qualitative Data Analysis Software (CAQDAS) program NVivo (v.10). This electronic process of data storage, coding and analysis as chosen over a manual analysis for a number of reasons, most prominent of which was the ease of data management and retrieval, as well as to improve the manageability of the extensive dataset (*Basit*, 2003). Through an iterative process coding, a comprehensive framework was produced which could then be analysed for discourses as described below. While some approaches recommend detailed coding at the line or sentence level (*Charmaz*, 2006), this level of specificity often lost much of

the contextual and meaningful information that was important in gaining an insight into the more abstract components of the data. In order to improve the analysis and provide a better platform for the analysis of shared discourses and understandings of low carbon housing, a wider coding protocol was adopted, focusing on the paragraph level to ensure that important data was not lost. This led to many extracts being coded at multiple nodes to avoid 'lumping' the data into too few categories and losing analytical details in a different way (*Saldaña*, 2012).

Despite the grounded approach to the analysis described above, the focus on discourse within this research meant that this research cannot be described as a fully inductive, grounded theory analysis. While the above approach was adopted in order to ensure that coding system developed remained as grounded in the data as possible, prior knowledge of discourse theory and literature meant that the analysis cannot be fully dissociated from existing research. *Henwood and Pidgeon* (1992, 104) describe this interplay between data and theory as a constant 'flip-flop between ideas and research experience' that allows for an emergent theoretical account of the research. This approach has been adopted within this research in order to develop a grounded approach to discourse analysis that will be appropriate for analysing both the secondary media data and the qualitative interview and focus group data considered in this project.

3.5.3 Phase 1 data analysis: Identifying media discourses

The analytical method used within this research thus builds on a number of different approaches to analysing discourses of the environment (*Gamson and Modigliani*, 1989; *Hajer*, 1995; *Dryzek*, 2005; *Carvalho*, 2008). When considered as a whole, two components of discourses, discursive elements and discursive practices, can be identified within the literature (although termed in different ways). This analytical separation cuts through my analysis, the details of which are set out below.

Discursive elements are the basic components used to construct issues, objects and

actors within the discourse. *Gamson and Modigliani* (1989) show how discursive elements are used to frame the issue of nuclear power within 'media packages'. They distinguish between framing devices, which influence what is thought about an issue (*e.g.*, exemplars, metaphors, images and depictions) and reasoning devices, which justify what should be done about an issue (*e.g.*, causal arguments, consequences and moral claims). More recently, *Carvalho* (2002) developed a framework for media discourse analysis that incorporated a number of similar elements. Developed from a critical discourse analysis perspective, Carvalho's framework for textual discourse analysis assessed articles based on: morphological characteristics of the article; the ontological content of the article; the use of linguistic and rhetorical devices; the voices of actors represented; ideological viewpoints; and the discursive strategies employed. For the purposes of this study, not all these dimensions were adopted within the analytical framework adopted here. The morphological characteristics of the article (such as word count, location in newspaper *etc.*) were omitted, as due to the small sample size (and general lack of coverage on this issue) all articles were given equal weight within the analysis. In addition, the language and rhetoric of the articles was largely excluded. A common focus of analysis and critical discourse analysis more broadly (*e.g.*, *van Dijk*, 1995), the linguistic features of the text, such as semantics and syntax were not considered in this analysis, as an analysis at this level of detail would have meant a significant reduction in the amount of data that could be analysed within the scope of this project.

This first stage of analysis led to a range of codes, representing the different discursive elements listed above. These included: framing devices, for example, the meta-code *Problem frames*, within which sat the codes *Climate change* and *Energy security*, and the meta-code *Solution frames*, within which sat codes such as *Domestic renewable energy* and *Retrofitting existing homes*; and rhetorical devices, for example codes relating *Metaphors and Imagery* (as well as the meta-code *Discursive strategies* discussed below). Following the approach of *Dryzek* (2005), the next stage of the analysis was

identifying groups of these elements within the discourse that cohered together. Due to the more contained nature of the discourse surrounding low carbon housing (in comparison to the broad and multi-dimensional discourses of the environment), *Hajer*'s (1995) concept of storylines, was adopted as a central aspect of the analysis. A storyline was seen to be identified when a group of the discursive elements described above could be seen to cohere together, so as to allow the concept of low carbon housing to be understood or interpreted in a way that was shared across the discourse, in multiple source articles and at different points in time.

In contrast, discursive practices represent the ways in which actors use these elements to promote their own positions and understandings of an issue. Storylines can be used and manipulated to re-order understandings and gain discursive credibility and can be taken up by diverse actors, forming discourse coalitions (*Hajer*, 1995). While discursive practices are a key feature of the environmental policy discourse literature (due to the focus on discourse as a form of practice), it is not clear from the literature what this term means in relation to media. Previously omitted from analysis within media discourse research, *Carvalho* (2008) develops a framework for investigating the discursive strategies used to actively frame an issue, object or actor. Her explication of discursive strategies was adopted within this thesis, in order to incorporate this important aspect of discourse analysis. A number of strategies are thus considered relevant to this research, including: the legitimisation and/or contestation of other actor's positions; the appropriation of existing arguments or objects within the discourse; analytical or relational reframing (the redefinition/repositioning of objects and problems, or of actors and responsibility respectively).

One innovative aspect of *Carvalho*'s (2005) analytical framework was to investigate discourse at both a 'comparative-synchronic' level, through an in depth analysis of the discourses within the different newspaper sources, as well as from a 'historical-diachronic' perspective, which focused this analysis on critical discourse moments throughout the development of the discourse. While this approach is particularly successful in inves-

tigating discursive changes over a long time period (*e.g.*, *Carvalho*, 2005; 2007; 2010), this aspect of the analysis was not adopted in full, due to the recent development of the concept of low carbon housing and the small sample size (234 articles, in comparison to the thousands relating to climate change more broadly). Whilst this meant that sampling through time was not possible (or necessary), attention was still paid to any discursive shifts over the short time period considered within this analysis, with any differences between the four source newspapers also identified.

3.5.4 Phases 2 & 3 data analysis: Investigating expert and public discourses

As set out in the research questions above, the main aim of analysing the expert and public discourses of low carbon housing was to identify shared or common understandings within each data set and allow for the later comparison between the expert and public discourses identified. The focus was therefore not to analyse across the groups, but, like *Zeyer and Roth* (2009), to seek to understand the 'communal interpretations' of low carbon housing within the data sets. While identifying storylines was the key analytical focus of Phase 1 of this research, the messy nature of more natural discourse sources meant that it was very difficult to identify these with Phase 2 & 3 of this study. For this reason, analytical attention was focused on the elements of discourse that incorporated expert and public constructions of the concept of low carbon housing and the issues surrounding it. In order to remain broadly comparable with the media discourses investigated in Phase 1, the elements considered within the discourse analysis remained similar to those described above. Particular attention was paid to the framing and reasoning devices used by participants, with the aim of identifying which storylines (if any) experts and the public were drawing on to construct their understandings.

The investigation of the discursive practices, or 'functions' of the discourse, used by participants (*e.g.*, use of language to make a specific point, or in positioning others or

themselves in a particular manner) can provide interesting and valuable findings and has been conducted successfully in relation to public understandings of climate change (*Capstick*, 2012). However, with the focus of these Phases on the discursive elements used to construct concepts of low carbon housing, inclusion of discursive practices would not have added significantly to the analysis and was thus considered outside the scope of this research. In addition, as *Potter and Wetherell* (1987, 33) describe, the 'analysis of function cannot be seen as a simple matter of categorising pieces of speech', relying on the detailed reading and interpretation of the context in which the data is situated, and would therefore have been extremely time consuming, detracting from other important aspects of the research.

One exception to this rule was in the analysis of the problem and solution frames used to justify the concept and purpose of low carbon housing. The framing of low carbon housing as a solution to a particular issue (such as climate change), whilst made up of discursive elements (primarily the reasoning devices described above), can also be considered a discursive practice, as it constitutes the purposeful (be that individual or societal) construction of an argument to justify the existence and value of the concept. When considering the expert and public discourses of low carbon housing, this aspect of the discourse was of key relevance, both in understanding the ways in which these groups give meaning to the concept, and in allowing a comparison with the media discourse identified in Phase 1. Whilst the media storylines focus primarily on the construction of issues to which low carbon housing was a solution, expert and public discourse broadened this to include aspects of responsibility and morality and attention to this aspect was also incorporated in the analysis.

3.6 A reflexive evaluation of the research process

As discussed above, a key epistemological principle in all interpretive qualitative research is that of the co-production of knowledge, in which 'researcher and researched

are characterised as interdependent in the social process of research' (*Henwood and Pidgeon*, 1992, 106). This influence can be at all stages of the research, from the conceptualisation and design of research methods, and throughout the practical stages of data collection and transcription, as well as being a key consideration during data analysis and the writing up of research (*Flick*, 2014). Throughout this chapter I have thus tried to provide a reflexive account of the methodological approach that has been adopted throughout this research, and identify ways in which I, as a researcher, have inevitably contributed to the construction and interpretation of the data and findings presented within this thesis. In addition it is important to recognise and document my position and background as a researcher in relation to my research. This includes my interdisciplinary educational background (studying for a BSc in Environmental Science, before completing an MSc in Climate Change), my personal interests in environmental issues (having previously worked for both Friends of the Earth and the Green Party), as well as other factors such as the newspapers I read (primarily the Guardian).

Whilst accepting that these factors, among others, have influenced my approach towards designing, conducting and interpreting this research, it is not to say that this in any way undermines the research, but to acknowledge that the researcher is part of the social world in which the research is produced. As *Forsyth* (2009) highlights, the way in which the research problem is framed (both theoretically and methodologically), acts to close down the problem, necessarily constraining the boundaries of the research and reducing the range of findings possible. In addition, considering the interpretive nature of discourse research, *Potter and Wetherell* (1987, 168) describe the process of analysis to 'like riding a bike compared to conducting experiments or analysis survey data', in that there is no prescribed procedure for the interpretation of qualitative data, highlighting the at once both 'artful' and structured nature of the analysis process (*Guba and Lincoln*, 1994). It is thus important to keep in mind that this analysis is thus just one way of 'slicing the debate' (*Brand and Fischer*, 2013) that may have been interpreted differently, but importantly no more, or less validly, should it have been

conducted by another researcher.

Care was also taken in writing up this research as, as *Carvalho* (2002, 147) states, 'writing about discourse is producing another discourse'. Due to the large volume of data collected and analysed within this thesis, it was not possible to present all aspects of the analysis undertaken, let alone provide textual examples to validate every point of the arguments presented and it is therefore important to acknowledge the interpretive nature of this aspect of the research. Along with the detailed explanation of the process of analysis (which this chapter has provided), the 'richness in detail' of the presentation of data has been highlighted as a key feature of a rigorous discursive analysis (*Taylor*, 2001). Throughout the thesis, I have thus attempted to balance the provision of a stimulating narrative, with the more detailed description of the data collected, illustrating the most relevant and novel findings with quotes and examples from the data.

CHAPTER 4

Low carbon housing in UK policy: Tracing the discourse of decarbonisation

With climate change rising up the political agenda, the beginning of the 21st century marked the start of the low carbon agenda within UK politics. As discussed in Chapter 2, the concept of sustainable housing was at this time, reframed by the then Labour Government as a low carbon solution, aimed at tackling the threat of climate change (*Lovell*, 2004). With its roots in the discourses of climate change and *Ecological modernisation* (*Goodchild and Walshaw*, 2011), the concept of low/zero carbon housing within policy discourse has evolved over time. Recent research from a number of disciplines provides detailed analysis of the development of sustainable housing policy (*Williams*, 2008; *Pickvance*, 2009), as well as specific low carbon housing policies (discussed below), such as the Code for Sustainable Homes (*McManus et al.*, 2010; *Lu and Sexton*, 2011), the Zero Carbon Homes target (*Greenwood*, 2012; *Goodchild and Walshaw*, 2011) and the Green Deal (*Guertler et al.*, 2013). With this is mind, the purpose of this chapter is to provide a brief history of the low carbon housing agenda in the UK, focussing on the discursive shifts in policy rhetoric that reflect the changing meaning of the concept of low/zero carbon housing, and form the context in which current understandings of low carbon housing within the wider discourse should be understood.

4.1 The early 2000s: The rise of the low carbon housing agenda

Prior to 2001, housing policy debates were largely silent on issues surrounding climate change and sustainability (*Williams*, 2008). At this time, links between energy and housing policy focused heavily on the issue of fuel poverty, with schemes such as Warm Front, which provided grants to improve the energy efficiency of existing homes, and the Decent Homes standard, a building performance standard for public sector housing developments. Whilst the sustainable housing movement had been growing in the UK since the 1970s (*Lovell*, 2004), the concept of a sustainable building was not taken up within the policy discourse until around 2003. In addition to the rising importance of the climate change agenda at both the national and international level, a number of factors were fundamental to the development of low carbon housing policy at this time.

In 2002, the EU Parliament approved the Energy Performance in Buildings Directive (EPBD), which was designed to reduce carbon emissions from buildings through improved energy efficiency measures. Although non-binding at this time (the Directive was later recast in 2010, to include a mandatory target of all new buildings to be nearly zero energy by 2021 – *European Council*, 2010), this led to increased pressure on the creation of energy efficiency policy and eventually led to the introduction of Energy Performance Certificates (EPCs) for domestic buildings in the UK by 2008. At this time, another significant development came in the form of the WWF's One Million Sustainable Homes campaign, which built on the success of the BRE's EcoHome standard, and demanded that the Government produce a framework to introduce sustainable housing across the UK by 2012 (*WWF*, 2002).

Following the publication of the 'Sustainable Communities Plan' (*ODPM*, 2003), which set forward plans to build 200,000 new homes, as well as the 'Barker Review of Housing Supply' (*Barker*, 2003), the Sustainable Buildings Task Force was convened, culmi-

nating in the release of the 2004 report 'Better Buildings, Better Lives', which recommended the creation of a Code for Sustainable Buildings (*SBTF*, 2004). Finally in 2005, the concept of a 'zero carbon' house was first set out within the Environmental Audit Committee's 'Housing: building a sustainable future' report, which recommended a zero carbon target for all new build housing (*EAC*, 2005). This rapid shift in the framing of housing and energy policy seen between 2000 and 2005, thus demonstrates the reframing of sustainable housing as low/zero carbon housing as a solution to the threat of climate change and marks the point at which the low carbon discourse began to be integrated within housing policy (*Lovell*, 2004).

4.2 2006-2010: The evolution of zero carbon housing policy

2006 marked the start of a period of radical policy change, in which competition between the main political parties, high profile NGO campaigns, and the creation of the Department for Energy and Climate Change (DECC) all contributed to the rapid development of climate change and energy policy (*Carter and Jacobs*, 2014). This culminated in the Climate Change Act 2008, and the formation of the Committee on Climate Change (CCC) who are tasked with advising successive Governments in the setting, and meeting, of national carbon emissions budgets. With the publication of the influential *WWF* (2006) report, 'One Million Homes', and the UK Government's 'Program for Climate Change' (which set out the key policy proposals for tackling emissions from housing – *HM Gov*, 2006a), 2006 was also a pivotal year in the development of low carbon housing policy. During this time, the Labour Government maintained their strong rhetoric surrounding the need to reduce carbon emissions from national housing stocks. Low carbon housing thus remained framed as a key solution to the threat of climate change, with the then Minister for Housing and Planning, Yvette Cooper declaring the need 'to go further and faster' in tackling emissions from the housing sector (*Green Alliance*, 2006, 3).

The growing momentum surrounding the concept of low carbon housing culminated in the announcement of the new Zero Carbon Homes target and the Code for Sustainable Homes (CSH – See Box 1) in December 2006 (*HM Treasury*, 2006; *DCLG*, 2006). Designed as a voluntary standard by the Sustainable Buildings Task Force, the Code was aimed at improving the sustainability of new build housing. It thus retained its broad focus on all aspects of sustainability, considering everything from energy/carbon and water, ecology, and health and wellbeing, highlighting the influence of the sustainability movement, and in particular the WWF on this policy's development. However, the concurrent announcement of the new Zero Carbon Homes target that all new build homes would be 'zero carbon' by 2016 emphasised the greater importance of climate change and the low carbon agenda within Government discourse.

With these announcements came the first official description of the term zero carbon house within the policy context. Defined as a 'completely zero carbon home (*i.e.*, zero net emissions of carbon dioxide (CO_2) from all energy use in the home)' (*DCLG*, 2006, 7), this definition was seen by many as a firm, if challenging, commitment to tackling emissions from the housing sector. Countering criticisms surrounding both the ambiguity within the definition of 'zero carbon' and the uncertainty surrounding the mechanisms by which the 2016 target would be achieved, further details of the policy were set out within the 'Building a Greener Future' policy statement (*DCLG*, 2007a). A twin track system was designed to meet the target, involving the gradual tightening of Part L (Conservation of Heat and Power) of the Building Regulations through amendments in 2010 (a 25% improvement – Code Level 3); 2013 (a 44% improvement Code Level 4); and finally to the zero carbon standard (Code Level 6) in 2016 (*DCLG*, 2007a). Changes in planning policy were also introduced at this time to facilitate the development of new sustainable housing, through the supplement to 'Planning Policy Statement 1: Delivering Sustainable Development' (*DCLG*, 1997), 'Planning and Climate Change' (*DCLG*, 2007b), which placed responsibility to reduce emissions from buildings and encourage the implementation of low carbon energy technologies

with local planning authorities.

Box 1: The Code for Sustainable Homes

Launched in 2007, the Code for Sustainable Homes is a national housing standard developed to encourage the construction of sustainable houses (England, Wales and Northern Ireland only). The Code assesses houses based on nine sustainability criteria: energy/carbon; water; materials; waste; pollution; surface water run-off; ecology; health and wellbeing; and management. Each house is then given a sustainability rating, ranging from Code Level 1 ($\star$) to Code Level 6 ($\star\star\star\star\star\star$), each of which represents a percentage improvement above Part L (Conservation of Fuel and Power) of the 2006 Building Regulations (*HM Gov*, 2006b). Code Level 3 and 4 require the equivalent of a 25% and 44% improvement respectively, with Code Level 6 representing a 'zero carbon home'. From 2008, all Government funded social housing was required to meet Code Level 3 and it became mandatory for all new houses to be assessed against the Code. The Code was updated in 2010, and again in 2014, in order to match on-going changes to the Building Regulations and Government Zero Carbon Homes policy (discussed below). Between 2008 and 2014, over 140,000 and 37,000 houses were awarded Code Level 3 and 4 respectively, whilst only 262 achieved the 'zero carbon' rating (*DCLG*, 2014a).

Despite these developments, a growing critique of the Zero Carbon Homes policy was developing from both sides of the debate. One particularly influential report, 'Home Truths' (*Boardman*, 2007) came through the collaboration between Oxford University's Environmental Change Institute and Friends of the Earth. Published as the Climate Change Act was passing through parliament, the report offered a scathing critique of Government policy, questioning the vagueness and short-termism of current proposals to meet the proposed 80% emissions reduction target, criticising the lack of both consideration of how to tackle emissions from the existing UK housing stock and incentives to support low carbon energy technologies. In contrast, pressure was

also growing over the need for certainty regarding the meaning and trajectory of the Zero Carbon Homes target from the house building industry (represented by the Home Builders Federations), whose concerns regarding the costs of implementation, preference for voluntary measures and objection to local or regional emissions reductions schemes had already played a central role in the formulation of low carbon housing policy (*Pickvance*, 2009).

This need for clarity led to the institutionalisation (*Hajer*, 1995) of the low carbon housing discourse through the creation of the UK Green Building Council (UKGBC) in 2007, and later the Government-Industry sponsored Zero Carbon Hub in 2008. In conjunction with the Zero Carbon Task Force (ZCTF - a steering group comprised of representatives from Government, the house building industry and energy companies, as well as the WWF, the Home Builders Federation and BRE), these organisations have led the debate to agree a policy definition for the concept of a 'zero carbon' house. By 2008, the definition of 'zero carbon' was already beginning to shift, when a UKGBC-ZCTF report (*UKGBC*, 2008), 'The Definition of Zero Carbon', concluded that it was not economically feasible to meet the target for onsite net-zero carbon houses, *i.e.,* all emissions reductions achieved through energy efficiency/low carbon energy measures on-site, as previously intended. This shift marked the beginning of a plethora of reports over the next two years, including industry and public consultations regarding the future of the Zero Carbon Homes target (*ZCH*, 2009; *DCLG*, 2009) and culminated in the introduction of the Fabric Energy Efficiency Standard (FEES) and the Carbon Compliance Level (CCL), which set out the maximum energy demand (for heating and cooling) and the minimum onsite low carbon energy requirements (set to 70%) of a 'zero carbon' house.

While small shifts within the Labour Government discourse were visible as early as 2007 (with energy security in particular rising up the political agenda at this time as the UK once again became a net-importer of energy - *Pearson and Watson*, 2012), the framing of low carbon housing as a solution to climate change remained constant

throughout these debates, with the housings sector cited as a key contributor to the problem. However, with climate change dropping down the political agenda following the economic crash of 2007/8, the relevance of low carbon housing as a solution to other pressing energy policy issues began to gain prominence. From 2009 climate change as an issue (as opposed to more general discussion of emissions reduction targets) began to drop out of the Government rationale within low carbon housing policy, with emphasis instead placed on issues such as energy security and fuel poverty. From this time, policy rhetoric surrounding the need for zero carbon housing also weakened in connection with this shifting discourse, focussing instead on the need for a practical, flexible and efficient definition, in place of the rhetoric of revolution that announced the policy in 2006.

Whilst still considered primarily as consumers, during this time the public are conceptualised as environmentally conscious 'eco-consumers' that desire low carbon, environmentally friendly homes, and low carbon housing policies are thus advocated as attractive to business and industry due the public's consequent willingness to pay for more expensive properties. Other aspects of the decarbonisation problem, such as tackling the existing stock and the importance of behaviour change were also beginning to rise up the political agenda. This led to a range of other policies aimed at reducing carbon emissions from the existing housing stock, including the Low Carbon Building Program, Carbon Emissions Reduction Target (CERT) and Community Energy Saving Programme (CESP), which provided grants towards energy efficiency improvements in existing homes and the installation of low carbon energy sources.

In addition, despite the Government's techno-economic focus on reducing emissions from housing through changing the buildings themselves rather than the lifestyles of the people within them (*Pickvance*, 2009), the low carbon housing discourse also began to appear in behaviour change messaging, through the Act on CO_2 information campaign (*DECC*, 2010). This focused primarily on the importance of reducing carbon emissions from within the home, particularly focussing on the need to reduce your carbon footprint. Throughout this time, the main barriers to reducing emissions from

existing homes were seen to be the cost of retrofitting, and the need for greater public education and information. In 2009, the UKGBC, WWF and the Energy Saving Trust (EST) launched the 'Great British Refurb' campaign (which primarily framed home refurbishment around the need to reduce carbon emissions, as well as reducing home energy bills) to coincide with the announcement of the 'Low Carbon Transition Plan' (*DECC*, 2009). Although focussing primarily on supply side energy policy, the White Paper also set out further plans for tackling the existing housing stock, such as the introduction of smart meters.

4.3 2010-2014: The return to energy discourse

Despite the focus on climate change and the environment within the election campaigns of all three major political parties, the election of the Conservative-Liberal Democrat Coalition Government in May 2010 represented a key turning point in the low carbon housing policy debate. The most significant change to the Zero Carbon Homes target and the definition of 'zero carbon' came in the 2011 Budget announcement. Following extensive debate regarding the feasibility of achieving the Zero Carbon Homes target, the new Government announced that unregulated emissions (those related to the use of the home, such as through cooking or appliances) would be omitted from the definition, substantially reducing the level of low carbon energy required to meet the target. The focus on energy efficiency measures was strengthened, while the on-site Carbon Compliance Level was again reduced, ranging from 44-60% depending on dwelling type. This paved the way for the announcement of the Allowable Solutions scheme (*ZCH*, 2011), which allows developers to offset any emissions reductions that cannot be cost-effectively addressed on-site elsewhere. Further amendments were later made to the Building Regulations in 2014, officially introducing these changes and defining the concept of Allowable Solutions (*HM Gov*, 2013). While many in the housing industry welcomed the new definition, for some, this weakening of the zero carbon standard

represented the final straw, with the WWF resigning from the Zero Carbon Task Force in 2011 (*WWF*, 2011).

Following the Coalition Government's announcement of the Red Tape Challenge (which aimed to scrap or amend 3,000 pieces of regulation from all areas of policy), the Housing Standards Review was launched, a consultation aimed at reducing the 'unnecessary' burden of regulation on housing developers and rationalise and simplify the Building Regulations (*DCLG*, 2013). Through this, the Coalition Government made clear their intention is to phase out the Code for Sustainable Homes, due to the increasing bureaucracy and cost of the scheme, as well as to address the issue of varying local and regional standards[1]. Whilst supported by the house building industry, this shift in the low carbon housing policy trajectory, has led to concerns that these changes may lead to further weakening of the Zero Carbon Homes target (*UKGBC*, 2013). Recently, the House of Commons Environmental Audit Committee launched an enquiry into Housing Standards Review, countering the main claims of the consultation and stating its support for the retention of the Code for Sustainable Homes (*EAC*, 2013). Recent developments have also seen attempts to further weaken low carbon housing policy, with a new consultation launched in November 2014 to investigate the possibility of exempting small developments (the size of which has yet to be defined) from the increasingly stringent Part L of the Building Regulations (*DCLG*, 2014b).

Throughout this period the issue of climate change rapidly became absent within policy rhetoric, with focus instead placed only on meeting emissions targets and increasing national energy security. Reflecting the similar influence of *Ecological modernisation* in other areas of policy, an increasing emphasis was placed on the role of low carbon housing in creating jobs and stimulating business. Considering broader climate change and energy policy throughout this time, it is possible to identify a clear shift in the policy discourse, with climate change de-emphasised and replaced by a focus on energy.

[1]The Code for Sustainable Homes was officially scrapped in May 2015 (*HM Gov*, 2015). Energy efficiency standards are now expected to be met through the building regulations as the Zero Carbon Homes target comes into force in 2016.

While the debates surrounding the Zero Carbon Homes target progressed, the discourse surrounding reducing carbon emissions from housing more broadly began to focus predominantly on addressing the existing housing stock. Acknowledging the Committee on Climate Change's recent advice that emissions from the domestic sector needed to be reduced to 'near zero' (*CCC*, 2010), the publication of the Coalition Government's 'Carbon Plan' in 2011 focused on efforts to reduce emissions within existing homes, reframing this issue to highlight the economic benefits of making home energy efficiency improvements. Designed to replace the CERT and CESP schemes, the Green Deal and Energy Company Obligation (ECO) thus came into force in January 2013.

A Pay As You Save scheme, the Green Deal was designed to help homeowners meet the costs of improving the energy efficiency of their homes by providing loans (linked to the house, rather than the individual) that are paid back through a contribution added to household energy bills. Due in part to the comparatively high cost of finance, as well as concerns over the effect of taking out such a loan on house prices, the scheme was not successful (for a more detailed discussion of the development of the scheme – see *Guertler et al.*, 2013). Criticism of the Green Deal has been substantial throughout, with the Committee for Climate Change issuing an open letter to the Coalition Government condemning the low ambition of the scheme and the Government's leave it to the market attitude to tackling this issue (*CCC*, 2011). There was thus a sharp decrease in the installation of energy efficiency measures during this time (in comparison to those undertaken under CERT), with up-take only really increasing when the Green Deal Home Improvement Fund (a cash-back scheme) was launched in 2013. Complementing the Green Deal, ECO was primarily designed to tackle the issue of fuel poverty, providing subsidies for those not eligible for the Green Deal scheme, with energy companies bearing responsibility for installing energy efficiency measures in the poorest households (funded by a levy on all energy bills).

Although a more detailed discussion of these policies is beyond the scope of this review, the discourse surrounding them highlights the considerable difference in the

framings adopted in comparison with the (largely comparable) Labour policies to reduce emissions from existing housing. In contrast to the Low Carbon Building Programme, CERT and the Act on CO_2 campaign, climate change as an issue was no longer seen as central to low carbon housing policy, with efforts to reduce emissions now wholly framed and advertised as an effort to reduce home energy bills through energy efficiency measures, *e.g.*, *DECC* (2013b). A purposeful effort was then made to reframe energy efficiency improvements as 'home improvements' (*Guertler et al.*, 2013); a framing that was reflected in the media discourse surrounding these policies (*e.g.*, *Gosden* (2012) – discussed further in Chapter 5).

Within this new discourse, policy representations of the public had once again shifted, with members of the public considered again to be individual consumers and economically rational actors, essentially only concerned with the costs and benefits of installing energy efficiency measures, and thus no longer the eco-consumers envisioned by the previous Labour Government. With energy efficiency framed as a consumer good, cost, along with the hassle of installation and a lack of education and information were seen as the major barriers to consumer adoption of energy efficiency measures. In contrast, the role of low carbon energy technologies (and relevant policies such as the controversial Feed in Tariff scheme) has largely been marginalised.

4.4 Low carbon housing policy: An increasingly techno-economic approach

This review has highlighted the shifting discourse surrounding UK low carbon housing policy over the past 15 years. Originating in *Ecological modernisation* and the discourses of climate change that dominated Labour Government policy in the early 2000s, the concept of low carbon housing developed out of the desire to reframe sustainable housing options as a climate change mitigation strategy, leading to the Code for Sustainable Homes and the Zero Carbon Homes target. The language of low/zero carbon housing,

first formally entered the policy discourse in 2006, with the announcement of the original definition of a 'zero carbon' house, which although ambiguous, set out the ambitious aim for all new build housing to be net-zero carbon by 2016 (*DCLG*, 2006). However, over time this ambition, as well as the objective for this target to be achieved entirely through on-site interventions, has been watered-down, with current targets for onsite emissions equivalent to a reduction of 44-60%, with the remaining emissions offset through offsite measures. In addition, un-regulated emissions (related to the use of appliances within the home) have been removed from the definition, further reducing the level of emissions reductions required for a house to qualify as zero carbon.

Although a range of economic, socio-technical and material factors have of course influenced the changing definition of a zero carbon home within the UK policy, this chapter has sought to highlight the role of the shifting discourses of low carbon housing, and climate change more broadly, in shaping the current Zero Carbon Homes target. Buoyed by the rising climate change agenda, the Labour Government's ambitious low carbon housing policy, was shaped by the growing coalition of (previously unconnected) actors, which brought a wide range of organisations together around the common discourse of low carbon housing (*Lovell*, 2004). However, by 2009, cracks were already beginning to appear, with growing criticism of Government policy from all sides. Following the economic crisis of 2007/8, the previously revolutionary climate change discourse began to subside, replaced instead by a focus on the practical and economic issues of low carbon housing, which in time, were translated into the policy definition as a lowering of the requirements of the Zero Carbon Homes target. Since the election of the Coalition Government, discourses of climate change have been largely marginalised. With focus shifting instead to energy policy, the concept of low carbon housing has also been marginalised, with policies aimed at reducing emissions from housing now framed around the issue of rising energy bills; a shift which eventually led to the scrapping of the Code for Sustainable Homes.

Despite the significant shift in the discourse surrounding low carbon housing and the

consequent definition of zero carbon housing, over this period, there are still some commonalities that are worth exploring. Specifically, whilst the climate change focused discourse of the Labour Government in many ways represented a radical shift in environmental policy discourse, it did not stray from the techno-economic paradigm advocated by *Ecological modernisation* within broader climate change policy; an approach which only strengthened within the rhetoric of the Coalition Government, who reduced the climate change discourse to a practical discussion around national emissions reductions targets (if climate change was mentioned at all). As *Pickvance* (2009, 342) highlights, it is clear that both Governments characterise the problem as about 'changing buildings rather than about changing lifestyles', largely neglecting the question of behaviour change in the home. This focus has led to the omission, if not purposeful marginalisation, of other aspects of low carbon housing, including the role of social and behavioural change in reducing emissions, as well as the issue of embodied carbon emissions within the construction of the house (estimated to be as high as 50% of lifecycle emissions – *DCLG*, 2007a), the importance of which will be investigated further within Chapter 7.

CHAPTER 5

Media discourses of low carbon housing: The marginalisation of social and behavioural dimensions

As demonstrated in Chapter 4, developing a low carbon housing stock has become a key element of the UK Government's climate change and energy policy during the last decade. With the media playing an important role in the development of both policy and public discourses surrounding environmental issues (as discussed in Chapter 2), the first phase of this research thus aimed to investigate the changing discourses of low carbon housing within the British broadsheet press. Conducting a discourse analysis (informed by the approaches of *Carvalho* (2008) and *Dryzek* (2005) - see Chapter 3), these findings are based on the analysis of 234 articles, from the four main broadsheet newspapers, *The Guardian*, *The Independent*, *The Telegraph* and *The Times* (and their Sunday equivalents), spanning an 8 year period (Jan 2006 - Dec 2013) to coincide with the emergence of the political discourse surrounding low carbon housing. The analysis is structured around the discursive elements (*e.g.,* framing and rhetorical devices) incorporated within media storylines and the discursive practices utilised to promote them within the media discourse, assessing how the concept of low carbon housing has been represented by the media, what storylines are used to understand low carbon housing, and what discursive practices are used to promote these storylines.

Three distinct storylines were identified: 1) *Zero carbon housing*, 2) *Retrofitting homes* and 3) *Sustainable living*, each of which displayed different discursive elements and practices. Dominating the discourse, *Zero carbon housing* promotes the cutting edge technology of new-build, low carbon houses as a technological solution to the climate problem (echoing the broader political discourses surrounding climate change and *Ecological modernisation*). In contrast, *Retrofitting homes* emphasises the need to reduce emissions within the existing housing stock, tackling both climate change and rising fuel prices. A more marginal discourse, *Sustainable living*, frames low carbon houses as intimately related to individual identity and the desire for off-grid (*i.e.,* independent from the national electricity grid) and greener lifestyles. Although never high on the media agenda, since 2012 the low carbon housing discourse as a whole has begun to disappear from the broadsheet media, possibly as a result of recent shifts in the low carbon policy landscape described in Chapter 4. Overall this analysis demonstrates how a similar techno-economic paradigm has dominated the media discourse on low carbon housing, marginalising important social and behavioural dimensions.

5.1 Low carbon housing storylines

Three discursive storylines, *Zero carbon housing*, *Retrofitting homes* and *Sustainable living*, were identified within the media discourse surrounding low carbon housing. Figure 5.1 shows the relative prevalence of these storylines within the media, demonstrating the dominance of *Zero carbon housing*. Introduced by an illustrative quote, each storyline is described below, considering both the discursive elements and the discursive practices embedded within them. Particular focus has been placed on identifying: a) how low carbon housing and decarbonisation more broadly has been represented within each storyline; b) which actors (re)produce these representations and what discursive practices they use to achieve this; and c) any changes within the storylines over time or differences between newspaper sources.

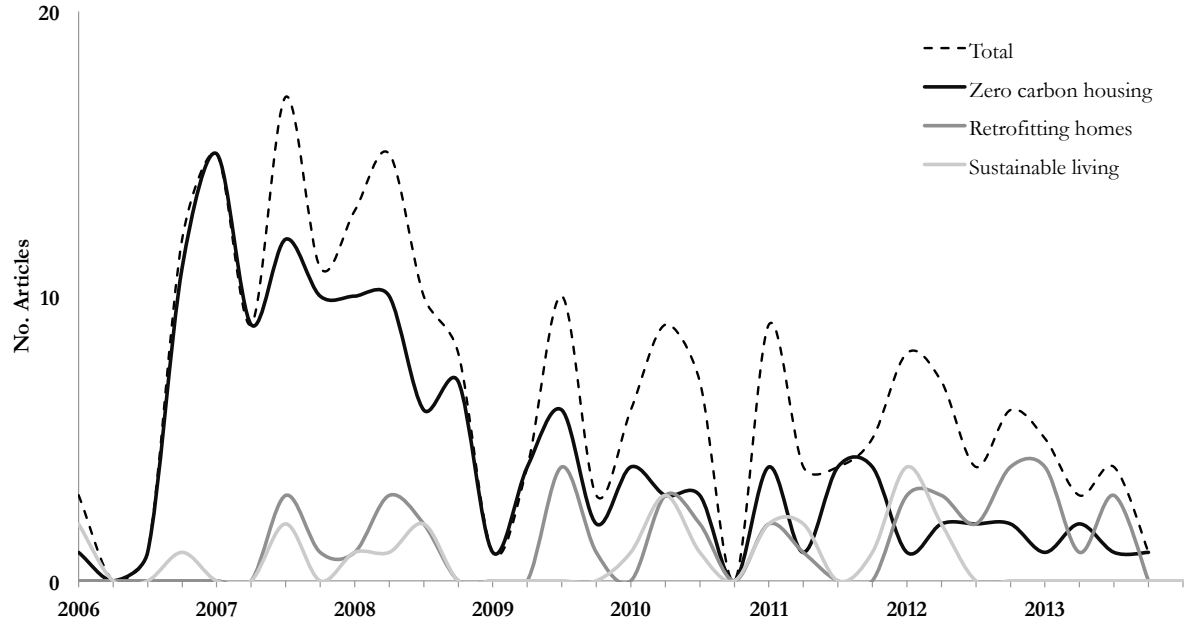

Figure 5.1: The changing prevalence of low carbon housing storylines within the British broadsheet media (Jan 2006 - Dec 2013).

5.1.1 Zero carbon housing: Dominating the discourse

> Ministers are planning a raft of reforms to Britain's building regulations. Houses contribute nearly 30 per cent of Britain's total carbon emissions, pumping 41.7 million tons of carbon into the atmosphere each year [...]. Treasury officials estimate that eight million tons of carbon emissions a year could be saved by 2050 if all new homes are zero-carbon rated by 2016.
>
> **Russell, *The Independent*, 07/12/2006**

Discursive elements

The *Zero carbon housing* storyline justifies low carbon housing as an essential element of climate change mitigation policy, with new-build, zero carbon houses proposed as the primary solution. The UK housing sector is highlighted as a significant contributor to national carbon emissions, although little information is provided regarding the source

of these emissions, *e.g.*, heating, lighting or appliances. However, although an urgent need to reduce emissions is repeatedly emphasised, explicit mention of climate change as an issue decreases over time. Increasing energy bills are thus highlighted as another issue which zero carbon homes can solve:

> Our homes, said the Chancellor, account for one-quarter of Britain's carbon dioxide emissions, and he provided a series of measures designed to encourage the development of low-carbon houses - 'benefiting the climate through lower emissions, and benefiting consumers through lower bills'.
>
> **McCarthy, *The Independent*, 22/03/2007**

The definition of a zero carbon home within the storyline is initially undefined, with no official definition presented, and only casual explanations offered:

> Zero-carbon homes use a variety of technologies to enable them to be lived in without resorting to the use of conventional gas and electricity. In the future, they will have photovoltaic cells built into south-facing roofs and/or nearby wind turbines - both generating electricity which can be stored for later use.
>
> **Brignall, *The Guardian*, 07/12/2006**

Interestingly, the inclusion of onsite energy generation is initially considered a key feature of a zero carbon house. However, this prominence rapidly disappears, with attention shifting to issues of energy efficiency and building standards.

Given this lack of conceptual clarity, it is mainly through descriptions and examples of zero carbon houses that a representation of their material and social characteristics is provided. A key frame within this storyline is that of zero carbon housing as a cutting edge technology. Focusing on technological and design features, this frame depicts these houses as technologically advanced; a vision of the future and the solution to reducing

emissions from housing:

> Other more exotic features, from rooftop wind turbines and solar panels to grey-water recycling systems, were more glaringly obvious at the two state-of-the art houses built to generate virtually no greenhouse gas emissions in their running, and unveiled at an exhibition of new construction methods.
>
> **McCarthy, *The Independent*, 12/06/2007**

This frame is initially contested by the idea that zero carbon homes are in reality experimental and untested. However, this is rapidly undermined by the emergence of a competing frame depicting these houses as exciting, pioneering technology:

> Although it is easy to look for faults in such innovative developments, it is through their pioneering work that we can learn what succeeds and what fails [...] 'The more complicated you make these systems for saving energy and cutting emissions, the more likely they are to break down [...]. Ideally, low carbon buildings should have passive systems that manage themselves.' David Strong, formerly of BRE
>
> **Leake, *The Times*, 28/09/2008**

Within this storyline, little connection is made between low carbon houses and society more broadly. Only the Ecotowns policy, designed by the Labour Government to site ten new eco-housing developments within the British countryside, touches on social aspects of zero carbon housing. Following a modified line of reasoning, the storyline is expanded to include the need to address the UK's housing crisis and provide affordable housing for all. However, links are rarely made between these houses and the lifestyles they support, and emphasis is seldom placed on conveying comfort, homeliness or quality of life within these homes. Focus is instead placed on the affordability and normality of these houses, with little suggestion that any level of behaviour change would be required

in order to decarbonise UK housing.

Discursive practices

Originating within the then Labour Government's policy announcements, *Zero carbon housing* appears within the media discourse following the announcement of the Code for Sustainable Homes (*DCLG*, 2006) in December 2006. Reproducing the Government discourse of low carbon housing as a solution to climate change at this time (discussed in Chapter 4) within news and policy based feature articles, this storyline rapidly gains discursive dominance.

Considering media reproductions of press releases, official quotes, and a small number of opinion pieces from prominent Government officials, evidence of the purposeful framing of low carbon housing as a solution to climate change can be seen within the media data. Emotional and value-laden language is initially combined with the idea that individual homes contribute substantially to climate change, to promote housing policy and appropriate environmental credibility:

> Far from trying to scupper government plans to tackle climate change [...] my department is at the forefront of efforts to cut carbon emissions. Heating and running our homes accounts for 27% of the country's emissions - the third biggest cause of carbon emissions after business and transport [...] I am determined to do what is needed to make a real and lasting difference to the environment. This government not only supports sustainable communities but is the author of that concept.
>
> **Kelly, *The Guardian*, 16/03/2007**

However, over time, the Labour Government begins to downplay the culturally polarising issue of climate change, shifting instead to a cost savings based frame.

Media representations of low carbon housing reinforce this storyline. With responsibility to act placed firmly with policy makers, the role of professional actors such as developers or construction firms is given little prominence. Issues surrounding behaviour change and the responsibility of individuals/households to reduce their emissions are also largely excluded. Although a range of alternative positions are presented by the media through the use of quotes from a broader range of experts and professionals, these focus on criticisms of Government policy, further emphasising the responsibility of policy makers. Little divergence was seen within NGO positions, which did little more than reiterate Government accountability, without suggesting more radical policies for decarbonisation. This serves to reinforce the key elements of the storyline, criticising specific policy options whilst continuing to frame zero carbon housing as a technical solution to climate change.

A discourse coalition can thus be seen to support this storyline, including the Labour Government, NGOs and the UKGBC. In comparison to other actors, the UKGBC is accredited a high level of expertise, with its definition of zero carbon housing repeatedly legitimised by all newspapers. Interestingly, representing as they do, a number of prominent industry organisations and businesses, the formation of (and later reports from) the UKGBC is also used to imply agreement between all actors, providing a commentary that is largely unquestioned by the media.

Following the election of the Coalition Government in 2010, the *Zero carbon housing* storyline becomes increasingly contested, echoing the policy debate surrounding the definition of the Zero Carbon Homes target. Through a subtle modification of the storyline, the UKGBC played a key role in (re)defining 'zero carbon' housing, moving focus away from the mitigation of climate change, to the practicalities of achieving change within the housing industry. The focus on practical and economic aspects of decarbonisation present within the already shifting climate change and energy discourse adopted by the Coalition Government (as discussed in Chapter 4), is also reflected within the media discourse. From this point, no discourse coalition is discernible

and contention over the definition and achievability of zero carbon housing begins to strengthen, increasingly used strategically within the media to criticise policy and destabilise the storyline:

> 'Let's stop calling these houses zero carbon when they clearly will not be zero carbon. Zero-carbon housing has been a long standing political pledge and an acid test of the ability of the construction industry to deliver.' Friends of the Earth
>
> **Wright, *The Independent*, 25/02/2011**

Following these changes in the political landscape, media legitimisation of official Government positions decreases. This is reflected in the decreasing dominance of the *Zero carbon housing* storyline. Possible ideological divides between newspapers become more apparent, with each paper clearly favouring different aspects of the debate. *The Guardian* and *The Independent* are more commonly associated with a stronger emphasis on climate change and debates surrounding the definition of zero carbon housing, supporting actors such as Friends of the Earth. In contrast, *The Telegraph* and *The Times* favour debates surrounding the Ecotowns policy, instead legitimising other actors, including the Campaign to Protect Rural England. However, these contentions remain largely rhetorical, with such struggles failing to significantly alter the fundamental structure of the storyline.

5.1.2 Retrofitting homes: A counter storyline

> 'Nearly a quarter of the housing stock consists of solid-wall homes, many of which are period properties. Retrofitting these properties will be crucial if we are to meet our target of reducing UK emissions by at least 80 per cent by 2050.' John Alker, UK Green Building Council
>
> **Bloomfield, *The Times*, 11/06/2010**

Discursive elements

Echoing many key elements of the *Zero carbon housing* storyline, *Retrofitting Homes* again emphasises the urgent need to mitigate climate change. However, in contrast, this storyline claims that policies promoting new-build, zero carbon homes are failing to address the real cause of emissions: pre-existing homes. Retrofitting existing homes is proposed as the only solution and is based on two arguments; 1) approximately 75% of existing homes will still be in use in 2050, and 2) embodied emissions within the construction process mean that truly zero carbon housing is unachievable:

> [N]ew-build homes will continue to add only 1 per cent to our housing stock each year. Experts predict that of the 24 million homes now standing, 20 million will still be in use - draughty, leaky and adorned with impractical period windows - in 2050.
>
> **Heyward, *The Times*, 24/07/2009**

> [B]uilding a new home emits more than four and a half times as much carbon dioxide per square metre as refurbishing an existing one. As much as 35 tonnes of carbon dioxide could be saved by bringing an existing home up to scratch - equivalent to driving a car from London to Sydney and back seven times. Over 50 years, this means that there is almost no difference in the average emissions of new and refurbished homes.
>
> **Blackwood, *The Times*, 14/03/2008**

In contrast to *Zero carbon housing*, the term zero carbon house is not relevant within this storyline, with the terms low carbon, low energy and sustainable housing more commonly utilised. This storyline makes stronger connections between low carbon housing and other policy issues, such as energy security and affordability. Retrofitting your home is thus most commonly framed as a solution to rising energy bills:

> Added to the urgency to prevent the polar ice caps melting, dependence on imported gas in recent years has pushed the average fuel bill in the UK to around £800. An Ofgem report last month estimated that average bills would rise 60% by 2016 as energy supplies become more volatile. It makes sound environmental and economic sense to green your home.
>
> **Carus, *The Guardian*, 07/11/2009**

While the arguments in favour of decarbonisation are strongly emphasised within this storyline, depictions of retrofitted houses themselves are limited. Representations of low carbon existing housing as cutting edge are absent, replaced by a focus on more pragmatic solutions within the framework of readily available technological options. Energy efficiency takes a central role within this, followed by the importance of onsite electricity generation:

> With autumn fast approaching, now is the time to start checking your home is as energy-efficient as possible to keep fuel costs down. Just a few simple measures can have a significant effect on annual bills, and the sooner you start making changes, the greater your savings will be. [...] Draught-proofing windows and doors is a good place to start and need not be expensive.
>
> **Wright, *The Telegraph*, 13/09/2009**

> Owners of period houses that cannot be brought up to modern insulation standards could cut their carbon footprint and their fuel bills by installing green boiler technology, which generates electricity as well as heat.
>
> **Partridge, *The Guardian*, 15/06/2008**

Some social frames do feature within this storyline, primarily revolving around affordability. However, concepts of comfort and green living also emerge, in the context of emphasising the normality of these homes:

> To the casual observer Maria Hawton-Mead's pretty but unsensational Victorian terrace looks like thousands of others in suburban Brighton, but it hides a secret. Hawton-Mead is a forerunner of the retrofit revolution [...] her period home has been reinvented as a thoroughly 21st-century example of sustainable housing.
>
> **Bloomfield, *The Independent*, 29/04/2011**

While less common, ideas surrounding smart technology are also incorporated, subtly highlighting more social implications of retrofitting households:

> I have a new member of the family. It's small and discreet but a terrible nag [...] Wattson, as it is called, tells me at any time of day how many watts of electricity are being used and how much that level of consumption would cost annually. The answer is blood-chilling.
>
> **Jardine, *The Telegraph*, 15/07/2009**

Discursive practices

Positioned largely as a challenge to the dominance of *Zero carbon housing* and the then Labour Government's discourse surrounding new build low carbon housing, *Retrofitting homes* draws heavily on the support and opinions of alternative actors, including NGOs, *e.g.*, Friends of the Earth, academics and consultants. A combination of technical and emotional language is utilised within the storyline to strengthen the core arguments and highlight both the rationale and procedure for achieving decarbonisation. In this way expertise is drawn from a diverse range of experts, including both the more technical

knowledge of organisations such as the Royal Institute of Chartered Surveyors, and the practical advice provided by prominent individuals:

> 'People aren't going to change their habits just to save the environment' says architect George Clarke. 'They need to see the benefits for themselves.' The presenter of Channel 4's The Home Show and The Restoration Man believes that the best way to make properties more sustainable is to adopt a holistic approach, recognising that saving energy needs to benefit consumers and not impose heavy additional costs.
>
> **Davidson, *The Telegraph*, 14/08/2010**

Despite the greater focus on the role of individuals within this storyline (as opposed to an emphasis on Government obligations and responsibility), explicit moral reasoning or calls for action are rare. Instead, emphasis is placed on expertise and providing evidence that lends weight to the arguments promoted. Therefore, though many articles do encourage the public to reduce the energy use and carbon emissions of their homes, this is always framed and promoted as for their personal benefit, rather than as a responsibility, with behaviour change rarely openly implied or advocated. Some contentions do arise, stemming from the technical nature of the debate and the reliance on diverse sources of evidence in support of this storyline. In particular, debate surrounded the effectiveness of micro-generation technologies, including confusion over varying estimates of payback times presented. However, despite these minor issues, this storyline provides a strong, generally unified criticism of Government policy for decarbonisation of UK housing.

The Labour Government engaged relatively late with this storyline, appropriating it to position themselves as leaders through the assertion that a 'revolution' in existing home retrofit was needed. However, this position was not related to any specific policy announcements and no suggestions for achieving this transition are presented. In

contrast, and as discussed in Chapter 4, by 2012, the Coalition Government can be seen to have fully appropriated this storyline, reframing low carbon housing as low energy housing and a solution to rising energy bills; a storyline that is intricately bound up with the Green Deal policy.

5.1.3 Sustainable living: An alternative discourse

> The three-bedroom home designed by Michael and Dorothy Rea, near the shoreline of a secluded bay, has become a test bed for living 'off-grid': generating all their power from renewable sources, growing most of their food at home, and running a car without a petrol station.
>
> **Carrell, *The Guardian*, 19/05/2008**

Discursive elements

The *Sustainable living* storyline is in many ways quite separate from *Zero carbon housing* and *Retrofitting homes*. This storyline frames sustainable housing as a solution to a number of different issues and is not related to Government policy. While the issue of reducing individual carbon footprints remains an important element within the discourse, this storyline portrays sustainable housing as about more than just reducing carbon emissions. Instead, the resource intensive nature of modern life is the central issue.

Environmental concerns are therefore combined with a number of other issues. The increasing pace of modern life (and the stress and health problems that accompany it), is repeatedly highlighted as a cause for adopting more sustainable lifestyles:

> 'London attitudes had taken a grip on our lives: it was self, self, self. We lived disjointedly -home, work, exercise, socialise, all in different compartments - and we were rushing around from one

> to the other. But for what? We wanted a simpler way of life.'
>
> Mrs della-Porta, Self-builder

Rosen, *The Times*, 27/07/2008

In addition to being an important aspect of happy, healthy and green lifestyles, sustainable housing is framed as an escape from the burden of expensive fuel bills. However, this was about more than economic benefits. The importance of being 'off-grid' was a particularly prominent concept, primarily focused on reducing the power of large energy companies:

> 'Generating your own power makes economic and environmental sense. I think people are becoming scared about becoming too reliant on the system that we have,' Mr Law, Self-builder

Vidal, *The Guardian*, 21/03/2006

In this way, sustainable housing and, in particular, sustainable self-building is framed as a solution to both personal and environmental problems. Despite this central role within the storyline, few representations of these homes themselves appear. While terms such as zero carbon and low carbon are entering this storyline, no definitions are provided as to the specific meanings of these terms, or what constitutes a sustainable home, and little detail is provided surrounding their technical and material features. Focus is instead placed on self-build homes as a product of the ingeniousness of their residents and a part of their individual identities. Cutting edge frames are absent from this storyline, with the focus instead placed on the comfort and hominess of these houses.

The green values of residents are a prominent theme, making the link between self-building and identity. Seen within their descriptions of their homes and lifestyles, the idea of self-sufficiency was critical for many residents, this was not primarily related to the lower cost of utility bills. Instead, a personal desire for independence, whether from the state or systems of energy production, as well as a professed sense of self-worth

drove residents' choices. *Sustainable living* thus presents an at times idealised vision of low carbon housing, focusing on the idea that lifestyle change (along with ownership of your own eco-home) can act as a pathway to improved health and wellbeing, as well as more environmentally friendly lifestyles.

Discursive practices

Representing a relatively minor strand of the overall low carbon housing discourse, the *Sustainable living* storyline pre-dates *Zero carbon housing*, and takes shape via significantly different discursive practices. Generally appearing independently of policy announcements, this storyline is seen primarily within feature articles, which utilise personal narratives to appeal to public interest through depictions of rare and unusual lifestyles.

The normality of the lifestyles portrayed is a key feature of this storyline, both within the media representations and in direct quotes from self-builders and residents. Despite their perhaps unusual lifestyles, residents typically present their homes as 'normal', often highlighting their distinctive features, but always focusing on ideas of hominess and comfort:

> 'But it's just a standard house, an honest house, nothing fancy. It's a serious project in renewable design and energy efficiency, an experiment in joined-up technology, but it's also a house we intend to grow old in.' Mrs Rea, Self-builder
>
> **Carrell, *The Guardian*, 19/05/2008**

Media representations reinforce this account, normalising significant lifestyle changes through the detached language used to describe them:

> When they moved into the house, however, BT wanted to charge them more than £100,000 to install a phone line, so they took it in turns to drive 10 miles each way to the nearest internet-enabled

library.

Rosen, *The Times*, 27/07/2008

Even more dramatic lifestyle changes are depicted as relatively smooth transitions into new routines, with residents portrayed as taking changes in their stride:

> 'We've learnt to adopt an older, more natural rhythm [...]. We spend hours a week maintaining our power supply, checking storage batteries, making sure the wind turbine is okay and monitoring water levels.' Mrs della-Porta, Self-builder

Rosen, *The Times*, 27/07/2008

These lifestyle choices are portrayed as personal and bound up within individual identities, rather than being framed as normative guidance for society as a whole and moralistic arguments are absent within the storyline. With barely any mention of Government or expert actors, residents of sustainable houses and more specifically, self-builders, are central. This lack of prominent actors reduces contention within the storyline, and residents' choices in building/designing sustainable homes are not subject to critique. However, while no alternative views are presented, this lifestyle is not actively advocated and is rarely explicitly portrayed as a model for others to follow.

5.2 Discursive shifts over time: The demise of *Zero carbon housing*?

Despite the low level of coverage of this topic, the rise and fall of the media interest in low carbon housing can be seen to mirror the peaks of media coverage of climate change more broadly, peaking in 2006 before gradually declining (*Gifford et al.*, 2015). More importantly, the media coverage surrounding low carbon housing can be seen to mirror discursive shifts within the political landscape. Arising following the announcement of the Code for Sustainable Homes, the low carbon housing discourse, and more specifically

the dominant *Zero Carbon Housing* storyline, largely stemmed from the Government policy discourse (discussed in Chapter 4), becoming decreasingly newsworthy over time and almost vanishing completely following the election of the Coalition Government in May 2010. While the overall representation of low carbon houses (as a cutting edge technology) remains largely the same throughout, the new Government sought to reframe the problem, moving away from the strong rhetoric surrounding climate change as they began to water down the Code for Sustainable Homes. This is likely to be in part due to the decrease in Government interest in climate change policy at this time, due to both the economic recession and neo-liberal ideological standpoint of the Coalition Government and reflects the shift in climate change and energy policy at this time (discussed in Chapter 4).

Interestingly, it is important to note here that while a small increase in the *Retrofitting Homes* storyline was seen following the announcement of the Green Deal in 2010, these only represent a small sample of the newspaper articles covering this policy. This is because most articles discussing the Green Deal did not link this policy to low carbon housing, or even to broader discussions surrounding reducing carbon emissions from housing, demonstrating that the Coalition Government's framing of the Green Deal as an energy efficiency, rather than a climate change or low carbon policy was also adopted within the media unquestioned. Recently, a further shift in the discourse away from low carbon housing can be seen, following the rise in domestic energy prices in late 2014. At this time, low carbon housing and energy policies (of which the Energy Company Obligation was the most prominent) were criticised as the cause of these price rises within the media, reflecting Coalition Government press releases and quotes. Whilst small, the number of articles linking this criticism with the low carbon housing discourse still significantly outnumbered any articles from the three storylines outlined above, highlighting the further weakening of the low carbon housing discourse within the media, and the general discursive shift from carbon to energy issues.

5.3 Marginalising the social and behavioural dimensions of low carbon housing

Focussing on the distinctions and commonalities between the storylines, this section provides an overview of these findings, drawing out connections with prior work. The dominant *Zero carbon housing* storyline broadly reflects the discourse of climate change promoted by successive Governments of the time, and as such, is rooted in *Ecological modernisation*, supporting *Lovell*'s (2004) finding that low carbon housing has been purposely reframed as a solution to climate change. However, while Lovell highlights a discourse coalition in support of two separate, but complimentary storylines, this distinction is less clear within the media discourse. While elements of both the *Life Cycle* (with its focus on the economic costs and benefits of constructing low carbon housing) and *Smart House* (with its focus on smart technologies and high levels of energy efficiency) storylines are apparent, some key concepts such as economic rationality, are largely unspoken within the media discourse.

With similar foundations in *Ecological modernisation*, the *Retrofitting homes* storyline in many ways echoes that of *Zero carbon housing*, displaying a number of elements found within *Lovell*'s storylines (2004), as despite contesting the dominant storyline, *Retrofitting homes* remains rooted within the same techno-economic paradigm. In contrast, *Sustainable living* provides a very different narrative, emphasising individuality and self-sufficiency, and focussing on people living outside society's dominant social norms, *e.g.,* generating their own energy. Nevertheless, whilst echoing *Civic environmentalism*, as well as the values of the Sustainable housing advocacy coalition (*Lovell*, 2004), the *Sustainable living* storyline does not generally promote these lifestyle choices as normative, instead portraying them as deeply individual acts that express personal and rather idiosyncratic identities. A tension runs through this storyline, with significant lifestyle changes typically portrayed as undisruptive to households and individuals, framed instead as being rather easily translated into new routines.

The normality of low carbon housing emerges as a central theme of all three storylines. Despite using very different discursive practices, each storyline presents low carbon living as broadly desirable, with little contestation of the need for emissions reductions in the home. *Zero carbon housing* adopts a persuasive narrative of cutting edge housing as a technological solution to climate change, naturalising a belief that these houses themselves, rather than occupant behaviour, will lead to emissions reductions in a similar way to that identified within the policy discourse (*Pickvance*, 2009). Adopting more technical language, *Retrofitting homes* instead reflects a common sense narrative, utilising data and expert opinions to promote retrofitting existing housing as both an achievable and sensible option for reducing household emissions and fuel bills. In contrast, normality is portrayed very differently within *Sustainable living*, with unusual lifestyles portrayed as often a small sacrifice made in exchange for increased personal comfort and happiness. Focusing on low utility bills, these homes are promoted as affordable, with less emphasis given to the costs of the purchase and construction of self-built low carbon houses, which would put them well beyond most individual's financial reach, thus further distancing the concept from public lifestyles.

Supported by a strong discourse coalition, *Zero carbon housing* has rapidly achieved discursive dominance following the announcement of the Code for Sustainable Homes, endorsing *Lovell*'s analysis (2004). *Retrofitting homes* is supported by a more disparate group of actors, becoming more prominent in 2008/9, plausibly as a result of the economic downturn and the subsequent election of the Coalition Government. In addition, the importance of climate change is increasingly played down, especially following the 2010 UK General Election, which may be in part due to the shifting climate change and energy discourses of this time. However, the continuing underlying presence of *Sustainable living* demonstrates that remnants of the older sustainable housing discourse still persist. Nonetheless, this storyline lacks clear advocacy from professional or NGO actors (such as those highlighted within *Lovell*, 2004).

Despite the differences between the three storylines, a number of common ideas and

assumptions run through the discourse. Although discourse analysis often focuses on the different elements and practices used in constructing storylines, what has been excluded or marginalised is also of interest (*Dryzek*, 2005). A number of key concepts, present within the academic literature surrounding low carbon housing, have largely been omitted from the media discourse. Despite the techno-economic paradigm that dominates both *Zero carbon housing* and *Retrofitting homes*, some technical concepts that challenge these storylines are excluded. These include the importance of embodied emissions during construction (*Zero carbon housing* only), tackling the performance gap identified between housing design and occupied homes (see *Stevenson and Leaman*, 2010, and potential unintended consequences such as reduced indoor air quality or overheating (*Davies and Oreszczyn*, 2012).

Other concepts largely excluded from the discourse are changes in individual behaviour, cultural expectations, and social norms. Although there is continuing debate surrounding the adoption of particular theoretical frameworks for the analysis of social and behavioural practices, (as highlighted in Chapter 2), there is broad agreement that substantial reductions in domestic emissions will require fundamental shifts in the way we live our everyday lives, perhaps even to the extent of requiring considerable social upheaval (*Davies and Oreszczyn*, 2012). Perhaps due to ideological or political factors, acknowledging these social complexities has been difficult for the main actors within the discourse, and there is little discussion of these aspects within either *Zero carbon housing* or *Retrofitting homes*. The marginal *Sustainable living* storyline clearly depicts quite different behaviours and social practices of the occupants of low carbon homes. However these practices are nevertheless normalised, although not explicitly advocated as a model for others to follow.

The absence of these social aspects is surprising, as it might be expected that media norms of personalisation would highlight them. It is likely that these omissions stem from the implicit assumptions and blind spots to behaviour change currently found within the dominant techno-economic paradigm that dominates UK decarbonisation

strategies (*Spence and Pidgeon*, 2009). Whatever the reason, this analysis has demonstrated that the dominant media depictions of low carbon housing are embedded within *Ecological modernisation*, with a focus on technical and economic aspects and a relative neglect of the cultural and social dimensions that would seem to be implicated.

However, at its heart, reducing emissions from the home is not only a technical or political problem, aimed at finding cost-effective, efficient or politically acceptable methods of reducing emissions from housing. It is also a social issue, as such a transition would require fundamental shifts in individual behaviours, cultural expectations, and social norms and practices. Ultimately, if discourse matters, and this thesis rests on the understanding that it does, then this rather incomplete media depiction of low carbon housing may have serious implications for transitioning towards low carbon living. As discussed in Chapter 2, despite their dynamic nature, discourses place certain boundaries on both the political and public understandings of phenomena, potentially excluding innovative ideas and solutions to the problem of reducing emissions from the housing sector. Moreover, there is the possibility that framing low carbon housing as distinctly 'normal' and as essentially imposing no restrictions or challenges to current lifestyles, institutions, and practices, may lead to social resistance when the realities of more radical decarbonisation hit home.

CHAPTER 6

Expert opinions of low carbon housing: Defining socio-technical configurations

Expert conceptualisations of the configuration of technology, as well as broader imaginaries of the public, have been shown to have a significant influence on policy design and in shaping socio-technical systems (*Walker et al.*, 2010a). Based on 22 expert interviews with housing and energy professionals, including policy makers, industry and architecture professionals, academics and NGO representatives (see Chapter 3 for further details), this chapter explores the meanings of the concept of low and zero carbon housing within expert discourses and their visions of a low carbon housing future. Whilst the term low carbon house was common and well understood within the expert discourse, discussions of the meaning of this concept were diverse. For many, policy and industry professionals in particular, understanding of this concept initially centred on the policy debate surrounding what constitutes a 'zero carbon' house, as discussed in Chapter 4. For this reason, before introducing expert visions of the future of low carbon housing, this chapter begins by highlighting expert perceptions and understandings of the concept of a zero carbon house and the policy implications of this. Following this, two visions of possible low carbon housing futures are discussed: the Passivhaus and the Smart home. The Passivhaus employs extremely high levels of thermal efficiency in order to passively minimise energy use in the home, while the Smart home is able to take direct control of heating, lighting and appliances through a

whole house smart-system. However, echoing the techno-centric understandings of low carbon housing within the policy and media discourses (discussed in Chapters 4 and 5) and despite the technological differences between these two visions, the underlying rationale, to attempt to reduce the influence of occupants on household energy use, and thus carbon emissions, remains the same.

6.1 Critiquing policy: The validity of the zero carbon concept

The concept of a zero carbon or zero energy house (as opposed to low carbon/energy) was almost exclusively associated with current UK and EU policy, broadly leading to the following definitions:

1. A zero carbon house: a house that meets the current Government definition for Code Level 6 of the Code for Sustainable Homes, focusing on the regulated emissions of the house only.

2. A net-zero carbon house: a 'completely self-sufficient' house that over a year uses no more energy than it generates, and thus 'has no impact on the planet' (Interview 5, Housing and construction expert).

3. A nearly zero energy house: a house that achieves very high energy performance standards, as defined by the EU Energy Performance of Buildings Directive.

Opinions were mixed as to the effectiveness and appropriateness of these definitions, and in this context, opinions regarding the validity of classifying houses under any of these terms were mixed. The original aspiration of the Code for Sustainable Homes, the net-zero carbon house was generally considered the most credible definition, although opinion was divided regarding the political and technical feasibility of implementing this at a national scale. In contrast, the definition and even concept of a zero carbon house (as defined within UK policy) was commonly called into question. Focusing on

the UK policy definition, the recent exclusion of unregulated emissions (as discussed in Chapter 4) from the zero carbon definition was considered particularly concerning, raising criticisms that the Department for Communities and Local Government 'should stop trying to water down [the definition], at the behest of the house builders' (Interview 3, Environmental campaigner). The inclusion of the Allowable Solutions mechanism was also controversial:

> [A]llowable solutions, so these will be payments to have [carbon] offsets elsewhere and then the house could be said to be zero carbon in one sense. But obviously, some people would say that's ok, and others would say 'well that's not really zero carbon', so depends on how you take that really.
>
> **Interview 4, Environmental policy researcher**

More conceptually, the feasibility of ever achieving a truly zero carbon (or energy) house was regarded as problematic. In addition to technical limitations and the influence of occupants on household emissions, the exclusion of embodied carbon emissions (associated with the raw materials, manufacturing, transport and construction of the building) from any definition of zero carbon housing was highlighted as particularly concerning. Whilst often described as 'an important aspect to be taken into account if you're looking, in a holistic way, at decarbonising the housing stock' (Interview 3, Environmental campaigner), the issue was often seen as too complicated, both technically and politically, to take account of:

> [A]ny developer is going to be driven by the legislative requirement that they have to follow and in any case, if they don't have to do it, then they won't do it. So because the Code for Sustainable Homes doesn't really consider embodied carbon, then most developers aren't really concerned about it.
>
> **Interview 9, Sustainability architect**

For these reasons, suggestions arose that the definition of a zero carbon house, as well as the term itself, was no longer relevant and that a change in UK policy (and more specifically, the Code for Sustainable Homes) was needed in order to better reflect its meaning. Despite this 'loss of faith that [zero carbon] really means zero carbon' (Interview 4, Environmental policy researcher), this definition, as a label, was still seen to play a role in reflecting the aspirations of the Code for Sustainable Homes, and that now largely accepted by industry, any alterations would be detrimental to achieving emissions reductions:

> It's in the name. I believe that there is a value in maintaining this term because it took a lot of years working with the Government [...]. So if you keep changing stuff then that might create confusion. [...] But as you mentioned, sometimes it's a little bit misleading to refer to things as zero carbon when they're not.
>
> **Interview 13, Housing policy expert**

The need to move towards a broader focus on achieving a low carbon housing sector was thus deemed to be more appropriate, than the more specific Zero Carbon Homes target, which in reality may not be feasible. General approval of the EU's nearly zero energy definition also led to suggestions that following the European example, a focus on low energy housing was more appropriate, in part because 'we haven't the slightest idea what the carbon intensity of electricity is going to be in the future' (Interview 11, Professor of housing and energy).

6.2 Visions of the future: The technological configuration of low carbon housing

In contrast to the policy related interpretations of zero carbon housing, the concept of a low carbon house evoked a diverse range of visions of what low carbon houses could and

should look like, and how exactly they would achieve the required emissions reductions. Interestingly, while new build homes are often considered a low priority in comparison to addressing emissions from the existing housing stock, discussion of what constitutes a low carbon, or low energy, house was dominated by descriptions of new build homes (although many elements were deemed to be transferable through refurbishment of the existing stock).

Low carbon houses were generally described in terms of their technical configurations, perhaps including 'more insulation, triple glazing windows, perhaps a heat recovery ventilation [system], so it's very high spec compared to a normal current house' (Interview 4, Environmental policy researcher). In addition, the visual appearance of the house was also considered crucial, with emphasis placed on the idea that low carbon houses could (and should) take a variety of forms, from the traditional to the very modern:

> [A low carbon house] would look absolutely normal, from the external and the interior. [...] and from the exterior you wouldn't be able to tell if it's a low carbon house or not, maybe you could say 'oh this is producing energy' because of the PV. But they look identical to normal houses.
>
> **Interview 12, Engineer and retrofitting expert**

Within this, two contrasting visions of low carbon housing futures could be identified: the Passivhaus and the Smart home. Echoing the policy discourse (as discussed in Chapter 4), addressing the fabric of the house to reduce both energy use and emissions was key to both approaches, with the importance of energy efficiency continually stressed. However, despite agreement on the need to adopt a fabric first approach to effectively reduce heating demand, the similarity between these two technological approaches employed ended there.

6.2.1 Passivhaus

Originally developed in Germany with the aim to 'dramatically reduce the requirement for space heating and cooling, whilst also creating excellent indoor air quality and comfort levels' (*BRE*, 2015b), the Passivhaus standard was often seen as the pinnacle of low carbon/energy housing. Often seen as the future of low carbon housing, there were also suggestions that this standard should replace the Code for Sustainable Homes. Focusing on the high thermal efficiency, Passivhauses were generally considered a simple and effective way to reduce the energy use required for heating, whilst maintaining a comfortable temperature:

> Passivhaus is a good standard actually. It's [...] the fabric of the building, not throwing lots of equipment inside and systems, because, matter of fact, it doesn't normally have heating in there. You know, you become the heating source and the light bulb almost.
>
> **Interview 1, Civil engineer and Welsh policy expert**

The reduced reliance on new technologies to reduce emissions was seen as a particular benefit of Passivhauses, with mechanical ventilation with heat recovery systems (which top up heating levels when necessary), the only new technology that would need to be incorporated within the house. Many examples were provided highlighting existing projects, with many experts personally advocating how enjoyable and warm they are to live in, the low energy bills associated with these houses and the possible health benefits due to increased indoor air quality.

Despite enthusiasm for the concept, some concerns were still raised in regards to implementing this standard within the UK. In addition to the increased cost of build, the appropriateness of Passivhaus reliance on extremely high thermal efficiency was questioned in relation to the risk of over-heating in the UK climate; a risk that is likely

to increase in the future if housing designs are not optimised to adapt to this. However, seen as by far the greatest barrier to reducing energy use, public acceptability of these homes was a concern, with issues around social preferences for indoor temperature settings seen as particularly relevant. For example, while the Passivhaus was deemed to provide acceptable heating services, the lack of any focal points of heat within these homes was highlighted as a possible barrier to adoption amongst the UK public, due to lack of control over heating levels:

> [T]he biggest problem is that people in general, in my opinion, like conventional heating systems, they like a house to have a focal point and to be able to go in and go, I'm going to turn the heating on and it works and within half an hour they've got heat coming out. Low carbon houses, because of the calculations methodology and the design process don't have high levels of heat because they don't actually need them.
>
> **Interview 5, Housing and construction expert**

6.2.2 Smart home

In contrast to the vision of a largely passive, low technology form of low carbon/energy housing delivered by Passivhauses, the incorporation of high-tech innovative smart systems within new Smart home provided a divergent vision of future housing. The inclusion of smart technologies (such as two-way smart metering and smart energy control systems) within both new and existing housing was seen as an important mechanism for reducing energy use from housing, improving demand management and allowing occupants more control and understanding of their energy use. Aware that simply increasing the level of information regarding home energy use would not necessarily lead to reductions in energy use, fully automated smart home systems (that control heating, lighting and appliances in the house, and are able to learn and adapt to

occupant behaviour), were advocated, although this possibility was currently considered a more challenging alternative to achieve:

> [T]he best way to drive down the carbon use in properties is actually to take people out of the equation and actually make the houses smarter. [...] If you had controls that learn about patterns of user behaviour and then adapt it to that, that would be a smart control. But there's nothing smart about one that tells you you're wasting energy. If you get a smart meter at the moment all it does is tell you you're really wasteful.
>
> **Interview 5, Housing and construction expert**

Interestingly, the public acceptability of these systems was generally not considered an issue, with the idea that the public would reject this technology due to the lack of personal control over heating and appliances in their homes dismissed. Any public fears regarding these technologies were suggested to be hyped up by media, particularly through a number of (then recent) articles in newspapers such as the Daily Mail's 'Big brother to switch off your fridge' (*Myers and Beck*, 2013):

> From my perspective I can't see why, as long as you get the service you want, you know your fridge stays cold enough and your hot water is there when you need it, why you'd worry about that, but it's presented as an incredibly invasive technology, which I find strange, but it's interesting that it was. I don't know whether that's just the media wanting to make a story, or whether people are genuinely concerned by that, I don't know.
>
> **Interview 4, Environmental policy researcher**

In contrast, the possibility of reduced energy bills was thought to override any public concerns or resistance to the intrusion of these new technologies, and that in general people would be happy to relinquish control in exchange for cheaper energy services.

This finding is interesting, as although cost savings have been shown to be an important consideration (*Hargreaves et al.*, 2010), recent research has highlighted the complexity of surrounding the uptake of smart technologies. In particular, *Spence et al.* (2015) demonstrated how the individuals most concerned with household energy affordability, were the most likely to demonstrate unease over sharing personal energy data, with individuals demonstrating a strong concern about climate change actually more likely to accept these features of smart technology.

6.3 Homes as machines: Imagining future homes and their occupants

Whilst the perception of low carbon housing as a cutting edge technology, seen so strongly within the media's *Zero carbon housing* storyline, was clearly present within the expert discourse, the focus of these visions of future low carbon housing was shifted away from the detailed descriptions of the technical characteristics of the house. Instead low carbon houses were understood more holistically, as complex systems and machines. In particular, parallels were drawn between these technological visions of future low carbon housing and the increasingly technological nature of modern cars. Concerns were raised regarding the increasing level of expertise needed to understand, as well as properly operate these technologies, many of which require a new level of engagement from occupants:

> All of a sudden the house becomes a bit like a car and it gets a bit complicated. People don't want to know how the engine works they just want to drive it.
>
> **Interview 20, Sustainable housing consultant**

With the correct operation of either Passivhaus or Smart home type low carbon houses seen as central to achieving any reduction in household energy use and emissions,

concerns were raised (as discussed above) regarding whether the public were capable and willing to adapt to these new housing systems:

> [I]f you live in a passivhaus and you don't operate it the way that it's intended to be, would you actually use more energy than a normal house? I don't know the answer to that, it would be interesting question. So I think there are some people, well there are lots of people probably who could live in passivhaus buildings and could operate them pretty close to the way they're meant to be and therefore would achieve significant energy saving.
>
> **Interview 2, Professor of architecture**

Interestingly, while both the Passivhaus and the Smart home visions aim to design out the influence of the occupant on household energy use and carbon emissions, they do it through very different technological configurations; the Passivhaus employing extremely high levels of thermal efficiency in order to passively minimise energy use in the home, while the Smart home is able to take direct control of heating, lighting and appliances. However, both these approaches still require occupants to incorporate new systems of energy use within their everyday lives, and opinions were split as to whether the individuals were capable of adapting sufficiently to these new technologies.

The need for simple designs and technologies was thus continually stressed, whether taking the approach that reducing energy use needed to be achieved 'as passively as possible, with as little reliance on green bling as possible' (Interview 9, Sustainability architect), or designing high-tech systems that were simple to understand and easy to control. These concerns led to suggestions that housing be reconceptualised as a service provider, advocating that in the future, housing should be adaptable and easy to use, with technology working behind the scenes to provide all the desired services such as warmth, light and space; thus moving towards 'a system a bit like the car, where [householders] just have to get the car serviced' (Interview 10, Professor of energy

systems), with little knowledge of how these systems work. As such, it is clear that while the visions described above at first appear to be focused primarily on the technical configuration of low carbon housing, they are also intimately bound up with broader discursive imaginaries of the public, and the way in which occupants may interact with new forms of housing. With both the Passivhaus and Smart home futures envisaging the houses themselves as the solution to reducing emissions from housing, the occupants, and the public more widely, were often perceived as the primary barrier to achieving this goal.

Demonstrating a strong reliance on the deficit model of public understandings of science (*Sturgis and Allum*, 2004), public knowledge (both in terms of technology specific information and a wider understandings of climate change and the need to reduce carbon emissions) was considered a key barrier to achieving this goal. The perception that 'people don't understand technologies' (Interview 5, Housing and construction expert) was a strong theme within the expert discourse, underlying concerns around the correct operation of low carbon housing and leading to the suggestion that 'it takes a certain type of personality to live in and operate a passivhaus in the way that it needs to be operated' (Interview 2, Professor of architecture). With low carbon houses presented as a technological solution to reducing emissions from housing, the public were thus largely characterised as a barrier to achieving this:

> You know that, human nature is a wonderful thing. Sorry, it's building a house. The house is fine, it's putting the people in that's the problem [laughs].
>
> **Interview 1, Civil engineer and Welsh policy expert**

In addition, expert conceptualisations of the public more widely paralleled previous findings in this area (*Besley and Nisbet*, 2011; *Maranta et al.*, 2003). Whilst the complexities of these understandings varied between individual experts, members of the public were still generally described as part of a homogenous group. More complex understandings

often relied on the, now commonly adopted, Department for Environment, Food and Rural Affairs population segmentation model, which splits the public into seven groups (positive greens; waste watchers; concerned consumers; side-line supporters; cautious participants; stalled starters; and the honestly disengaged) based on their willingness and ability to adopt pro-environmental behaviours (*DEFRA*, 2008). Although not necessarily referring to any one of these groups specifically, the public as a whole were however generally divided into two broad groups, a small minority who were concerned for the environment and interested in taking action, and a majority who would be either actively against the concept of low carbon housing and technologies or simply have other priorities.

In particular, the visual appearance of homes was seen by many interviewees to be a key barrier to public acceptance:

> [T]he only one that anybody liked was the one that looks like a traditional house, [...] it just tells you about what goes on in people's minds, what's their aversion. And it's about funky designs, they don't like it, they want houses.
>
> **Interview 5, Housing and construction expert**

This led to the assumption that low carbon houses simply needed to look 'normal' (meaning as close to traditional terrace or semi-detached houses as possible) in order to improve adoption rates. Possibly stemming from recent reports around the hassle factor associated with adopting home retrofit measures (*DECC*, 2013c), the hassle and disruption from both the installation and use of low carbon housing and technologies was also considered a significant barrier to adoption. This led to a generally narrow conceptualisation of a public that could not (or would not) pay the extra cost of low carbon homes and technologies, or even if willing and able to pay, would be put off by the hassle and disruption of installing and using new technological systems.

In conclusion, this imagining of the public thus acts to further enforce the idea that low carbon houses need to act as machines, with technologies working in the background to reduce carbon emissions below the level of occupant awareness, providing a vision of the future, which on the surface at least remains largely within the socio-economic status quo. Through their investigation of socio-technical imaginaries, *Jasanoff and Kim* (2009) discuss how shared visions of the future can be seen to shape social order, embedded within policy, scientific knowledge and technologies. Whilst the concept of a single technology, a low carbon house, cannot be understood on the same scale as the national visions of the future they describe, the metaphor of homes as machines acts to promote the idea that low carbon houses are themselves a solution to climate change. As such, this metaphor can be seen to follow the dominant Eco-technic logic of sustainable housing identified by *Guy and Farmer* (2001), resonating with the techno-economic paradigm embodied within the term low carbon (*Nerlich*, 2012) and the discourse of *Ecological modernisation* from which it arose. Interestingly, aiming to design out the influence of occupants on household energy use, both the Passivhaus and Smart home visions fit within *Lovell*'s (2004) Smart Housing storyline, acting as technical solutions to reducing carbon emissions and minimising the need for lifestyle change.

Despite advocating the need for rapid action to tackle climate change and move towards a more sustainable housing stock, expert discourse thus echoes the policy and media discourses (presented in Chapters 4 and 5), naturalising a techno-centric approach and reinforcing the message that reducing emissions from housing will not present a challenge to current lifestyles and practices. However, embedded within this is the assumption that removing or reducing occupant control over household energy use will be effective in reducing carbon emissions from housing. This assumption to some extent directly contradicts the concerns regarding the need for the correct use of low carbon houses and technologies and a professed desire for the public to become more 'carbon literate' (Interview 5, Housing and construction expert) and engaged with energy use in the home.

CHAPTER 7

Public constructions of low carbon housing: The influence of terminology

Public understandings are multifaceted, drawing on a range of discourses, as well as personal values and experiences, to give meaning to ideas and phenomena (*Fischer et al.*, 2012). Following the discussion of the meaning of low and zero carbon housing within expert discourses (Chapter 6), this chapter now turns to investigate the concept of low carbon housing within public discourses. Based on deliberative discussions within five focus groups (see Chapter 3 for further details), this chapter focuses on the terms low energy and low carbon house as they exist currently with public understandings. Despite a general lack of awareness of these terms, or their meanings, interpretations were constructed, as participants drew on broader discourses of energy and the environment, as well as personal knowledge and experiences. The terms low energy, low carbon and eco- house were found to have considerably different meanings when constructed in this way, contrasting the often interchangeable nature of these terms within policy and media discourses. However, while these terms are discussed separately below, it is important to note that the distinctions between these categories were blurred within participants' discussions and were not always agreed upon, but the result of consideration of the language and distinctions made through discussion and debate. Following a description of the different meanings ascribed to these terms, this chapter goes on to discuss the role of language in determining public understandings,

assumptions and acceptance of previously little known concepts; demonstrating how these terms shaped public understandings of the purpose and effectiveness of low energy and low carbon houses, as well as assumptions regarding the lifestyles that accompany them, these houses were imagined as a technical fix, reducing energy use and carbon emissions respectively whilst requiring little or no lifestyle change.

7.1 The different meanings of low energy, low carbon and eco- housing

7.1.1 What makes a house low energy?

While the term low energy housing was not considered to be common in everyday life, it was nonetheless easily interpreted, rapidly bringing to mind a range of different meanings. Broadly understood to be 'a house that uses little energy' (Russell, Focus Group 3: Church group, King's Lynn), the most common interpretations revolved around energy conservation measures. The concept of a low energy house was primarily understood in relation to the low energy features that a house may have, rather than through an image of what it might look like. For this reason, the design of the house itself was not seen to be particularly relevant, with discussion dominated by energy efficiency measures, such as cavity wall and loft insulation, as well as double- or triple-glazing. Low energy houses were thus believed to have a low energy requirement, leading to a reduced need for heating and lower energy bills:

> **Gareth:** [A low energy house] would be different, because probably you'd have lower bills wouldn't you. And we probably wouldn't have the oil fire in here, because if you had more insulation in here, you probably wouldn't need hardly any heating at all.
>
> **Focus Group 2: Farming community, Newcastle Emlyn**

Despite the focus on energy conservation, on-site electricity generation was still considered a relevant feature of low energy housing, following the understanding that creating your own energy effectively reduced energy bills, as you were not paying for energy from the grid. Renewable energy sources were also seen as a way to 'generate energy to offset any energy that you do use' (Louise, Focus Group 1: Postgraduate students, Cardiff) from the grid. However, interestingly, the inclusion of renewable energy sources within understandings of low energy housing was a point of confusion for many, who, due to the association with climate change and environmentalism, were uncertain whether to classify this feature as low energy or low carbon.

The low energy concept was generally seen as something that was realistic and achievable, and a desirable step towards reducing energy use and carbon emissions in the home, with the idea that homes would no longer need to use energy, whilst retaining the warmth and comfort that energy provided particularly appealing:

> **Russell:** Well it doesn't need to use energy does it. Like you said, you barely need to turn the heating on because of your insulation. So using little energy, because you don't need to.
>
> **Focus Group 3: Church group, King's Lynn**

For this reason, all homes were generally thought to be capable of becoming low energy houses, due to the ability to retrofit existing houses with energy efficiency measures and renewable energy technologies. Several participants also expressed the perspective that their existing homes were already low energy, describing how they were well insulated and had (in their opinion) low energy bills, questioning whether in fact they were already living in a low energy house and highlighting the ordinary everyday understandings of the concept of low energy:

> **Edna:** Well that's why I feel at the moment my bungalow is low energy. Because it's been seen to outside, the cavity walls and that, so I don't need a great deal of heating. And whether you

class that as low energy. Is there any other form of low energy?

Focus Group 3: Church group, King's Lynn

7.1.2 What makes a house low carbon?

In contrast, the term low carbon house was less clearly understood, with many admitting to having never heard the term previously and unsure of its meaning. For this reason, the meanings ascribed to the term often arose through discussion, as questions over the credibility of labelling houses as low carbon was debated. While renewable energy sources were considered an important element of low carbon housing, the most prominent focus of discussion was the importance of utilising low carbon materials and products during construction. Requiring consideration of the materials used and/or the energy required to construct the house, a low carbon house was thus seen as something more than just one which consumed little or no energy from the grid:

> **Mervin:** I always think of a low carbon house as being something that is built from materials that have not, they're not possibly the best materials [technically speaking] and in cases they're almost impossible to put in, but are sourced locally.

Focus Group 5: Environmental group, Barmouth

Demonstrating an implicit understanding of embodied energy, the idea that carbon is emitted as a result of the energy used to produce, manufacture and transport materials for construction was a key consideration in classifying a house as low carbon. The high carbon content of construction materials such as concrete and their incompatibility with the concept of low carbon housing was thus a prominent focus of discussion, and seen as a key determinant of the carbon footprint of a house. Due to the short transport distances required, local materials were generally considered lower carbon. In addition, the carbon needed to produce energy efficient or low carbon products such as double glazing units and photovoltaic solar panels was also considered highly relevant.

Questioning the idea that through efficiency improvements, these products payback the carbon that has been used in production and construction, the difficulty in determining the true carbon footprint of a home is highlighted:

> **Mervin:** I heard a very interesting theory today, that double glazing or triple glazing is not low carbon. Because 1) on build it would take two lorries as opposed to one lorry to bring the glass in, and 2) double glazing panels fail with unerring regularity, so they have to be changed more, when you'd never get that with a single glazed window.
>
> **Frank:** Single glazed windows smash more easily.
>
> **Mervin:** Pardon?
>
> **Frank:** Smash more easily. Footballs, cricket balls [laughs].
>
> **Mervin:** Ahhhh. No, not particularly, you'll still find. Yes I suppose you're right.
>
> **Mary:** It's not simple is it?
>
> **Focus Group 5: Environmental group, Barmouth**

Combining these issues, the need for carbon savings achieved through the reduction of energy use in the home to balance or exceed the embodied energy used in the construction of a low carbon house was therefore considered key for the categorisation of a house as low carbon:

> **Glen:** Yeah, so if you live in a so-called low carbon house, how much carbon have you used to build that, or create, there's got to be industry somewhere that's making that stuff. I can't think, you can't really make things without making some pollution. So even if you're making a low carbon
>
> **Russell:** [Interrupts] Or it's how much, it's working it out isn't it. It takes so much to make this house, how much to make this

house.

Glen: It's balancing one against the other.

Focus Group 3: Church group, King's Lynn

Taken to the extreme, this focus on the importance of embodied carbon led to the idea that even the length of time a house could be used for was important, and should be taken into account before the true carbon credentials of a house could be established:

Mervin: You'd be lucky to get a wooden house to stay up more than 100 years, whatever they do.

Frank: Yes, there's been no energy spent in rebuilding, well there has been actually, we redid some of them didn't we. But yes, potentially if you get an old house.

Jane: Cost per decade [laughs].

Mervin: Well, when you're doing costing, should you add in the decades? It's going to last longer, so should that be part of the formula?

Focus Group 5: Environmental group, Barmouth

7.1.3 What makes an eco-house?

Introduced repeatedly by participants, the term eco-house signified a third distinct interpretation of a low carbon/energy house that was rooted in popular culture and provided a more immediate and commonly shared image, in comparison to the terms discussed above. The term eco-house was often linked explicitly to known examples of autonomous eco-houses, seen within the media and in particular TV programs, such as Grand Designs, as well as to personal experiences of visits to existing eco-houses, such as those seen at the Centre for Alternative Technology. The design and visual aesthetics of eco-houses were seen as a key element of an eco-house, with the term ground house, as well as terms from popular culture such as 'Teletubby house' and

'Hobbit house' (Focus Group 1: Postgraduate students, Cardiff), used repeatedly to reference the more unusual design of these houses.

In some ways similar to descriptions of a low carbon house discussed above, the type and localness of construction materials was also considered an important characteristic of eco-houses. However, descriptions of this type of house were more detailed, highlighting the more unusual features and materials, such as grass roofs and straw bale walls. In contrast to low energy houses, eco-houses were therefore generally considered to be outside the realms of ordinary housing developments. Described as individual and bespoke, eco-houses were thought of as one off homes, often self-built by the owners or constructed to demonstrate an alternative way of living. These homes were thus deemed to be the pinnacle of environmentally friendly living, placing them well beyond the normal everyday home that the average member of the public would aspire to:

> **Russell:** Yeah, well they're extreme low energy aren't they. So yeah, they'd look different, you're talking about eco-houses they look very different. So underground houses and houses that are made out of something completely different.
> **Edna:** And on the roof they have gardens.
> **Russell:** That's right. So obviously they look very different.
> **Glen:** If this was the motoring world, they'd be the Formula1.
>
> **Focus Group 3: Church group, King's Lynn**

7.2 Drawing on discourse: Making sense of low carbon housing

Highlighting how terminology acts to configure public understandings, the terms low energy, low carbon and eco- house have been shown to lead to considerably different meanings when interpreted by members of the public. The only pre-existing term

within public understandings, the concept of an eco-house was associated with a distinct discourse outside that of climate change and energy, reflecting the *Sustainable living* storyline identified within Chapter 5. First appearing in the early 1970's (*Benz*, 2000; *Russell and Porter*, 1972), the concept gave rise to a specific and shared conception of alternative housing, similar to that associated with the sustainable housing coalition (*Lovell*, 2004), albeit altered by the more modern and high-tech discourse within popular culture such as that presented by the Grand Designs television programme. In comparison, the terms low energy and low carbon were less commonly known and understood, with the meanings of these terms often ascribed through group discussion and personal consideration in the context of existing knowledge. Wider discourses of energy use and the environment were thus called upon to construct understandings of these less familiar terms. Whilst to some extent overlapping, this process of meaning making led to quite different interpretations of the concepts of low energy and low carbon housing by members of the public, despite the often interchangeable nature of these terms within other discourse domains.

A more relatable idea, the concept of a low energy house was thus closely linked to prior understandings of energy use in the home, leading to the perception that low energy housing was an achievable ideal, both at home and in the existing housing stock more widely. Drawing on ideas around energy conservation in the home, this term was primarily interpreted as relating directly to the energy efficiency and heating systems of the house and the desire to reduce personal energy bills. This perspective is linked to both the everyday experience of energy use, as well as a wider political and media discourses (as discussed in Chapters 4 and 5) that stem from the proliferation of energy efficiency programmes since the 1970s (*Parnell and Larsen*, 2005). In contrast, the term low carbon house was less immediately clear, with meanings shaped through extensive discussion and debate. With the focus of low energy housing focusing on reducing the energy consumption of the house in use, the concept of low carbon housing was in contrast deemed to centre on the need to consider the carbon embodied within the

materials and products used to construct the house.

The different meaning ascribed to this term can be understood through a consideration of the wider discourses of environment that informed the discussion and provided the basis on which understandings of low carbon housing were constructed. Rather than connecting carbon emissions to energy production and demand (the dominant perspective within expert and policy discourses), the concept of carbon and broader understandings of the need to reduce carbon emissions was strongly linked to wider public discourses of the environment. Whilst climate change did for some represent a part of this concern, tackling a broad range of environmental issues was seen as the dominant reason to reduce carbon emissions from all areas of society. Echoing previous research (*Darier and Schüle*, 1999; *Fischer et al.*, 2012; *Butler et al.*, 2015), the depletion of natural resources, concerns regarding the possibility of peak oil, and a broader desire for sustainability, as well the importance of reducing pollution and environmental degradation, were thus seen as equally important, merging together to form a wider discourse of concern for the environment. Termed *Environmental concern*, this public discourse is discussed further within Chapter 9.

Contributing to the high importance placed on the consideration of embodied carbon and the materials used within construction, this link between the term low carbon house and wider discourses of environmental concern is of particular interest. More widely known carbon related terms, such as carbon neutral and carbon footprint, were central to this understanding, most likely because they provided an easily accessible idea though which to understand the concept of a low carbon house. Over recent years, the term carbon footprint has become more commonplace, with a recent survey suggesting that 48% of participants claimed to understand the concept (*DEFRA*, 2009). Referring to the total amount of carbon dioxide emitted either directly or indirectly as the result of a particular object or person and the impact this has on the environment (*OED*, 2014), the term has become particularly associated with product labelling and purchasing. This broader contextual knowledge may, in part, be the reason for the focus

on materials and emissions associated with production, transport and construction of low carbon housing, highlighting how an intrinsic understanding of embodied carbon shaped their understanding of the concept, both in terms of what a low carbon house was, and its credibility as a valid option for reducing emissions from the housing stock.

The way in which different discourses of energy and the environment are drawn on to give meaning to the terms low carbon, low energy and eco- house, highlights the importance of broader discourses, or linguistic repertoires, in shaping public understandings. In making sense of new concepts, individuals thus draw on knowledge available from a range of different spheres, including policy and media discourses, as well as wider social discourse and personal experiences. The influence of media and popular culture is particularly well demonstrated by the establishment of the concept of an eco-house within public understandings; while the separation between discourses of energy and carbon (and thus climate change) is also in part likely to be influenced by the changing policy conceptualisation and media coverage of these issues (as discussed in Chapter 4). However, despite the role of the media in making a connection between the public and policy discourses (*Painter*, 2013; *Mautner*, 2008), the dominant policy understanding of a zero carbon house (as defined in Chapter 1) was absent within public understandings of low carbon housing, possibly due to the low profile of this concept within the media.

In addition, public understandings of the concept of low carbon housing make little explicit connection with wider climate change discourse, demonstrating how, for these participants at least, the term and concept of low carbon is not automatically associated with climate change mitigation (as seen in the policy, media and expert discourses of low carbon housing). For this reason, this term had none of the connotations of *Ecological modernisation* attached to other definitions of a low carbon house, and was associated with the values of environmental concern and responsibility. However, low carbon housing was equally disconnected from the more extreme green values and ideology (and more radical lifestyle changes) advocated by the environmental movement, contrasting those linked with the term eco-house. The terms low carbon, and in the most part, low

energy, house were thus still interpreted largely as a technical fix to reducing carbon emission and energy use from housing respectively.

With its roots located within national climate change mitigation discourse (*Koteyko*, 2010), the term carbon footprint enforced the idea of a low carbon house as an environmentally friendly product, implying that the purchase/construction of the house itself represented the mechanism for reducing carbon emissions, rather than the choices and lifestyle of the occupant. This had the effect of further distancing the issue of behaviour change from discussion of low carbon housing and reinforcing the logic of green consumption as a solution to reducing emissions from housing. This is particularly interesting, suggesting that the term carbon footprint has become primarily associated with the production and transport (and in relation to housing, construction) of a product or material, not necessarily incorporating the energy used by or within it (as implied within a broader use of the term and campaigns such as Act on CO_2 – although this understanding is likely to be different when considering the personal carbon footprint of an individual).

In contrast, whilst still conceptualised largely as a technical solution for reducing energy use through new energy efficient features and technologies within the house, the concept of a low energy house was indirectly connected to discussion of reducing energy use within the home through personal behaviour change. This concept was thus in a small way connected to the pervasive use of the *Small actions* repertoire within climate change discourse in part due to the assumption that a low energy house would have low energy bills, leading to a focus on how to further reduce home energy bills though actions such as turning down heating and switching off lights. As highlighted in Chapters 2 and 4, a focus on individual responsibility for tackling climate change has been purposely promoted, via the Act on CO_2 campaign among others, to encourage personal behaviour change as a way of reducing both energy bills and carbon emissions from the home simultaneously; an influence which is likely to have been strengthened by the recent shift of Government discourse towards energy efficiency and demand reduction.

In conclusion, this chapter has demonstrated how the largely unknown term low carbon housing is translated and understood within public discourses, and the influence that the use of different terminology, such as low energy and eco- house (terms that are often used interchangeably within media and policy discourses), has on public understandings. The different understandings generated by these terms highlight the importance of language and discourse, demonstrating how processes of sense-making influence the way publics understand new terms such as low carbon housing. This may in turn shape understandings of the purpose of low carbon housing, its effectiveness and the lifestyles that accompany it. Seen primarily as a technical fix to either reducing energy use within the home or reducing the impact of carbon emissions on the environment respectively, low energy and low carbon houses were thus generally assumed to have few implications for the everyday lives of the occupant. In this way it could be suggested that the terms low energy and low carbon house themselves may act as barrier to reducing emissions from the domestic sector, making it difficult to perceive the social and cultural implications of transitioning towards the low carbon housing stock envisaged by policy-makers and experts.

CHAPTER 8

Changing socio-technical configurations of home: Public perceptions of low carbon housing

As discussed in Chapter 2, despite extensive research into public understandings of climate change, little consideration has yet been given to understanding public perceptions of specific mitigation options, such as low carbon housing. However, with attempts to reduce carbon emissions from the housing sector particularly relevant to the everyday lives of ordinary people, public perceptions and understanding of low carbon housing is likely to be influential, not only on the uptake of new homes and technologies, but also on their effectiveness. Following the general lack of awareness of the terms low carbon and low energy housing, discussed in Chapter 7, this chapter sets out responses to a total of twelve different houses, presented within photo and video elicitation exercises (see Chapter 3 for further details). Four key themes emerged throughout the discussions, namely the: *social acceptability*, *technical configuration*, *affordability*, and *environmental credentials*, of low carbon houses in relation to both new build low carbon housing and the low carbon retrofitting of existing homes. Whilst other important themes such as the importance of family and community within the home were identified, this chapter focuses primarily on the aspects of the discussion that were directly related to the implications of living within a low carbon house. Building on *Parkhill et al.*'s explication of the role of social values in shaping public perceptions of energy system change and their 'strong explanatory power for interpreting why people's

preferences are the way they are' (*Parkhill et al.*, 2013, 38), this chapter sets out the role of wider values of comfort, control and security surrounding the meaning of home in shaping perceptions of low carbon housing. Whilst recognising the connections with the existing behaviour change literature (*e.g.*, *Shove*, 2003; *Gram-Hanssen*, 2010; *Groves et al.*, 2015), especially in relation to themes such as the comfort and the everyday practicalities of low carbon housing, this chapter does not attempt make assertions regarding the implications of these findings for the achievement of carbon emissions (or energy demand) reductions, but instead focuses on how participants perceived these themes to be of relevance in forming opinions regarding the acceptability of low carbon housing options.

8.1 The social acceptability of low carbon housing

The most prominent theme arising from the discussions of low carbon housing options revolved around the social acceptability of these homes. This concern can be broadly divided into two separate, but interconnected considerations; first regarding the acceptability of the house itself, and second that of the broader social and spatial context in which the house is situated.

8.1.1 Normality and a 'homely' house

As with any home, the visual appeal was a key factor in determining personal opinions of low carbon houses, to some extent reflecting the findings of the NHBC survey discussed in Chapter 2 (*NHBC*, 2012). Although participants were aware of many forms of low carbon housing, and did not reject the concept simply on the basis of visual aesthetics, when considering their willingness to live within specific properties, style and character were clearly extremely influential. While personal preferences were varied and diverse, it was clear that for many participants these views originated within individual perceptions of what home means to them, focussing on ideas of normality

and homeliness. The idea that a house should look like a house was a common theme, with a number of participants highlighting the desire for a 'normal' home:

> **Glen:** I think we've figured out why [we like photo] No.3, because it's more or less what we know as a house. It's not gone wild, sort of avant-guard sort of stuff. It's still recognisably a house.
> **Russell:** [Interrupts] It's got a conventional look to it.
>
> **Focus Group 3: Church group, King's Lynn**

For many the appearance of some low carbon housing options was just too unusual to be considered, with some participants strongly opposed to houses that they did not identify with as homes, commenting that they looked 'space-agey and weird' (Gemma, Focus Group 1: Postgraduate students, Cardiff) or 'cold and sort of experimental' (Peter, Focus Group 5: Environmental group, Barmouth). With preferences varying from traditional urban terrace and semi-detached homes, to modern new build estates and isolated farmhouses, the ideal home was of course different for every individual. While often it was primarily the aesthetic value of period features, for many these preferences appear to have been rooted more deeply in the memories of childhood homes. Combined, these factors thus led to the consideration of only particular styles of housing, such as Victorian terraces, with which they felt a deeper personal or historic connection, and considered worthy of making home:

> **Sarah:** My issue with things like that box house [photo No.1] is it's too modern. It doesn't have any nice features. It doesn't have any connection with me like old looking houses.
>
> **Focus Group 1: Postgraduate students, Cardiff**

However, while the traditional features of a Victorian terrace or semi-detached house were for some integral to feeling at home, others were more open minded and excited by the possibility of a modern and unique home. Despite their unusual appearance, even the most unconventional low carbon house was sometimes described as full of character

and style, when compared with more 'generic' new build housing based on 'the look of it. It's like iPhones and iMacs isn't it, it looks sharp, modern, cool' (Russell, Focus Group 3: Church group, King's Lynn). Many aspects were considered, including colour, symmetry, the proportions of features such as windows and doorways, construction materials and the addition of solar panels, all of which were felt to contribute to the overall 'feel' and homeliness of the house. Internal design was also important and seen to have a significant effect on homeliness, primarily through changing the space and light within a house, with descriptions of low carbon houses ranging from dark and enclosed, to too open and lacking cosiness:

> **Chris:** That's fine, that's your opinion that you like [photo No.3]. I think that's horrid.
>
> **Louise:** I think it's because even with the windows it still feels quite closed off. I don't know why. A lot of these low carbon or energy efficient houses seem quite closed off.
>
> **Focus Group 1: Postgraduate students, Cardiff**

A homely house, was seen to be something that you created, with the 'atmosphere' of home seen as a combination of both sensual and physical elements of concepts such as comfort and style, echoing the findings of *Devine-Wright et al.* (2014) who highlight the importance of comfort, cosiness and glow in the successful introduction of low carbon heating sources. Considered by far the most important aspect of 'home', comfort predictably played a key role in perceptions of what made a homely house and without it many of the other aspects discussed became irrelevant, mirroring the findings of *Fudge and Peters* (2011) regarding the non-negotiability of warmth and comfort in modern everyday life. Although often discussed holistically, the concept of comfort within the home can be broken down into a number of areas, primarily warmth, light and noise. Most strongly associated with comfort was warmth and this was often the first priority in creating a 'homely' house:

> **Theresa:** But when you talk about warmth, I mean there's no atmosphere in the house, because without having the heating on, there's no feeling. It's like no one lives there. Because my brother has never got his heating on ever [...] and his house never feels homely, ever.
>
> **Focus Group 4: Grangetown local residents, Cardiff**

Warmth was often seen as a prerequisite for happiness and entailed not only direct control of the temperature within the home, but also the speed and location in which this could be altered.

Style and character inside the house were also considered by many to be particularly important, and was not seen as something you could simply purchase. This primarily revolved around decor and personalisation, and the need to be able to put your own stamp on the house. While there was clearly an aesthetic component, this was also discussed in relation to forming and projecting personal status and identity, as well as keeping alive the memories of people and places from the past. Furnishings, decoration and personal belongings were thus seen as crucial, and many suggested that almost anywhere could be made homely in this way, as long as you had the control and ability to do so:

> **Claire:** For me, I'd say, when you do renovations, and this doesn't matter what scale. It might just be decorating, but when you actually put your own mark on it, that's when it becomes home to you, it might just be a colour scheme or it might be knocking walls down.
>
> **Focus Group 2: Farming community, Newcastle Emlyn**

8.1.2 Socio-spatial configurations of home

Further to the features of the home itself, participants discussed how important aspects of place, space and location influenced the feeling of home. In many ways, the importance of location when discussing low carbon housing remained the same as that of choosing any home, including desires to live in: a particular setting (countryside, suburb or city) or landscape (mountains or seaside); within the area in which you grew up; or more practically, in close proximity to work, school or family commitments. More relevant to the design of new low carbon homes, was the issue of space, with many participants highlighting either the size of the house and/or gardens as crucial to a good quality of life. Comparable to a form of comfort, this was primarily related to issues of privacy and the need for personal space, separating you from your neighbours and excessive noise (often associated with bad neighbours or busy road locations), and was seen as a problem that could make even the perfect house unhomely.

The configuration of the local neighbourhood within which the house was situated thus had a significant influence on the acceptability of low carbon housing. The proximity between dwellings and the amount of personal space available was seen to be of crucial importance in judging the acceptability of specific properties:

> **Deborah:** Well I think having us all live on farms, the thought of some of these places all crunched in together with no privacy is really hideous.
>
> **Focus Group 2: Farming community, Newcastle Emlyn**

This feeling was even stronger when discussing more densely populated options, with housing complexes and apartment buildings described as akin to 'rabbit hutches' (Daniel, Focus Group 3: Church group, King's Lynn). The architecture and social configuration of this type of housing was believed to constrain occupant identity, where all residents must 'wear the same, look the same, have the same car' (Lisa, Focus Group 4: Grange-

town local residents, Cardiff), leading to a loss of individuality:

> **Frank:** The thing about [photo] No.5 is it hasn't got any individuality. You're one of a mass of people living in a block. Some of the windows are different shapes. They've tried to make it sort of interesting. But actually there's nothing about that window which distinguishes you from anyone that lives behind that window, or that one. It's just part of a homogenous block.
>
> **Focus Group 5: Environmental group, Barmouth**

Different housing configurations were often seen to be associated with people from different backgrounds and at different stages of their lives. Some housing was thus only deemed 'appropriate' housing for certain people or situations, such as for a single individual living alone in a 'bachelor pad [like photo No.5]' (Russell, Focus Group 3: Church group, King's Lynn) or when renting rather than buying a house. For this reason, many of the houses themselves invoked connotations of the types of people, from different social backgrounds, who may live there, echoing the work of *Costello* (2005), who demonstrates how high-rise apartments have become synonymous with working-class and racial stereotypes of their occupants. The level to which participants identified, or otherwise, with these imagined occupants was therefore also influential in determining the acceptability of properties:

> **Susan:** [Photos] No.4, No.5 and No.2, I know exactly what type of people are going to be there, and I don't want to be there [laughs].
>
> **Ethel:** Susan, you can't say that.
>
> **Susan:** I can, I can. In No.5 will be upwardly mobile, double income no kids people [laughs].
>
> **Focus Group 4: Grangetown local residents, Cardiff**

Linked to considerations of design discussed above, this concern also extended to the

appropriateness of the housing for the local and cultural context in which it is set. For some houses, this was reflected in rejection due to a lack of fit with place based cultural aesthetics and ideals, such as not being appropriate within a traditional countryside location. For others however, it was the social connotations that the house itself evoked, such as resembling council housing estates, or even a 'cheap Butlin's holiday' home (Mike, Focus Group 1: Postgraduate students, Cardiff).

8.2 The technical configuration of low carbon housing

Considering low carbon housing options in more detail, the second major theme to arise centred on the technological configuration of the house and its energy supply and can broadly be split into three discussions: the acceptability of new technologies within the home; the influence these technologies may have on everyday life; and the risks involved within the adoption and use of these technologies.

8.2.1 New technologies in the home

As a concept, transitioning towards the use of renewable energy sources was popular, and in principle at least, participants were not averse to adopting these new household technologies in the future. In relation to both new and existing homes, photovoltaic solar panels were by far the most well-known and least controversial renewable energy source. Considered the only viable micro-scale electricity generation systems, many participants demonstrated extensive knowledge of both photovoltaic and solar hot water panels, and in some cases had direct experience of installing them in their homes. Others had tried (and failed) to adopt solar panels, or been offered them through Government or energy company schemes. In addition, many had a more indirect knowledge through the experiences of friends and family. However, despite this support in principle, a number of issues and concerns were also raised. Whilst the relatively high upfront costs were seen as prohibitive to many (as discussed below), concern about the unstable nature

of national energy policy led to a reluctance to consider investing in new technologies, with trust in the Feed in Tariff scheme, and the Government more widely, partially responsible for this, due to the complex and shifting price tariffs:

> **Deborah:** But they keep changing the goal posts, because the feed in tariff has just gone down and down and down.
> **Gareth:** Yeah, as more people go in and they think 'oh we can't afford this anymore' so they drop it down.
>
> **Focus Group 2: Farming community, Newcastle Emlyn**

Looking to the future, harnessing solar energy was however generally seen as a key component of the national energy mix, with knowledge of current technological innovations, such as inbuilt solar roof tiles, used to moderate objections to this technology on the basis that there would soon be no need to make trade-offs between reducing emissions and visual appearance.

While renewable electricity sources were generally well received, transitioning towards new low carbon/low energy heating systems within the home was a topic of extensive discussion, with the personal biomass boiler (presented in video No.1) proving the most controversial, leading to its dismissal due to both practical and safety concerns (discussed below). With several participants already aware of the concept, the Passivhaus (such as those seen within video No.3 and No.5) was popular. Whilst low energy bills were clearly a factor, the simple design, focus on energy efficiency, and comfortable nature meant these houses were appealing on a number of levels. Possibly due to the connection with this popular concept, MVHR ventilation systems (seen in video No.1 and No.3) were also reasonably well received. However, a number of concerns were raised over the implications this system would have on the comfort and atmosphere of the homes, due to the 'noise pollution' from the system's 'constant whir' (Gemma Focus Group 1: Postgraduate students, Cardiff), which despite the noise of existing technologies, such as boilers and radiators, was seen as intrusive. Some participants

also demonstrated a high level of knowledge about air source heat pumps, explaining the mechanism to other members of the group as 'like a fridge working backwards' (Daniel, Focus Group 3: Church group, King's Lynn). Questions were raised however surrounding the effectiveness of their use, as well as the possibility of further noise.

Despite prior research to the contrary, few participants saw an issue with the associated changes in the configuration of the home, such as the removal of radiators, with many in favour of removing them to give more space and flexibility within the home:

> **Glen:** Yeah, as long as the house is warm.
>
> **Russell:** Yeah if you don't need radiators. You've only got radiators because you need them to heat your house. If you're heating it in different ways, you don't need radiators.
>
> **Glen:** If you don't have radiators you don't drape damp washing over them to dry them out and put damp into the air.
>
> **Russell:** They are nice for putting a towel on and trousers. I think I'd miss that.
>
> **Focus Group 3: Church group, King's Lynn**

This finding is interesting, as *Devine-Wright et al.* (2014) demonstrate that while low carbon heating systems may reach the required temperature deemed to be acceptable with a home, this may not satisfy residents' personal experience of comfort for a range of reasons, also suggesting that Passivhaus homes may be unsatisfactory for many people due to the lack of a direct heat source. However, while most participants were not initially concerned about this new heating configuration, this may in part be due to the lack of personal experience with such changes.

In contrast to new low carbon energy and heating systems, as well as the Passivhaus concept, public awareness of current developments in smart and automated technologies or the concept of a Smart home was low. The idea that smart technology could increase personal control over home energy use was generally supported, with the idea

of controlling your heating while away from home seen as very appealing:

> **Chris:** I've got nothing against that. As long as it would be easier for me to use than the dodgy dial on the wall that doesn't seem to do much.
>
> **Louise:** Yeah, you can properly regulate things a lot more effectively.
>
> **Gemma:** Yeah, there's a new thing you've got on your phone. You can get an app where you can turn the heating on before you get home, which means you can make your house warm.
>
> **Focus Group 1: Postgraduate students, Cardiff**

Attempting to make this technology more understandable, analogies were made to existing technologies such as Economy 7 heating, energy monitors and online bank accounts, which although often helpful, could lead to misunderstandings. Most prominently, the common aim of removing control of home energy from the occupant and instead controlling heating systems and appliances automatically (as discussed in Chapter 6) was not guessed. This possibility was viewed with significantly more scepticism being seen not only as a concern in relation to personal privacy and security (discussed below), but also both as practically and financially infeasible, as 'it would be hugely expensive to implement [as everything] would have to have its own little logic device' (Mervin, Focus Group 5: Environmental group, Barmouth).

8.2.2 Everyday practicalities

The practicalities surrounding the adoption of new technologies (be they included within a new build low carbon house or installed within an existing home) were seen as particularly off-putting, especially in relation to the impact that they may have on everyday routines once installed. Whether considering a new low carbon or renewable energy system or simply insulating the loft, the installation of many new technologies

within your home was seen to be a significant job, involving extensive work, hassle and disruption. Whilst this concern did include the so called 'hassle factor' so often cited as a barrier to home retrofit (especially in relation to insulation - *DECC*, 2013c; *Brown et al.*, 2014), experience of undertaking home improvement measures (both energy saving and otherwise) instead suggested that the hassle and effort involved in gaining planning permission, choosing effective and appropriate technologies and employing trustworthy installers was of greater concern:

> **Claire:** But planning permission. I don't know what it's like for planning permission in a town setting, but there would be projects that I would be put off even beginning, because I would be concerned about spending a lot of money on planning permission to be turned down.

Focus Group 2: Farming community, Newcastle Emlyn

In relation to new build low carbon housing, concerns were also raised surrounding the ability to make functional changes to the house, and the implications these may have on the effectiveness of the house (for example, the impacts of installing a cat flap on thermal efficiency). Linked to concerns around the need for personalisation of the home, the ability to adapt and change your home for whatever reason was deemed to be a non-negotiable aspect of home ownership, leading some to reject new build low carbon housing in favour of the option to retrofit an existing home in a way deemed most personally effective.

Beyond this, the perceived implications of new technologies on everyday life centred primarily around the daily interactions with energy systems within the home and the routines that relied on them. The possibility that low carbon houses and technologies would require an increased level of maintenance in comparison to that currently associated with home ownership was also of concern. The possibility of malfunction and the increased hassle involved in repairing less common technologies, was a key worry, with

many concerned that it would either not be possible or would be very expensive to find the relevant expertise to repair it quickly and at a reasonable cost:

> **Chris:** That's my issue with this. I don't want it to be a burden. I don't want to be going out of my way.
>
> **Focus Group 1: Postgraduate students, Cardiff**

In addition to the new energy technologies incorporated within them, a number of concerns were also highlighted in relation to the quality of new build low carbon houses themselves. Older housing was often seen to be of a much better quality than new build homes due to new construction methods and airtightness regulations, which were believed to make new housing unhealthy and prone to damp, which would be both costly and disruptive to address.

Once installed, many practical issues were highlighted around appropriate and effective use of low carbon/low energy technologies. In contrast to the concerns emphasised by experts (as discussed in Chapter 6), such as the need for correct operation of both Passivhauses and Smart homes in order to achieve energy/emissions reductions, public focus was instead generally on the new routines that would be required. Although, the lack of radiators in Passivhauses was not generally seen as a problem for heating and comfort, questions were raised regarding the implications this would have on the drying of washing indoors, highlighting the need for a dedicated drying area to be provided. A number of issues around space and storage were also raised, particularly in regard to the use of new heating systems and the implications these may have on everyday routines. Here, operating new technologies correctly was often seen as involving significantly more effort, especially when comparing this to conventional boilers. Echoing *Claudy et al.*'s (2011) findings that wood pellet boilers were believed to adversely affect occupant routines, these concerns were particularly salient when considering the new heating systems such as wood burning stoves and the biomass generator due to the increased demands of buying, storing and using wood pellets:

> **Gareth:** A bloke up here, a doctor that lived just next door to the farm he's got one of those I think, because he was out on the side of the road a few months ago and like a lorry load, two pallet loads of bags, wood pellets, and he spent most of the day with a barrow moving these bags into his shed and it's just a lot of work isn't it. When the oilman comes and sticks his pipe in the tank and it's there automatically. Rather than carrying all these bags into the shed.
>
> **Focus Group 2: Farming community, Newcastle Emlyn**

8.2.3 Risky technologies

Safety and security were also seen as critical aspects when choosing a home. Participants raised multiple issues, ranging from fears of crime and the safety of the area in which the house is located, to the risks of power cuts and technology failures, and while some of these risks were universal, many were specific to the adoption of low carbon housing. This echoes previous research investigating public resistance to innovation, which highlights the economic, functional, and social risks of adopting new technologies (*Kleijnen et al.*, 2009). In relation to low carbon housing, these risks were primarily connected to the installation and use of new technologies (either included within a new build low carbon house or installed within existing homes) and generally fell into three categories: fear of financial loss, fear of malfunction and fear of personal danger. With the focus primarily on the economic and functional risks of adopting new technologies, it is particularly interesting, that given the importance of identity in housing choices that social risk, the perceived risk of choices being considered unacceptable by peers or wider society (*Kleijnen et al.*, 2009) was not a particular concern.

Financial security was seen by many to be an important aspect of feeling at home within your house, and many discussed how rising energy bills were adding to this

pressure. For this reason, even if the capital costs of investments in low carbon homes or technologies were available, participants were often concerned about the financial risks they may have to accept. Adopting non-mainstream energy technologies was considered particularly risky, due to the suggestion that innovative technologies may have a shorter lifespan than more conventional systems. This led to a fear that early adoption may lead to financial losses should the technology either fail to become more widely adopted, or become rapidly obsolete. In part, this fear was linked to issues of trust in the information provided by Government and energy companies, as well as previous experience of rapid technological change:

> **Susan:** The thing is, it's like all the people who changed all their catalytic converters in their cars, cost them £300-500 and then the Government all turned round and said you don't need that now. So you can't trust what they're saying half the time.
>
> **Focus Group 4: Grangetown local residents, Cardiff**

A fear that new and immature technology would malfunction and thus leave the occupants vulnerable within their home was common. The possibility of losing power or heating (or both) through malfunction was often seen as a fundamental risk of adopting technologies that were not yet considered mainstream. As discussed above, this anxiety was related to the inconvenience that the disruption of key services would lead to within the household, as well as the hassle and responsibility involved in repairing the system, and, supporting the findings of *Sauter and Watson* (2007), was particularly common in relation to the adoption of micro-scale energy generation technologies. This reluctance to expose yourself to greater risks than those already experienced when using mainstream heating systems was repeatedly highlighted, and led some to the conclude that low carbon/low energy houses would always need 'a back-up generator, and a back-up, back-up generator' (Louise, Focus Group 1: Postgraduate students, Cardiff).

Although rare and often contested, high levels of anxiety were displayed towards the

adoption of new energy generation technologies by some, exposing a fear that they may pose a serious safety threat to occupants. Most prominently the personal biomass boiler was the subject of numerous discussions regarding the possible dangers of living with new technologies, with this perception leading to admissions that they 'wouldn't feel safe at all' (Edna, Focus Group 3: Church group, King's Lynn) and would not be willing to put themselves or their families at risk. Fears over the consequences of malfunctioning smart and automated technology were also raised, both in terms of personal safety in the home and the security of personal information and data:

> **Claire:** I wouldn't feel safe with the electric door.
>
> **Alice:** No.
>
> **Claire:** I would feel unsafe. What if it locks you in? What if it locks you out?
>
> **Eleri:** What if there's a fire and it meant you couldn't get out?
>
> **Focus Group 2: Farming community, Newcastle Emlyn**

While many of the risks above are rooted within a reasonable understanding of the social and technical change that would be required within a low carbon house, several misunderstandings also arose, giving rise to greater fear and anxiety around options for reducing carbon emissions from housing. These ranged from simple questions such as whether solar panels are hot to touch or the possibility of suffocating within an airtight house, to fears that low energy light bulbs might cause cancer.

8.3 The affordability of low carbon housing

The third key theme that arose within the public focus groups related to the affordability of low carbon housing, with discussions generally focusing on either the capital costs or payback times of low carbon houses and technologies. Whilst understood to be a complex issue, discussions centred on issues of personal affordability, as opposed to the

possible broader discussions surrounding the national affordability of policies aimed at reducing national carbon emissions. For this reason, and in contrast to *Butler et al.* (2013), whose exploration of public perceptions of large-scale energy system change highlighted the contested and multifaceted nature of public understandings of affordability, attitudes towards the affordability of low carbon housing were, for the most part, consistent both between and within groups.

Whether for environmental or economic reasons, most participants showed a strong desire to move towards a low carbon/low energy housing sector. However, most also felt that this ideal was currently out of reach for the average citizen, and many believed low carbon homes were only an option for the very wealthy:

> **Mike:** Both could easily have the same. But I mean person in box house, [photo No.1] person in hobbit house [photo No.6], both of those guys are obviously a hell of a lot more well off than any of the others, because they can afford to build their own home.
>
> **Focus Group 1: Postgraduate students, Cardiff**

The increased capital costs involved in buying a new low carbon house or retrofitting an existing home were deemed prohibitively expensive by many, as despite a desire to 'live in a house that saved electricity or brought the bills down' (Glen, Focus Group 3: Church group, King's Lynn), the small supply and high cost of such homes put them out of financial reach. However, while the availability of capital costs was thought to constrain the adoption of low carbon housing and technologies, financial concerns were more complex than simply a lack of willingness or ability to pay. The issue of payback times (the time it takes to recoup the initial investment and begin to make cost savings) was a key concern, and seen as strongly related to the personal and financial circumstances of the individual, as well as to stage of life.

Whether considering choosing a low carbon new build property or investing to improve

the low carbon/low energy credentials of an existing home, personal circumstances were considered highly relevant. A payback time of anything up to 10 years was generally considered reasonable, as 'a timeframe that you can kind of see yourself working on' (Chris, Focus Group 1: Postgraduate students, Cardiff). Retrofitting existing homes with energy efficiency measures, such as insulation and double glazing, was thus seen as the most worthwhile for this reason, as the payback times for other options, and particularly renewable energy sources, were considered unrealistic, given the unpredictable nature of modern life.

In relation to low carbon new build houses specifically, the long payback times presented a greater barrier, due to the slow rate at which savings on home energy bills accrued. In addition, the increased cost of these homes due to their low carbon features was not deemed to add enough value to the house when selling. These concerns were strongest amongst younger participants who currently couldn't afford to buy their own home, and whose desire to get on the housing ladder was dominated by other priorities (primarily cost and location). While age, and personal and financial security generally increased willingness to consider a longer term investment, payback times were still scrutinised. At this later stage of life however, an additional barrier, the desire to remain settled within one's existing home dictated opinions on low carbon new build. In this way, attention thus returned to retrofitting, as with no intention of moving, participants were generally more willing to pay the capital costs of making their homes more efficient. However, despite these intentions concerns over financial security, including family responsibility and preparing for old age still took priority.

8.4 Establishing the environmental credibility of low carbon housing

In addition to the social, technical and economic concerns put forward in relation to the adoption of low carbon homes and technologies, the final key theme running through

the discussions of low carbon housing revolved around the question of establishing the true environmental credentials of different housing options. For some, the validity of such options as truly 'low carbon' increased their willingness to adopt new technologies. However, while strong environmental values did play a role, other participants were adamant that they would make little compromise, arguing that reducing carbon emissions could not take priority above other more personal considerations:

> **Claire:** But they've probably compromised on the design of that for its eco credentials and I wouldn't be willing to compromise on the design that much for energy efficiency.
>
> **Focus Group 2: Farming community, Newcastle Emlyn**

However, ascertaining which home was really the most environmentally friendly was seen to be difficult, with many participants believing they did not have the necessary information to be able to make the necessary choices needed to live a low carbon lifestyle. Assumptions were often made as to which house would be more environmentally friendly on the basis of visual aesthetics, with photos No.1 and No.6 generally assumed to be the lowest carbon/energy houses, due to the high-tech appearance and extensive solar panel array, and the eco-house appearance and grass roof, respectively. However, echoing the discussion of low carbon housing more broadly (Chapter 7), the environmental credentials of even these houses were often questioned, following deeper scrutiny of the embodied emissions within the apparently 'low carbon' houses and technology. Other criticisms included issues over scalability of individual technologies, in particular over the carbon emissions needed to produce and transport wood pellets from the biomass boiler, as well as a concern that too many trees will be needed to support a larger number of users.

On a broader level, the effectiveness of low carbon houses within wider efforts to reduce emissions from housing was also questioned. Considering the issue of rising population, a need was seen for a solution that can work for the entire country, rather than a

niche solution that only works for a small number (due to either financial or spatial constraints):

> **Bernard:** It's probably the most eco one there, that one and the eco one [photo No.6], are probably the most energy saving.
> **Glen:** Probably might be very eco-friendly, but considering the population, not everyone, very few are going to be able to live in a house like No.6.
>
> **Focus Group 3: Church group, King's Lynn**

Interestingly, from this perspective the flats and apartments, which were considered the least attractive on a personal level, were considered the most eco-friendly when reflecting on national scale solutions, as they could house more people within a smaller area, conserving both energy and materials:

> **Joan:** I think there are two different questions inside that question actually. I think there's which would be more eco-friendly for the individual? But which is going to be more eco-friendly for the population? So for example, [photo] No.7 has got more people in it, in the ground space. So if we were going to live.
> **Mervin:** From the planet's point of view.
> **Joan:** Yes, from the planet's point of view, the overall point of view, to live within less ground space than [photo] No.3, which I'm assuming is just one family living there. Whereas about half a dozen families will be living there [photo No.7].
>
> **Focus Group 5: Environmental group, Barmouth**

However, although leading to reflections regarding the balance between finding solutions that work at the individual and national level, and whether 'we can have what we want as an individual' (Joan, Focus Group 5: Environmental group, Barmouth) whilst still achieving larger scale emissions reductions, this insight does not make these low carbon

housing options more appealing.

Considering possible compromises to this dilemma, the concept of a Passivhaus, such as that seen within video No.3, was seen as a more appropriate low carbon mass housing option. Rooted in concern about a lack of knowledge as to the most appropriate and effective options, the importance of trusted information sources and brands in determining the acceptance of these housing options was also clear:

> **Claire:** Now just because I know it's in Germany I'm going to make an assumption that those are the most eco-friendly, because they're so far ahead on renewables.
>
> **Focus Group 2: Farming community, Newcastle Emlyn**

When considering new build housing, the Passivhaus was thus generally considered in this situation to be one of the most truly effective forms of low carbon housing.

8.5 The public acceptability of low carbon housing: Valuing the multiple meanings of home

This chapter has sought to highlight the importance of the social and technical configurations of low carbon housing and the influence these may have on public preferences, highlighting the key meanings and values that underlie the perceptions of low carbon housing options within five focus group discussions. Whilst it is essential to understand that all participants did not hold these values and concerns equally, they nonetheless provide a broad picture of the wider social values on which preferences for the adoption of low carbon technologies are based. In addition to concern for the environment discussed in Chapter 9, values of comfort, control and security strongly influenced perceptions of the acceptability of the low carbon housing options presented, highlighting the interconnectedness of the themes presented above.

Adopting a broader meaning of the term, the importance of choosing and creating a

comfortable home spanned a number of the themes as discussed above. As well as the more obvious desire for a home that is deemed suitably warm and light, and free from intrusive noises, the value of a comfortable home was also understood to be rooted in personal visions of the ideal home, based on family histories and emotional attachments. Both personal and cultural identity were also seen to be bound up with design and technology, manifested not only in the importance of personalising the home, but also through the wider social connotations associated with the configuration of housing; leading to houses being deemed appropriate only for a certain type of individual, with acceptability judged primarily on personal identification with the type or style of the property, the wider neighbourhood in which it was set, or imagined occupant that might be living within it. In a similar way, decisions concerning home retrofit through the installation of energy efficiency or renewable energy technologies were also influenced by these factors, with technologies only deemed worthy of consideration when they were not seen as detrimental to the broader comfort of the home.

The issue of control was considered particularly important, in terms of both personal autonomy within the home and a more direct form of control over everyday life and routines. Freedom to modify the house, both structurally and more superficially, were also key elements of personal autonomy within the home, with any restrictions to this, such as not breaking the thermal envelope of a building, considered an unreasonable expectation. Personal control over energy use was also particularly important, with smart and automated technologies that increased this control in the home seen as particularly appealing. However, these technologies were sometimes seen to be a double edged sword, raising fears about the consequences over relinquishing control of energy use and personal data to energy companies (*cf.*, *Spence et al.*, 2015). Closely linked to this, the importance of personal security was also brought to the fore. In particular, low carbon technologies, be they included with a new build low carbon house or considered as a home retrofit measure, often induced a feeling of insecurity, and were seen as both a financial and a personal risk that may lead to a loss of investment, the loss

of energy services (and thus the comfort and convenience they provide), and the loss of time and effort due to increased maintenance requirements. Whilst concerns as to the affordability of low carbon houses and technologies could be seen as a simple expression of financial concern over the rate of return on investment, the prioritising of spending choices can thus be seen as in part rooted in deeper insecurities relating to the unpredictable nature of modern life and a desire for personal security.

These findings are particularly interesting in relation to the expert perceptions of the barriers to transitioning towards a low carbon housing stock presented in Chapter 6. Specifically the visual aesthetics and increased cost of new build low carbon houses, along with the capital costs and disruption during installation of energy efficiency and low carbon energy sources within existing homes, were believed by experts (see Chapter 6) to be key determinants of public acceptability. Although the expert perception that 'a house should look like a house', was somewhat supported within the public discussions, the focus purely on visual aesthetics of the house itself, neglected to take account of the complex personal and cultural dimensions of comfort and identity. Similarly, expert understandings of hassle and cost as barriers to adoption were also narrowly defined around the view that the public first could not, or would not pay the extra cost of low carbon homes and technologies, and additionally that even if willing and able to pay, the hassle and disruption of installing and using new technological systems would reduce uptake. Whilst recognising the existence of public concerns surrounding the costs and hassle of low carbon housing options, this perspective thus fails to consider the deeper values underlying these (and other) concerns, such as the implications of adopting these technologies on personal security and control, both now and in the future.

As such, while some aspects of a property, such as price and location are clearly universal elements of choosing a home, complex consideration of technical and design features, as well as the social and cultural characteristics of the house, are also influential in determining which houses can be identified as potential homes. It follows that in order to understand the public acceptability of low carbon housing options, it is important

that low carbon houses are understood not just as a combination of the material and technological elements of low carbon housing, or even through the interactions between occupants and these elements, but also as a home, the meaning of which is socially constructed on both a personal and societal level (*Easthope*, 2004). As discussed in Chapter 7, participants professed strong environmental values and a general support for measures that would reduce carbon emissions from housing; a principle that was clearly in evidence when discussing both new build low carbon houses and the options for home retrofit, although moderated by the desire to ensure that any proposals were effective at both a personal and national scale. More importantly however, broader values of comfort, control and security can be seen to moderate environmental concerns, underlying the perceptions and preferences towards low carbon housing and technologies expressed by participants.

CHAPTER 9

Discourses of decarbonisation:

Placing low carbon housing in context

As discussed in Chapter 2, the way in which environmental issues are framed can have a significant influence on both the way they are understood within society, and thus the eventual success or failure of policies to address them (*Kurz et al.*, 2005; *Forsyth*, 2009). In particular, the ways in which the problem itself is framed and defined can in turn influence, if not largely determine, the solutions that are proposed to solve them. Focusing on the technical and social meanings of the term low carbon housing, as well as the public acceptability of existing low carbon houses, Chapters 6, 7 and 8 investigated the concept of low carbon housing and how it was understood within expert and public discourses. However, as seen in Chapter 4, the concept of low carbon housing has only recently come into use within the policy discourse, framed as a solution to climate change. Building on these findings, this chapter begins by exploring the wider narratives surrounding the concept of low carbon housing, providing the context in which the expert and public conceptualisations of this concept must be understood. First, the problem frames mobilised by experts to advocate low carbon housing as a solution to multiple environmental and social issues are discussed, before moving on to present the key themes and debates identified within the expert discourse surrounding how to address the challenge of reducing emissions from the housing stock. Following this, the context within which the public understand low carbon housing is then explored

similarly, focusing first on the wider discourses from which they draw in justifying the need for low carbon housing, before moving on to consider the discourses around reducing energy use in the home.

The way in which the environmental problems and their solutions are framed with discursive storylines can have a significant influence on the way in which these issues are understood within society, and thus also the eventual success or failure of policies to address them (*Scrase and Ockwell*, 2010). While the framing of environmental problems and solutions within the policy and media discourses has already been addressed within Chapters 4 and 5, this element of the expert and public discourses of low carbon housing has yet to be considered. However, due to the complex nature of social discourse, it is more difficult to separate out distinct storylines within the expert and public discourses (such as those seen within the media discourse discussed in Chapter 5). In part, this is due to the way in which individuals create their own narratives, drawing on multiple storylines from within wider policy, media or public discourses. Rather than attempt to disentangle this complex discourse, this section thus attempts first to draw out key themes and debates, focusing on the interconnections between the problem and solution frames that are presented within the argumentation used to support the broader narratives around low carbon housing. Finally, the broader discourses of low carbon housing are summarised, providing a final layer of evidence for consideration within the comparative discussion of Chapter 10.

9.1 Exploring expert discourses: Converging agendas and multiple solutions

9.1.1 Converging agendas: The multiple benefits of low carbon housing

Climate change was conceptualised primarily as an environmental issue, highlighting the serious risks that climate change poses to society and the environment:

> Why should we do it? Climate change, can I just say that?
>
> **Interview 9, Sustainability architect**

Unsurprisingly, given emergence of the concept from the climate change discourse, low carbon housing was thus most commonly proposed as one of a range of mitigation options, advocating the need to tackle climate change within all sectors of society. Although acknowledging uncertainty, concern over climate change was seen to be scientifically justified, based on an understanding of the anthropogenic causes of climate change and the risks that increasing global temperatures and unpredictable weather patterns pose to society; the precautionary principle was often advocated, on the basis that 'the consequences of behaving differently and being wrong are very severe' (Interview 12, Engineer and retrofitting expert). Taking action to reduce carbon emissions and mitigate the effects of climate change, was also a moral concern:

> Climate change, I mean I just think that globally as a planet, to use more than you need is unnecessary and I just think we do it wilfully and I don't think that's right. [...] the consequences of it for other people are so significant that I think we're remiss if we don't do something about it basically.
>
> **Interview 9, Sustainability architect**

With this issue based framing of climate change embedded within a broader discourse of sustainability, low carbon housing was commonly seen as part of a wider solution aimed at transitioning to a more sustainable future. An ambiguous concept within the discourse, sustainability was understood to mean a range of different things, from a focus on maintaining the socio-economic status quo through green growth, to a more radical transition towards more sustainable lifestyles. However, underlying these understandings was a common belief in the need to consider the socio-economic system more holistically, focussing on the connections and interrelations between different sectors of society, such as those between housing, food and transport systems, as well

as the need to shift towards more sustainable resource use.

A second discourse of climate change was also identified, where the issue was restricted to a discussion around the need to meet national carbon emission reductions targets. In line with the shifting policy discourse surrounding low carbon housing (see Chapter 4), this argument focused on the need to meet the emissions targets set out within the Climate Change Act 2008. Through the focus on the importance of meeting Government based policy targets, this perspective implicitly acknowledges the existence of climate change, whilst marginalising this issue as an environmental problem:

> Well, I don't have a view, but my ministers do. No, there are clear commitments. I mean, you know it's sort of underpinned by a statutory expectation or a statutory requirement that the Welsh Government embeds sustainable development in everything it does and obviously tackling climate change is part and parcel of that.
>
> **Interview 7, Welsh policy expert**

Interestingly, while this perspective was less passionately advocated by interviewees, it was more strongly connected to the practical approaches to achieving carbon emissions within the housing sector (discussed below), in contrast to the common disconnection between discussion of climate change as an issue and the mechanisms by which it should be tackled.

Despite the central importance of climate change and the need to reduce carbon emissions more widely, the discourse surrounding the purpose and value of low carbon housing was seen to converge around a range of 'other reasons to act, including energy prices going up, energy security issues, fuel poverty, cleaner energy' (Interview 14, Housing policy expert). Echoing *Lovell*'s (2004) findings that low carbon housing had been reframed as a solution to a number of different policy problems, a number of different social and political issues were highlighted as central to this debate, includ-

ing; national energy security; energy bills and affordability; benefits to business and industry; and the creation of jobs. However, whilst these issues were only treated superficially, concerns regarding fuel poverty were seen as a key element of the low carbon housing agenda. Emphasising the multiple benefits of transitioning to a low carbon housing stock, including the benefits to health, wellbeing and education, meant 'a focus on the housing stock and energy efficiency both fulfils a social objective and an environmental objective' (Interview 3, Environmental campaigner).

Interestingly, both the policy and media discourses (discussed within Chapters 4 and 5) focus primarily on the need to reduce household energy bills; employed within the discourse surrounding the Green Deal as a persuasive argument to encourage the uptake of energy efficiency measures, and incorporated within the media's *Retrofitting homes* through the provision of *how to* guides and information sources to assist in reducing the home energy use. However, contrasting this, whilst acknowledging concerns regarding the rising cost of domestic energy supplies, reducing the energy bills of the general public was not seen as particularly relevant within expert discourses, with some even suggesting that homeowners (where not in fuel poverty) should be required to contribute financially to efforts to decarbonise their homes. Unsurprisingly, this focus on the role of low carbon housing in tackling energy policy challenges was again more commonly linked to mechanisms for achieving these goals and specific recommendations for action.

9.1.2 Multiple solutions: Towards a low carbon housing sector

In addressing these challenges, low carbon housing was understood and advocated as part of a wider challenge to decarbonise the housing stock. Transitioning towards a low carbon housing sector was seen as a broad and complex issue, linking the technical aspects of building fabric and efficiency, local and national energy supply systems and smart technology with the political and social aspects of national and environmental policy making, as well as everyday life and personal behaviour change. The discourse

surrounding the best approach towards this goal can be broadly divided into three key debates, surrounding choices between tackling supply or demand, focusing on existing or new build housing, and the possibilities for behavioural change. Achieving a balance between decarbonisation of supply and reducing demand was considered a key issue in achieving a low carbon housing sector leading to a focus on the 'classic trade-off between supply and demand' (Interview 2, Professor of architecture). Decarbonising the national grid and shifting energy supply towards renewable energy sources was also considered a key part of this challenge.

Determining the extent to which this is possible was seen as an important prerequisite to identifying the most effective ways of tackling demand side emissions reductions, with the appropriateness of proposals, such as switching to electric heating systems (presented within the Department of Climate Change and Energy Heat Strategy – *DECC*, 2013d), seen as entirely dependent on this. However, while extensive grid decarbonisation was often considered unfeasible, it was also agreed that 'you can't turn every house in the UK into a power station' (Interview 6, Passivhaus architect), leading to local level solutions to decarbonisation of supply being strongly advocated. In particular, combined heat and power (CHP) plants and district heating systems were supported by interviewees as effective ways of heating and powering low carbon housing developments, along with more radical proposals for regional smart-grid systems, as a more sustainable way of producing and using energy:

> You know, all right, it may be better in some strange way to burn the waste than bury it in the ground, maybe. But then to not use that power is crazy.
>
> **Interview 5, Housing and construction expert**

A second dimension to this debate revolved around the need to address emissions from existing housing. Whilst requiring a high standard of low carbon new build homes remained a key policy objective, addressing the expected lifespan and poor quality of

the current housing stock was also seen as essential, and with demolition not seen as an appropriate solution, retrofitting all UK homes was advocated. As seen in Chapter 6, improving the energy efficiency of the existing housing stock was at the heart of the debate, with low carbon generation considered only as a secondary option. Considered to be more than just another aspect of construction and design, energy efficiency was seen by many interviewees as a magic bullet to reduce carbon emissions from existing housing. A large scale roll out of energy efficiency measures was considered the best solution to the multiple problems identified above, including: reducing carbon emissions, improving the warmth and comfort of homes, addressing fuel poverty and health problems, reducing energy bills, and finally creating opportunities for growth and jobs in the process.

Whilst regulation was strongly favoured as a mechanism for ensuring high building performance standards in low carbon new build housing, the possibility of regulating existing housing led to a broader concern surrounding public acceptability and personal choice and autonomy:

> We can only encourage people to take up energy efficiency measures, we can't force them, so we're always constrained by that.
>
> **Interview 8, Government policy expert**

This debate was strongly linked to the Energy Act 2013 that sets out new requirements in the standard of rental accommodation, with most interviewees believing that regulation of existing housing was not the most appropriate way forward, although some did advocate that this 'principle should be extended out to the owner occupied sector' (Interview 3, Environmental campaigner) before homes could be sold.

Interestingly, despite the lack of consideration of the need to reduce household energy bills within the problem frames discussed above, financial incentives to help pay for the necessary energy efficiency improvements were thus seen as essential, including: loans; pay-as-you-save schemes; green mortgages; stamp-duty reductions; council tax

rebates; and sliding energy tariffs, as well as more radical suggestions such as directly paying homeowners to switch off appliances at times of high demand. However, echoing the focus on fuel poverty over reducing household energy bills, the subsidising of all households to improve their homes was not considered appropriate, with funding reserved for the fuel poor.

However, a tension ran through the expert discourse, between the discussions regarding the technical achievement of low carbon housing and the need for social and behavioural change advocated as part of the environmental concerns expressed by many experts. As seen within the Passivhaus and Smart home visions of future housing discussed in Chapter 6, a key barrier to reducing emissions was seen to lie in the incorrect use of low carbon housing and technologies, leading to calls for the development of technologies that bypass the influence of individuals on carbon emissions:

> We need to get better at our technological fixes, which almost remove the user from having to do anything. It just is efficient, you don't have to worry, you don't have to put pressure on people to change their behaviour.
>
> **Interview 14, Housing policy expert**

While this implies an almost purely technological approach to transitioning towards a low carbon housing sector, when considering the question of reducing carbon emissions more widely, experts were emphatic in calling for behavioural and societal changes. Two broad categories of behavioural change were identified: addressing small scale behaviours and choices, such as those advocated within the *Small actions* repertoire; and more fundamental changes to energy demand practices and routines, *e.g.*, shifting patterns of energy use throughout the day to make optimal use of renewable energy sources. However, effecting change in either of these areas was seen as extremely difficult, with most experts characterising behaviour change in a negative light, as something that the public would reject (thus shifting discussion back to the need for a

technological solution).

Education was seen as a key element of the decarbonisation agenda, and although for some this was an assertion of the linear model that information provision would increase adoption of new technologies, more sophisticated understandings of the possible options for encouraging behavioural change were available. These included the need for personally targeted and tailored information, the role of trusted intermediaries, and the importance of taking advantage of trigger points, 'when [people are] moving house, or having work done anyway' (Interview 3, Environmental campaigner), all suggested as mechanisms for overcoming barriers such as the hassle and lifestyle disruption of retrofitting homes and a lack of trust in Government and energy utilities. A need for a wider awareness and education surrounding environmental issues and climate change was also seen as pivotal to ensuring wider adoption of technologies, with the implication that an increasingly 'carbon literate society' (Interview 5, Housing and construction expert) would lead to a shift in public attitudes and behaviour, and thus emissions reductions within the domestic sector.

With regards to the role of environmental values in effecting lifestyle change, opinion was split, between those who believed that an appeal to environmental values was the most effective way of motivating change, and those that felt only a focus on the personal and financial benefits of reducing home energy use would influence public behaviour. In particular, shifting the public debate to focus on home improvements, to reduce energy use, and thus household energy bills, was often suggested as the only way to engage the wider public and achieve emissions reductions. However, regardless of opinion on this issue, a significant shift in social norms, *i.e.*, the behavioural norms of energy use within society, was generally supported. Suggestions encompassed the need for increased thought and consideration of energy use in the home, the stigmatisation of wasteful energy behaviours, the incorporation of new energy practices within personal routines, and the shifting purchasing practices, such as through a 'well publicised link between the energy efficiency of a home and its market value' (Interview 12, Engineer

and retrofitting expert), as well as influencing the norms of comfort and convenience that have developed within modern society. However, how these changes could be achieved was not clear, with a slow shift in society wide environmental values seen as the only way to achieve this.

9.2 Diverging public discourses: Energy or the environment

9.2.1 Protecting the environment: Values, responsibility and fairness

The need to reduce energy use (and emissions) throughout society was widely accepted within the public discourse, with few questioning the premise of the discussion surrounding the need for low carbon housing. Drawing on a wider public discourse of *Environmental concern*, the issues and debates surrounding climate change, resource use and peak oil, and sustainability, as well as language more commonly associated with issues of waste and pollution, were all incorporated, merging within a single discourse. Linking to the public conceptualisation of a low carbon house and consideration of the importance of embodied carbon within this, the depletion of fossil fuel reserves was at the forefront of public concern:

> **Deborah:** And the fact is that they think we will run out of fossil fuels in the end, so the fact is we've got to learn how to use less, haven't we. Even if it's nothing to do with climate change, there is a finite resource isn't there.
>
> **Focus Group 2: Farming community, Newcastle Emlyn**

The limited nature of fossil fuel resources was thus seen as an important reason to reduce energy use and was directly linked to the need for both increasing use of renewable energy sources and reducing energy demand in the home (*cf. Demski et al.*, 2015).

In contrast, despite the influence of climate change discourse (seen in the use of the *Small actions* repertoire) on public understandings around how to reduce carbon emissions from the home, the importance of climate change as an issue remained relatively implicit, as part of the conceptualisation of environmental issues more broadly, with the term climate change rarely acknowledged (*cf. Spence and Pidgeon*, 2009). While some participants do reflect on this, noting that '[n]one of us have talked about climate change have we' (Deborah, Focus Group 2: Farming community, Newcastle Emlyn), for most this issue remained in the background of debates surrounding low carbon housing. However, whilst explicit discussion of climate change as a scientific or environmental issue is rare, broader political and social discourses of climate change (*cf.*, *Capstick*, 2012) are strongly drawn upon in justifying and questioning the need to reduce household energy use; this highlights that while the terms low energy and low carbon were taken to mean specific and different things, the link between energy use, carbon emissions and tackling climate change is more clearly understood when considering broader environmental issues. From this perspective, the desire to save money on household energy bills was also incorporated to some extent within *Environmental concern*, as a co-benefit of protecting the environment.

Echoing previous findings, values of responsibility and fairness, as well as concerns over personal efficacy, were prominent features of *Environmental concern* (*c.f.*, *Capstick* (2013); *Demski et al.* (2015)). Strong environmental values were demonstrated by many participants, leading to a sense of moral responsibility to reduce emissions and energy use, both in the home and society more widely:

> **Mary:** I think we're morally obliged to do it. There's no two ways about it, it's not a choice. We're responsible for global warming. So I don't think we should be asked whether we think we want to do it. We've got to do it.
>
> **Focus Group 5: Environmental group, Barmouth**

However, this often prompted a wider debate surrounding questions such as where to locate responsibility for action, *e.g.*, at the (inter)national *vs.* the individual level, as well as highlighting underlying concerns regarding personal efficacy and the effectiveness of any attempts to reduce personal carbon footprints:

> **Russell:** You're absolutely right. Exactly, you turn your kitchen light off, because you don't want to turn it on. Las Vegas is running nonstop. You just think, what is the point.
>
> **Focus Group 3: Church group, King's Lynn**

Although primarily concerned with higher level debate surrounding responsibility and fairness, these discussions did provide another connection with household energy use, highlighting the tension between responsibility for the environment and that of looking after your family, which for most participants remained the priority (*cf. Shirani et al.*, 2013). From this perspective, energy use was conceptualised both as a resource, not to be wasted, and as a commodity, the cost of which needed to be considered (as discussed below).

Despite this link to personal energy use in the home, and in contrast to the expert discourse, discourses of energy were otherwise largely absent from the debate surrounding the question of why society should adopt low carbon housing. This is interesting, as it highlights how although the link between carbon emissions and energy use has been made when considering the need to protect the environment, the concept of the low energy house (see Chapter 7) was not connected to public discourse of *Environmental concern* in the same way that the concept of a low carbon housing was. However, as will be discussed below, when discussing the practical features and acceptability of specific low carbon houses and technologies, saving energy (and thus money) becomes seen as a key driver for change. This shows an interesting distinction in the way that individual *vs.* societal behaviour is conceptualised. Society was seen to primarily respond to the value driven need to reduce carbon emissions and protect the environment, despite the

relevance of low carbon housing in tackling fuel poverty and reducing energy bills. However, when following this discussion with questions of how (rather than why) low carbon housing could be achieved, individuals were conceptualised as responding strongly to financial incentives.

9.2.2 Reducing energy use: Changing homes and changing behaviour

Interestingly, perceptions regarding how to tackle the problems highlighted within the discourse of *Environmental concern* were centred primarily on reducing energy and was divided into two separate debates, the first relating to changing the fabric and technologies within housing, and the second deliberating the possibilities for social and behavioural change. Echoing the discussion surrounding the features and acceptability of low carbon housing options discussed in Chapter 8, agreement on the importance of improving the standards of new build housing was almost unanimous, with the Government seen as ultimately responsible for improving building performance through national level regulation and standards. However, more widely, the value of new build homes in reducing overall carbon emissions was seen as negligible in comparison to the need to address the existing housing stock:

> **Gemma:** In an ideal world, we'd start from scratch again and build a lot better, but we don't have that and we have all these houses that are built that we need to adapt.
>
> **Focus Group 1: Postgraduate students, Cardiff**

In contrast, regulations regarding the reduction of emissions from existing housing were viewed with suspicion. Concerns were raised around the issue of Government interference in everyday life, with values of fairness and control again high on the agenda. The practical and ethical difficulties involved in enforcing retrofitting measures were also a concern, 'as some people's financial situation might not put them in a position to meet legal housing requirements [which may lead to] a situation where houses

were deemed not fit to be lived in, because they were not meeting these requirements, which are luxuries in a way' (Claire, Focus Group 2: Farming community, Newcastle Emlyn). Social justice was thus also seen as a key element of any low carbon proposals, highlighting perceived dilemmas where making the best financial choice as an individual may in fact be detrimental to society more broadly:

> **Jane:** You know, it's just that with the Feed in Tariffs, the people who have them are the people who can afford them, and the people who are actually paying for it [...] are the poor.
>
> **Peter:** Basically, I'm grinding the face of the poor.
>
> **Focus Group 5: Environmental group, Barmouth**

With retrofitting considered as a voluntary process, a number of barriers to adopting energy efficiency low carbon energy technologies were highlighted; while generally being discussed in relation to the actions of other people, rather than the self, these largely reflected the values of comfort, control and security discussed in Chapter 8. However, cost and affordability were generally considered the key drivers for public decision making. Financial incentives (primarily the provision of grants or cheap loans) were seen as crucial to increasing adoption rates, with many believing that whether due to environmental values or the desire to save money, everyone would take up these measures if they were free. In addition, a perceived lack of information regarding the range of possible options for reducing energy use in their homes, or any financial assistance they may be able to receive, with a lack of advertising seen as a barrier that needed to be addressed:

> **Louise:** That's the thing, it wouldn't cost too much to make some educational programmes on the BBC.
>
> **Mike:** Or adverts, an educational programme isn't needed, just an advert. And advert that's 30 seconds long so you can't skip it on YouTube.

Focus Group 1: Postgraduate students, Cardiff

The need for personal behaviour change, as well as broader shifts in social and cultural norms formed a second and largely separate debate. Echoing the connection between reducing carbon emissions and everyday energy use, and in contrast to the focus on Government responsibility in relation to reducing emissions from housing, many highlighted the need for individuals to take responsibility for reducing their carbon footprint in order to protect the environment. Within this, behaviour change was conceptualised through the *Small actions* repertoire, focussing on personal habits and choices, such as wearing warmer jumpers, turning the thermostat down, and switching lights and appliances off. Echoing *Butler* (2010), the link between these behaviours and the discourse of *Environmental concern* often led these behaviours to be ascribed a moral component, leading to calls to take action 'for both reasons, the saving money and the eco reasons' (Louise, Focus Group 1: Postgraduate students, Cardiff), as well as for addition benefits, such as spending more time outdoors or with your friends.

However, despite this, personal behaviour change was seen as extremely challenging, if not impossible, to achieve for a variety of reasons:

> **Gemma:** I think in an ideal world it would be a bit of both [behavioural and technical change], but I think we've all become so complacent in our nice happy, warm, television fuelled lives that you're going to really struggle to invoke any sort of [behavioural] change.

Focus Group 1: Postgraduate students, Cardiff

Utilising a discourse of *Everyday constraints* (*cf. Phillips*, 2000), many daily practices, such as cooking and personal hygiene were seen as non-negotiable and a necessary use of energy in daily life, with the rights of homeowners to maintain a comfortable and secure home seen as a justification for maintaining energy use (*cf. Shove*, 2003). Mirroring previous findings (*Demski et al.*, 2015), wastefulness was thus a central concern, with

energy use justified up to a certain point, before becoming socially unacceptable:

> **Russell:** That's good, that means you're coming to the point where you're using what you need, rather than overusing. And if everyone, could save that unnecessary usage.
>
> **Focus Group 3: Church group, King's Lynn**

Whilst describing themselves as conscientious and careful consumers of energy, others were often characterised as wasteful, and unlikely to change unless it was made either easy or money saving for the individual, demonstrating a dissociation between understandings of personal energy use and the energy use of others. 'Does it always come down to money?' (Mary, Focus Group 5: Environmental group, Barmouth) was a contentious question, leading to concerns that you would be judged for admitting that saving money was a primary concern; 'you're a much better person than I am, in that cost would be my main driver' (Gemma, Focus Group 1: Postgraduate students, Cardiff).

While the Government were firmly positioned as responsible for enabling a transition to a low carbon housing sector, shifts in personal behaviours needed to be encouraged as a voluntary process, predicated on a fundamental shift in the social and cultural norms surrounding energy use. However, the pathways towards shifting these norms were unclear, often leading back to public education programmes as a way to instil environmental values in society. Beyond this, the potential to save money or an increase in energy prices, were seen as the only ways likely to encourage change. The complexity of attempting to produce a directional shift in public norms was thus acknowledged, with the effects of soft power seen to be influential, but hard to control:

> **Frank:** You can provide incentives and you can push people in general directions. You can try and influence but I don't think you can engineer things to that extent. [...] But even then, I think it just goes the way, we've got much less control over the

way society evolves than we think we have to be honest.

Focus Group 5: Environmental group, Barmouth

9.3 Drawing out discourse: Reducing carbon emissions from housing

Investigating the context in which low carbon housing is framed and understood is important in gaining a deeper understanding of the acceptability and implications of transitioning towards a low carbon housing sector. With this in mind, this chapter has explored the broader discourses of decarbonisation, providing the context within which the expert and public conceptualisations of low carbon housing (presented in Chapters 6 and 7) must be understood.

Considering the multiple benefits of low carbon housing, expert discourses of decarbonisation primarily highlighted the converging agendas of climate change and fuel poverty in creating a case for reducing carbon emissions and energy use from housing; although other issues, such as energy security, health and wellbeing, and the creation of green jobs were also considered relevant. Following on from this, the solutions to these multiple problems were thus also numerous, approaching carbon emissions reductions from a range of different angles. Achieving a balance between decarbonisation of supply and demand, tackling new build housing while maintaining a clear focus on retrofitting the existing stock, and increasing demand reduction through behaviour change in the home, were thus all seen as crucial elements of a transition towards a low carbon housing stock.

Although less distinct than the low carbon housing storylines seen within the media discourse (*e.g.*, *Zero carbon housing* and *Retrofitting homes* – see Chapter 5), similar storylines were present within the expert discourse. Whilst each interviewee created their own personal narrative surrounding the need to transition towards a low carbon

housing sector, two distinct, but interrelated sets of narratives can be identified within the expert discourse. *Low carbon new build* focused on the need for a technical and regulatory approach to ensuring a high standard of low carbon new build houses (through the strengthening of policies such as the Code for Sustainable Homes) in order to bring about the Passivhaus or Smart home visions of future housing discussed in Chapter 6. In contrast, *Low carbon retrofit* highlighted the need to increase the energy efficiency of existing homes and tackle household energy demand, in order to address both climate change and fuel poverty through a mixture of regulations, financial incentives and educational awareness programmes.

Just as in the policy and media discourses of low carbon housing discussed in Chapters 4 and 5, the expert narratives surrounding reducing emissions from the housing sector are founded within the techno-economic paradigm of the broader decarbonisation agenda (*Lovell*, 2004; *Nerlich*, 2012). Despite this, *Ecological modernisation* is less prominent than within policy discourses, with climate change largely framed as a social and environmental risk that requires urgent action, rather than simply focusing on the need to meet national carbon emissions targets. Similarly, (although focusing only on new build housing), *Lovell*'s Life Cycle storyline (2004) highlights how in reframing low carbon housing as an economically viable solution to climate change, the role of environmental values was marginalised within the discourse. However, the strong values held by many experts suggest a blurring of the line between the discourse and advocacy coalitions identified by *Lovell* (2004) within the wider expert discourse, with social and environmental values playing a strong role in the conceptualisation of the problems to which low carbon housing could be a solution.

Interestingly, when considering the issue of climate change and the need to decarbonise the domestic sector more broadly (as opposed to the specific concept of low carbon housing), a different narrative emerged. Echoing *Civic environmentalism*, *Reducing carbon emissions* advocated the need for a rapid change in social norms and household energy use behaviours, including the stigmatisation of energy wastage and shifts in

consumption patterns. Involving significant lifestyle change, the strengthening of public environmental values, as well as increased education and information provision, was seen to be essential. However, despite this, behaviour change was positioned as both publicly and politically unacceptable, causing hassle and disruption and something that would be resisted by the public. These findings are interesting, as although not explicitly advocating a purely technical solution, the main solutions suggested within *Low carbon new build* and *Low carbon retrofit* (and the visions of future low carbon housing discussed in Chapter 6) require little or no change to current behaviours and lifestyles.

In contrast, and to some extent echoing the divide between the conceptualisation of low carbon housing and low energy housing discussed within Chapter 7, an increasing divide between public discourses of the environment (which focused on the environmental and social values of fairness and responsibility), and of energy (which considered the options for reducing household energy, either through *Changing homes* and *Changing behaviour*), could be seen. Echoing previous research (*cf.* *Capstick*, 2013; *Corner et al.*, 2013; *Demski et al.*, 2015), climate change was not seen as a key issue in its own right, but instead incorporated as part of a broader discourse of *Environmental concern*. Based around a narrative of moral responsibility towards the environment, while climate change as an issue was rarely incorporated explicitly, elements of the discourse surrounding this issue had clearly seeped into the public consciousness and were utilised to create a case for reducing carbon emissions, both within the home and society more broadly.

With policy and media storylines of new build, low carbon housing largely absent, the public narratives that emerged surrounding low carbon housing and the need to reduce energy use in the home thus focused primarily on addressing the existing housing stock. Whilst the perceived problem remained the need to protect the environment, as opposed to reducing household energy bills, the solutions to this challenge were largely seen as rooted in home energy use. This finding is particularly interesting given the lack of

connection between environmental issues and the concept of a low energy house (which was understood to mean a relatively 'normal' house with high energy efficiency and low energy bills - see Chapter 7), highlighting how different understandings can form based on the direction from which a topic or concept is approached.

When approached from the perspective of environmental issues and concern, the connection between carbon emissions and energy use is likely to be in part due to previous information and behaviour change campaigns, such as Act on CO_2. The public discourse surrounding how to reduce national carbon emissions can thus be broadly divided into two closely linked discussions: *Changing homes* and *Changing behaviour*. Both approaches were rooted in the *Small actions* repertoire to highlight the small changes that could be made to reduce household energy use, be they through purchasing energy efficiency measures or altering personal energy use practices. Focusing on the role of the individual in reducing their energy use, these options were thus questioned in relation to issues of personal *vs.* national responsibility, as well as concerns over personal efficacy.

Given the dominance of *Ecological modernisation* within UK climate change and energy discourse, it is interesting that, in comparison to the media and expert discourses, the techno-economic paradigm was not really present within the public discourses of low carbon housing. Although technology was seen as playing a key role in reducing carbon emissions from housing, public narratives did not explicitly advocate a technical fix to reducing emissions, with personal behaviour change, discussed through the *Small actions* repertoire, seen as central to the debate.

The link between the conceptualisation of low carbon housing and the broader contextual discourses surrounding reducing national carbon emissions is thus an interesting one. Within the expert discourse, both *Low carbon new build* and *Low carbon retrofit* were clearly rooted within the dominant policy discourses of climate change and *Ecological modernisation*, and largely separate from the broader narratives of climate change seen within *Reducing carbon emissions*; a division that is likely to have played

a significant role in determining expert conceptualisations of low carbon housing as a techno-economic solution to reducing emissions from the domestic sector (as seen in the Passivhaus and Smart home visions of future low carbon housing discussed in Chapter 6). However, with *Ecological modernisation* largely absent from public discourses, low carbon housing, as well as the problem and solution frames that surround it evolved together through discussion and debate. Drawing primarily on existing discourse of *Environmental concern* and the *Small actions* repertoire, as well as an understanding of concepts such as a carbon footprint, thus enabled a different meaning of low carbon housing to be constructed (see Chapter 7), based around resource use and the embodied carbon within the materials, transport and construction of housing.

CHAPTER 10

The social construction of low carbon housing: A synthesis of low carbon housing discourse

With British households accounting for around 25% of national carbon emissions (*CCC*, 2014), decarbonising the domestic sector will be central to achieving national greenhouse gas emissions targets set out within the Climate Change Act 2008. Promoted as a solution to climate change, UK low carbon housing policy has developed rapidly over the last decade. Reframed from the existing concept of sustainable housing (which embodied the often radical environmental values and desire for lifestyle change advocated within the sustainable housing movement of the 1970s – *Lovell*, 2004), the concept of low carbon housing draws on *Ecological modernisation* and broader climate change and energy policy discourses to advocate a technological and economically viable approach to reducing emissions from housing.

It is a central tenet of this thesis that discourse matters, as the way in which social and environmental problems are constructed and communicated can have an important influence on the success or failure of actions taken to address the problem, as well as on public understandings of the issue (*Kurz et al.*, 2005; *Forsyth*, 2009). As such, this thesis has explored the discourses surrounding low carbon housing as they exist within different discursive domains, utilising discourse and thematic analysis to investigate the changing storylines, narratives and themes within the policy, media, expert and public discourses. This chapter now builds on these findings, exploring and comparing the

broader assumptions embedded within the discourses of low carbon housing and discussing the implications and limitations of this thesis, before highlighting opportunities for further research. First, a detailed summary of the key research findings is provided.

10.1 Exploring discourses of low carbon housing: Key research findings

Rooted within *Ecological modernisation*, the terms low carbon and zero carbon housing emerged within the UK policy discourse of the early 2000s, framing this concept as a solution to climate change (*Lovell*, 2004; *Pickvance*, 2009). Aiming to investigate the different ways in which this concept has been understood and (re)conceptualised within different discursive domains, this thesis has explored a number of different aspects of the policy, media, expert and public discourses surrounding low carbon housing. Providing the context from which these discourses have developed, Chapter 4 traced the development of the low carbon housing discourse within UK Government policy. Analysing the rise and fall of the Code for Sustainable Homes and Zero Carbon Homes target, the shifting discourses of low carbon housing (from a focus on climate change to energy use), were seen to increasingly marginalise the environmental values originally associated with this concept, in favour of a techno-economic conceptualisation of low carbon housing.

Exploring the media discourses of low carbon housing, Phase 1 of this research addressed Research Question 1 – How do the media construct and represent the concept of low carbon housing? Chapter 5 highlighted how, supported by a strong discourse coalition, *Zero carbon housing* rapidly achieved discursive dominance within the British broadsheet media discourse. This storyline largely reflected the policy discourses discussed above and framed low carbon housing as a cutting edge, technical solution to reducing carbon emissions from housing. In addition, with similar foundations in *Ecological modernisation*, *Retrofitting homes* echoed the dominant storyline, as although

contesting the focus on new build housing options, remained rooted within the techno-economic paradigm. Contrasting this, a more marginal storyline, *Sustainable living* provided a window into the lives of home-owners living outside society's dominant social norms, providing a different narrative that emphasised self-sufficiency, individuality and the desire for a more natural and sustainable lifestyle. However, despite this, the normality of low carbon housing arose as a central theme throughout the media discourse, with low carbon housing broadly presented as a desirable ideal that can be achieved primarily through technological, rather than behavioural, change. As such, the social and behavioural aspects of low carbon housing were clearly marginalised, with the concept of low carbon housing framed as essentially posing no challenge to the current lifestyles.

Through a series of semi-structured interviews with a range of housing and energy experts, Phase 2 of this research addressed Research Question 2 – How do experts construct and understand the concept of low carbon housing? The main findings from this phase of the research are presented in Chapter 6, which explored expert understandings of low carbon housing in detail. The term zero carbon house was seen to be associated primarily with the development of the Code for Sustainable Homes and the Zero Carbon Homes target and was generally seen as out-dated and unfeasible. However, the broader concept of a low carbon house was found to be embedded within expert visions of the future, with Passivhaus and Smart home housing envisaged as technological solutions to reducing carbon emissions from the housing sector. Embedded within these visions that conceptualise homes as machines, was the assumption that removing or reducing occupant control over household energy use was the only way to effectively reduce carbon emissions from housing, with these futures advocated as a solution that will bypass the need for lifestyle change and shifts in household energy use practices.

Exploring public interpretations of the term low carbon house, Chapter 7 addressed Research Question 3 – How do the public construct and understand the concept of low

carbon housing? Investigated through a series of five focus groups with a diverse range of participants from different socio-economic backgrounds, the term low carbon house was found to be largely unknown within public discourses. In contrast to expert discourses, public understandings of the concept of low carbon housing were constructed around three different terms, low energy, low carbon and eco- house, each of which had different features and purposes. Closely linked to personal understandings of energy use within the home, the concept of a low energy house centred on energy efficiency measures and the need to reduce household energy bills. In contrast, constructions of the concept of a low carbon house demonstrated how, drawing on a broader discourse of *Environmental concern*, public understandings of this term were based around resource use and the embodied carbon within the materials, transport and construction of housing.

Examining the public acceptability of different forms of existing low carbon housing, Chapter 8 addressed Research Question 3c specifically – How publicly acceptable are current low carbon housing options and how are these options understood and assessed in this context? Highlighting the importance of the social and technical configurations of low carbon housing on public preferences, concerns over homeliness, neighbourhood configurations, technological risk and environmental credibility, were seen to embody the broader social values of comfort, control and security. Identified as playing a key role in determining the acceptability of specific housing options, these social values were thus seen to moderate the desire for a low carbon homes professed by many participants. These findings were particularly interesting in highlighting the contrast between these public concerns and expert perceptions of the public barriers to adoption, which focused primarily on visual aesthetics and the increased cost of low carbon housing options and failed to take account of the complex dimensions of comfort and identity.

Following this, Chapter 9 addressed Research Questions 2d and 3d simultaneously – How is the concept of low carbon housing framed and understood in relation to the broader problem of reducing carbon emissions from housing? Providing the context within which the expert and public conceptualisations of low carbon housing must be

understood, the broader discourses of decarbonisation were explored. Considering the multiple benefits of low carbon housing, expert discourses of decarbonisation highlighted the converging agendas of climate change and fuel poverty in creating a case for reducing carbon emissions and energy use from housing that involved tackling the problem from a range of different angles, including new build housing and retrofitting existing homes, as well as increasing supplies of low carbon energy. In contrast, exploration of public understandings demonstrated an increasing divide between discourses of the environment, which focused on the environmental and social values of fairness and responsibility, and of energy, which considered the options for reducing household energy, either through changing homes and/or changing behaviour.

Through an investigation of the assumptions surrounding the incentives and mechanisms for change embodied within the different discourses, the remainder of this chapter thus addresses Research Question 4 – How do constructions of low carbon housing vary between these discourses and what are the implications of these differences? To begin, each discursive domain is mapped in relation to these assumptions in order to allow comparison of the discourses present within the policy, media, expert and public spheres, before the implications of these findings are considered in more detail. Following this a reflexive account of the research is provided, considering both the limitations of this thesis and the opportunities for further research that it provides.

10.2 *Ecological modernisation vs. Environmental concern*: Mapping the discourse of low carbon housing

Rooted within the techno-economic paradigm, *Ecological modernisation* advocates a technological and economic solution to environmental problems, contending that any conflict between economic growth and environmental protection can be reconciled. As such, this discourse can be seen as in opposition to *Civic environmentalism*, which regards a radical shift in environmental values and social change (both behavioural

and democratic) as the only appropriate solution to environmental problems such as climate change. An important feature of environmental discourses emphasised by *Dryzek* (2005, 18), these opposite conceptualisations of the incentives and mechanisms by which change occurs can be understood as 'assumptions about what is natural in the relationships between different entities' that are embedded within the discourse.

As such, this section identifies how these assumptions surrounding the nature of change (*e.g.*, reducing carbon emissions) are embedded within low carbon housing discourse through two interconnected dimensions: 1) assumptions regarding the economic *vs.* values based incentives for change, and 2) assumptions regarding the technological *vs.* social mechanisms by which change can be achieved. Within this the broad term 'economic' is taken to mean individual utility-maximising decision making (often based on financial/cost-benefit analysis), whilst the term 'values' is used to refer to a desire to act based on the intrinsic values (such as responsibility, fairness, equality, reducing waste and protecting nature) often associated with *Environmental concern*. Similarly, a 'technological' mechanism for change relates to the adoption of a techno-fix approach to reducing carbon emissions, whilst a 'social' mechanism is considered to be an approach that focuses on the need for a radical shift in everyday lifestyles and the norms of practice/behaviour at either an individual or societal level. Considered together, these assumptions can be considered as a continuum, within which discourses and storylines can occupy different discursive space. Exploring each domain in turn, this section explores how assumptions regarding these interconnected dimensions of incentives and mechanisms for change are embedded within the policy, media, expert and public discourses of low carbon housing.

10.2.1 Policy discourses of low carbon housing

Figure 10.1 highlights the discursive space occupied by the discourses surrounding key Government policies for decarbonising UK housing stocks. As discussed within Chapter

4, the Code for Sustainable Homes was designed as an ambitious policy to tackle climate change by reducing carbon emissions from new build housing. The Code for Sustainable Homes (and the Zero Carbon Homes target - that all new build homes must be zero carbon by 2016), originally incorporating strong environmental values, as demonstrated by the rhetoric surrounding the need for a radical transition to low carbon housing. Within this, the public were conceptualised as eco-consumers, to whom appeals to both environmental values and economic incentives for change would be effective in encouraging the adoption of this technological approach to achieving a sustainable housing stock. However, evolving over time, the policy discourse around the Code for Sustainable Homes began to shift, and by 2011 occupied a different discursive space. Dropping the rhetoric surrounding climate change, the role of environmental values in incentivising this transition was marginalised. Aiming to reduce carbon emissions through a purely technical and economically viable approach to low carbon housing, this shift reflected a broader shift in the Coalition Government's discursive focus from climate change to energy policy, and the reframing of policies to reduce carbon emissions within housing as purely for the purpose of reducing household energy bills.

Attempting to encourage the uptake of energy efficiency measures and low carbon energy technologies, the rhetoric around the Green Deal policy, recognises the need for both social and technological mechanisms for change. However, despite the need to influence the behaviour of homeowners, this shift is conceptualised as an alteration to purchasing choices, with technology still responsible for consequent reductions in energy use (as opposed to changes in household energy use and practices). In contrast to initial conceptualisations of the public within the Code for Sustainable Homes, by this point the public are reconceptualised, considered purely as consumers, whose concerns about the additional cost and effort of purchasing and installing new technologies can only be overcome through economic incentives. This discourse contrasts that surrounding the Labour Government's Act on CO_2 campaign. Based on the *Small actions* repertoire, the rhetoric around this campaign occupied a much more central

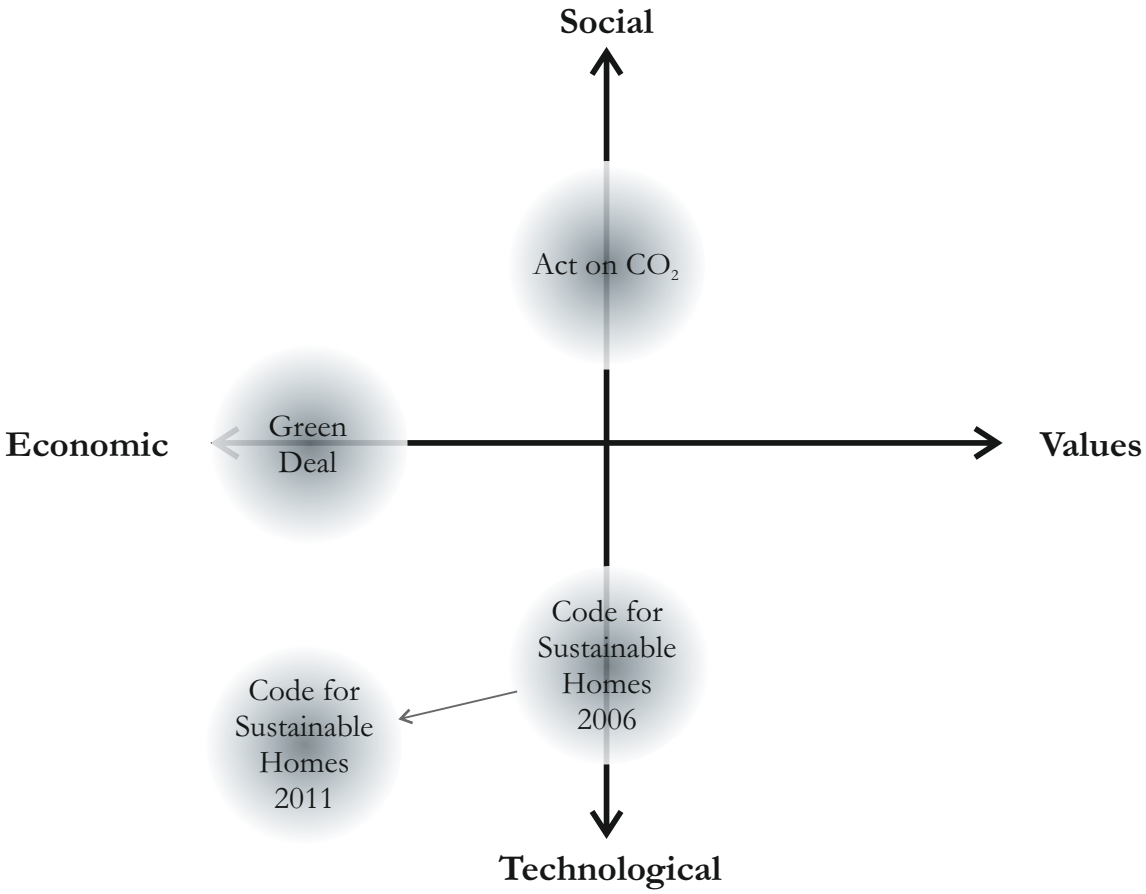

Figure 10.1: Policy discourses of low carbon housing and their assumptions regarding the most effective incentives (economic *vs.* values based) and mechanisms (technological *vs.* social) for change.

discursive space, advocating both social (in the form altered habits and energy use behaviours) and technical (through the purchasing of energy efficiency improvements) change. In addition, both economic and value based incentives are advocated, through a discourse of the multiple benefits of reducing carbon emissions and energy use in the home to both tackle climate change and reduce household energy bills.

10.2.2 Media discourses of low carbon housing

Figure 10.2 presents the media storylines discussed in Chapter 5 in relation to the assumptions around the economic *vs.* value based incentives and the role of technological

vs. social change within the discourse. Adopting the same techno-economic approach to decarbonisation seen within the discourse surrounding the Code for Sustainable Homes policy, the *Zero carbon housing* storyline represents an almost direct translation of policy discourse into the broadsheet media discourse. Whilst echoing the focus on climate change and sustainability issues seen within the 2006 announcement of the Code for Suitable Homes, the role of values was however not reflected within the media discourse, in part due to the focus on low carbon housing as a cutting edge technological solution to climate change. However, mirroring the shift in policy discourse discussed above, this storyline becomes increasingly embedded within *Ecological modernisation*, as the definition of a zero carbon house becomes more focused on the practical and cost-effective options for achieving the Zero Carbon Homes target, and reflects the increasing marginalisation of environmental values within the Coalition Government's discourse at this time.

Remaining rooted in the dominant *Zero carbon housing* storyline, *Retrofitting homes* broadly reflects a techno-economic approach to reducing carbon emissions from existing housing. In attempting to create change in public behaviour, albeit in personal purchasing decisions rather than energy use behaviours/practices, this storyline also reflects the discourse surrounding the Green Deal, emphasising the role of individuals in adopting low energy/carbon technologies for the economic benefits they will generate through reductions to household energy bills. However, focusing more directly on the need for a technological and policy based approach to retrofitting the existing housing stock (as opposed to attempting to persuade homeowners to makes changes to their homes), this storyline remains coupled to the techno-economic paradigm of the broader low carbon housing discourse. In contrast, *Sustainable living* occupies very different discursive space. Reflecting *Civic Environmentalism*, this storyline evolved following the emergence of the Sustainable housing advocacy coalition in the 1970s (*Lovell*, 2004), reflecting a more radical approach to tackling climate change and broader social and environmental problems through strong environmental values and lifestyle change.

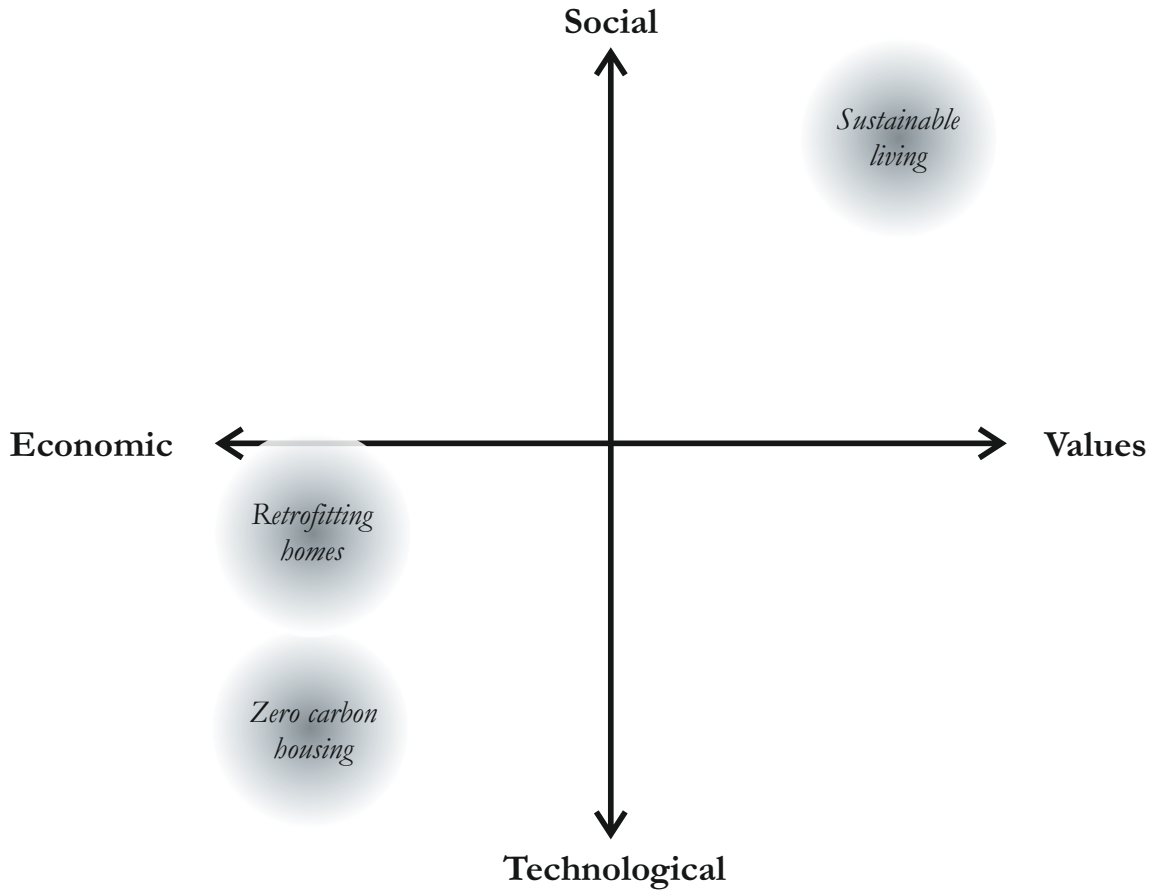

Figure 10.2: Media discourses of low carbon housing and their assumptions regarding the most effective incentives (economic *vs.* values based) and mechanisms (technological *vs.* social) for change.

10.2.3 Expert discourses of low carbon housing

As discussed in Chapter 6, and despite criticisms of the policy approach, the expert discourses of low carbon housing (Figure 10.3) again mirrored that of the broader policy discourse surrounding both the Code for Sustainable Homes and the Green Deal. Again, a division can be seen between the discourse surrounding *Low carbon new build* and *Low carbon retrofit*; this distinction is also reflected in the media's *Retrofitting homes* storyline that primarily originated from within the expert community (see Chapter 5). Similarly, this distinction again reflects the conceptualisation of new build low carbon houses as a purely technological solution to reducing carbon emissions, whilst the

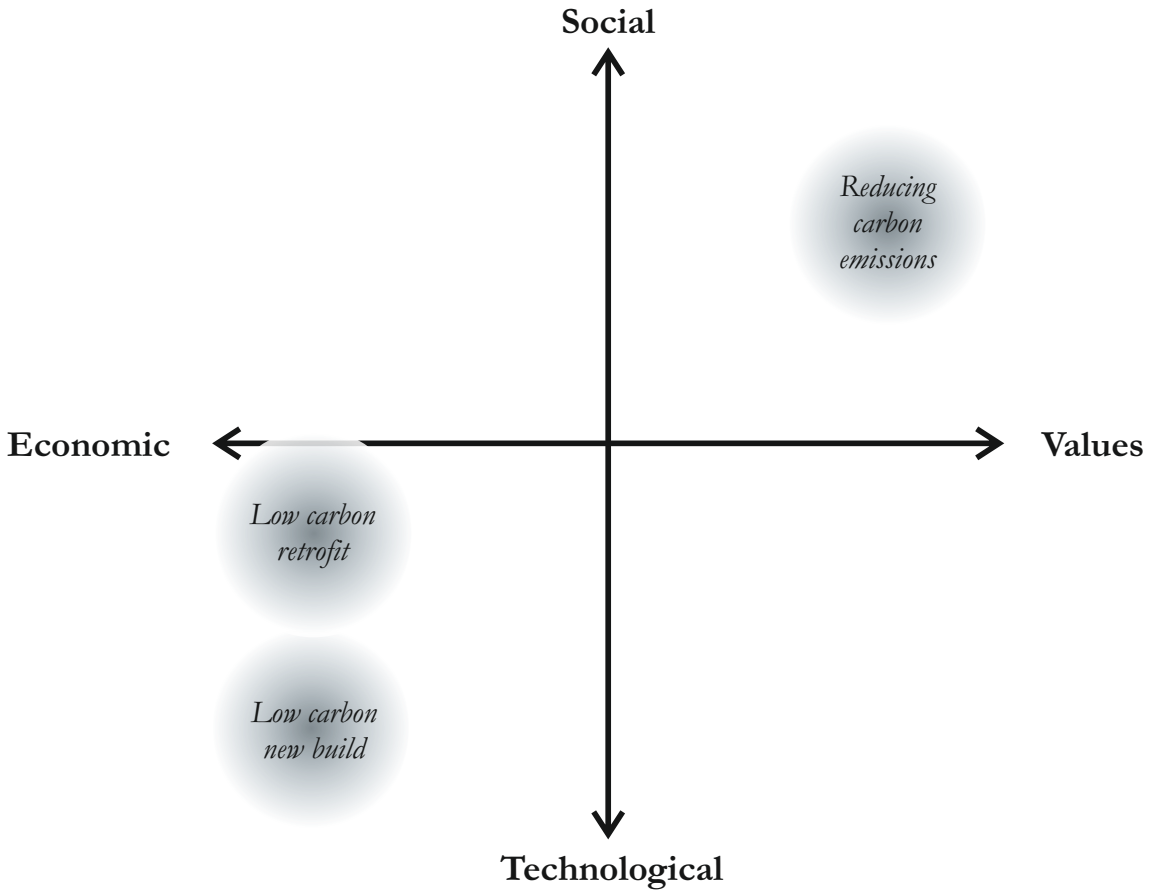

Figure 10.3: Expert discourses of low carbon housing and their assumptions regarding the most effective incentives (economic *vs.* values based) and mechanisms (technological *vs.* social) for change.

complexities of encouraging the extensive retrofitting of existing homes is understood to require a greater level of engagement with homeowners. However, despite this, it is the retrofitted technologies, be they energy efficiency improvements or low carbon energy sources, which are expected to lead to savings in household energy use rather than any significant change in lifestyle or energy use practices; and within this, the public is again conceptualised as responding primarily to financial incentives, a discourse compatible with *Ecological modernisation*.

Contrasting this perspective, expert understandings of the purpose of low carbon housing and the need to reduce national carbon emission more broadly, *Reducing carbon*

emissions occupy a very different discursive space. Connecting with *Civic environmentalism* and the media's *Sustainable living*, conceptualisations of the wider mechanisms for tackling climate change were deemed to require significant changes in the social norms of household energy use; a challenge that would thus require the strengthening of public environmental values through education and information provision. Two distinct ways of conceptualising the mechanisms for reducing carbon emissions from the UK housing sector arose. Whilst often discussed in conjunction, these perspectives occupy discrete discursive space and, considering the underlying assumptions surrounding the most appropriate incentives and mechanisms for change, are to a large extent contradictory. As seen within the policy and media discourses, the social change and values based incentives are thus marginalised in respect to low carbon housing options, whilst being emphasised in relation to the urgent need to tackle the problem of climate change. This contradiction is strange, as it highlights the way in which the expert discourse has diverged into two largely separate understandings of the concept of low carbon housing and the problem that it was designed to solve. Interestingly, the term low (or zero) carbon house itself is not seen to cross this discursive space, with experts interviewed for their personal and professional experience of sustainable living, finding little connection with the concept of low carbon housing.

10.2.4 Public discourses of low carbon housing

Figure 10.4 highlights the different discursive spaces occupied by the discourses surrounding the public constructions of low carbon housing discussed in Chapter 7. The public discourses surrounding low energy housing and eco-housing are largely rooted within the broad media-policy discourses of reducing household energy bills and the media's *Sustainable living* respectively. Drawing on popular culture and the media, the discourse surrounding the concept of an eco-house, focused on sustainable self-build housing and the deep green environmental values that accompanied them. Although commonly associated with unusual design and materials, the concept of eco-housing

varied in its depiction as a social or technological mechanism for change, and whilst often associated with radical lifestyle change, could be understood as in part a technological solution (due to the increasing emphasis of cutting edge technologies within television media such as Grand Designs).

In contrast, the concept of a low energy house (also *Changing homes* when considered in relation to *Environmental concern*) had links to the energy saving discourses of both the Green Deal and the media's *Retrofitting homes*. Within this understanding, economic incentives to encourage the implementation of technological fixes that can save money on household energy bills were central, with little direct connection made to environmental values, the issue of climate change and the reduction of carbon emissions. However, as highlighted in Chapter 9 *Changing behaviour* (which was based upon the *Small actions* repertoire) did provide a bridge between the concepts of low energy and eco- housing, through its emphasis of both economic and value based incentives for change. Interestingly, public use of *Small actions* was conflicted. At a social level, concern for the environment was seen as an important and self-evident motivation for change. However, on a personal level (and especially when considering the actions of others), a focus on *Everyday constraints* and everyday life meant economic incentives and technical fixes that avoided any undesirable impacts on comfort, control and security in the home were seen as essential.

The concept of low carbon housing was taken to mean something different within public discourses. Focusing on the embodied carbon emissions within the materials, production, transport and construction of the house itself, low carbon housing was intrinsically linked with the need to protect the environment and reduce unsustainable resource use. Despite connections with the term carbon footprint, which has previously been strongly linked to within the public and policy discourses around *Small actions*, personal economic benefits are not considered relevant within this conceptualisation of low carbon housing. However, contrasting the values based discourses in other domains, including the media's *Sustainable living*, the expert's *Reducing carbon emissions* and the

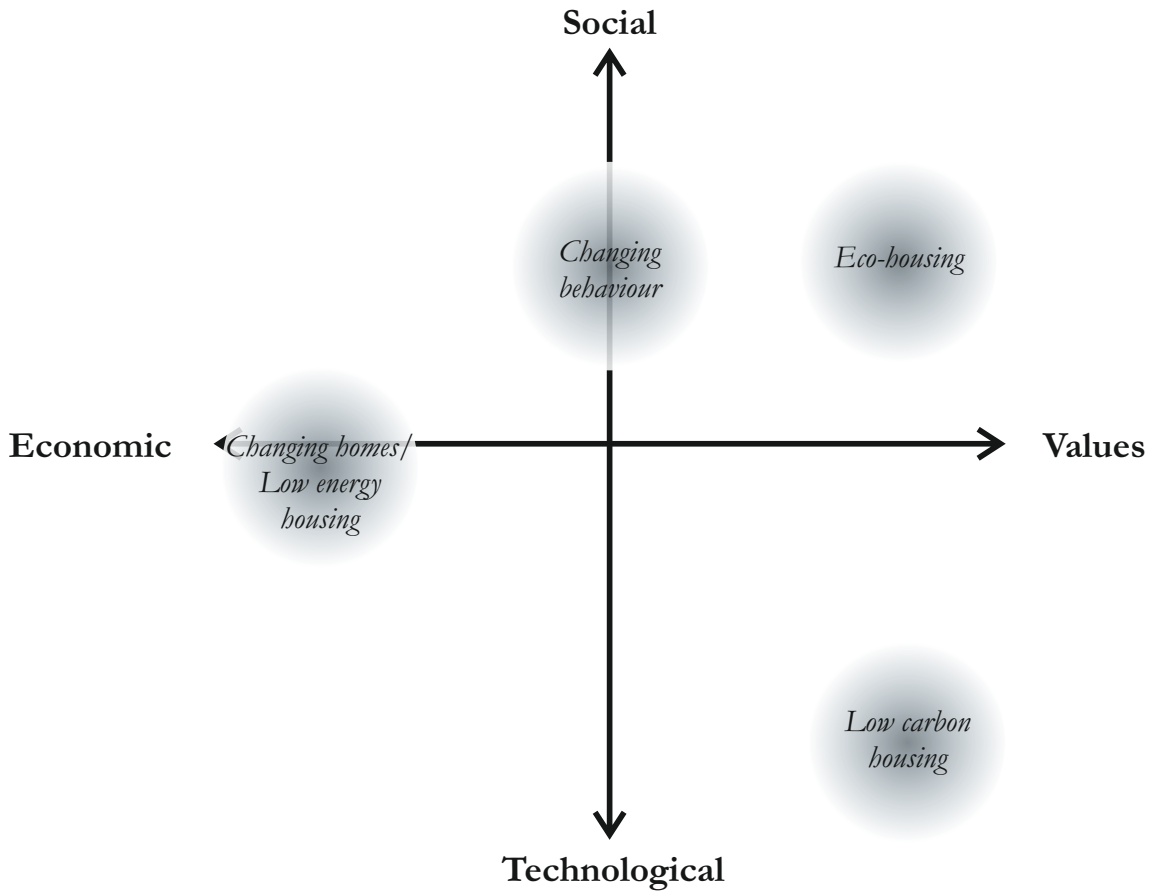

Figure 10.4: Public discourses of low carbon housing and their assumptions regarding the most effective incentives (economic *vs.* values based) and mechanisms (technological *vs.* social) for change.

public conceptualisation of eco-housing, technological, rather than social or behavioural, change is identified as the primary mechanism by which carbon emissions from housing will need to be reduced. This contrasts the meanings and assumptions embedded in the concept of low carbon housing identified within the policy, media and expert discourses, with public reinterpretations of this concept moving away from a techno-economic approach and placing understandings within a different, and previously unoccupied discursive space.

10.3 Communicating low carbon: Implications for reducing carbon emissions from housing

As argued throughout this thesis, discourse and language matter, reflecting and shaping realities, and the ways in which social and environmental problems are constructed and communicated (*Harré et al.*, 1999; *Forsyth*, 2009). As such, these social constructions have an important influence on the success or failure of actions taken to address these issues. Following a period of rapid climate change and energy policy change within the UK (*Carter*, 2014), terms such as low carbon and zero carbon, which were almost non-existent in relation to housing prior to the early 2000s (*Nerlich*, 2012) began to proliferate. *Lovell* (2004) demonstrated how the term low carbon housing emerged during this time, reframing the existing concept of sustainable housing, which embodied the often radical environmental values of the sustainable housing movement of the 1970s, as a solution to climate change. Rooted within *Ecological modernisation*, a discourse common throughout the wider UK policy discourses of climate change and energy, the concept of low carbon housing has evolved since this time, promoted as a technological and economically viable solution to climate change (*Lovell*, 2004; *Pickvance*, 2009). With this in mind, the implications of the key findings of this thesis on the future of the low carbon housing concept and the opportunities it provides for reducing carbon emissions from housing are now considered.

Demonstrating the role of language and terminology in determining the meanings associated with objects and phenomena, a range of different terms have been shown to be connected with the concept of low carbon housing, each of which has a different meaning. Interestingly, whilst a key focus of the policy discourse, the term zero carbon house has little resonance within expert discourses, except in relation to the definition of this term within the Code for Sustainable Homes and Zero Carbon Homes target policies. As discussed in Chapter 4, the original definition of a zero carbon house proposed by the Sustainable Building Task Force was based around a net-zero carbon

house, including the need to consider both regulated and unregulated energy use, as well as the embodied carbon within the materials and construction of the house itself. However, this definition has been heavily contested. Echoing the findings of *Stenberg and Raisanen* (2006), it is likely that the interpretive flexibility surrounding the term zero carbon house has allowed it to act as a boundary object (*Star*, 2010), with the plurality of meanings available providing a platform on which diverse actors (such as the discourse coalition of policy, industry and NGO representatives discussed in Chapter 5) can come together to work towards a common goal. However, it is clear that this definition was always at odds with the broader discourse of low carbon housing and *Ecological modernisation*, due to the high costs of achieving this standard, as well as the likelihood that some level of lifestyle change would be required. This mismatch between the zero carbon definition and the broader discourse is thus likely to have contributed to the extensive debate and consequent redefinition of this concept.

As discussed above, the discourses of low carbon housing more broadly embody assumptions regarding the incentives and mechanisms for achieving change (in this case, for reducing carbon emissions from within the housing sector). Rooted within *Ecological modernisation*, a techno-economic approach dominated the low carbon housing discourse, with the policy discourse surrounding the Code for Sustainable Homes, the media's *Zero carbon housing* and *Retrofitting homes*, and the expert discourses surrounding *Low carbon retrofit* and *Low carbon new build*, all seen to embody shared assumptions regarding the primacy of economic incentives and technological mechanisms for change. Thus the role of value based incentives and social or behavioural mechanisms for change have been marginalised, despite the social availability of a range of discourses that support them (including the media's *Sustainable living*, the experts' *Reducing carbon emissions* and the public discourses surrounding the concept of eco-housing and the *Small actions* repertoire).

Proponents of Ecological Modernisation Theory advocate techno-economic solutions to the environmental degradation caused by industrial society, that re-orientate the

'economy to harmonise it with ecological principles' (*Hannigan*, 2006, 26) and allow for green growth. However, critiques of this approach have focused on the under theorised nature of the social and political barriers to these strategies and how these can be overcome, as well as the strong sense of technological optimism embedded with them (*Christoff*, 1996; *Hannigan*, 2006). In relation to low carbon housing these criticisms are particularly relevant, due to the interrelations between the material, political and social aspects of housing. In particular, the techno-fix approach embedded within *Ecological modernisation* is challenged in relation to housing due to the currently unresolved 'performance gap' between the performance of low carbon housing as designed, when built and then finally in use (see *Stevenson and Leaman*, 2010 and *Janda*'s (2011) assertion that 'buildings don't use energy, people do'), suggesting that it is unlikely that a techno-economic approach to low carbon housing alone can achieve carbon emissions reductions.

A related consequence of the techno-economic approach embedded within the low carbon housing discourse can be seen within the expert conceptualisations of the role of the public in reducing carbon emissions from the housing sector. Whilst the broader *Reducing carbon emissions* discourse calls for changes to social norms and energy use practices in order to reduce household carbon emissions, a focus on the need to design out the influence of occupants on household energy use within *Low carbon retrofit* and *Low carbon new build* has come to dominate expert visions of future housing options (see Chapter 6). As such, it is clear that to some extent this approach to low carbon housing has constrained policy and expert understandings of the public, their values and motivations, and their interactions with technology, which in turn has led to assumptions regarding the public acceptability of low carbon housing. In particular, a simplistic focus on the perceived barriers to the adoption of low carbon housing and technologies, such as the visual aesthetics, the high upfront costs and the increased hassle of installation and use, has dominated understandings and prevented consideration of the complex interactions between low carbon housing options and social

and personal values of comfort, control and security that can be seen to mediate public perceptions (as discussed in Chapter 8).

For these reasons, as well as the perceived abstract nature of carbon emissions, many policy makers and experts suggest that the public acceptability of low carbon housing would be greatly increased by shifting the discursive framing towards reducing energy use in the home, and thus saving money on household energy bills; a belief that is reflected within the recent shift from climate change to energy discourse within UK policy (see Chapter 4). Interestingly, this reframing would, to some extent, correspond well with the public discourse surrounding low energy housing, which again largely adopts the assumptions of the techno-economic paradigm, remaining focused on household energy use and predominantly rejecting the lifestyle change advocated by the *Small actions* repertoire. However, whilst this framing may indeed increase public engagement surrounding the benefits of reducing household energy use, recent research suggests that in marginalising environmental values, this strategy may be counter productive. Specifically, the role of personal and social values, as the building blocks upon which broader public perceptions around the acceptability of policy options are built, needs to be considered.

Recent work exploring the framing of environmental issues has highlighted how appealing to extrinsic values (such as those embedded within a focus on saving money), whilst possibly effective in the short-term may back-fire, and are thus unlikely to achieve long-lasting change (*PIRC*, 2011). Rather than basing frames on self-interest, more intrinsic values such as fairness, reducing waste and social equity and security are seen to be more effective (*COIN*, 2015); a finding that was recently confirmed in relation to the public acceptability of wider energy systems transitions (*Parkhill et al.*, 2013; *Demski et al.*, 2015). In this case, a broader principle of affordability, which considered both the personal and societal costs in relation to fairness, responsibility and trust, was seen as a crucial element of public acceptability of energy system transitions, even where they may involve initial short-term costs. These findings thus highlight how, as previously

identified (*Owens*, 2000; *Jackson*, 2005), considering the public as economically rational individuals, and framing environmental policies as principally a mechanism for financial gain ignores the personal, social-cultural and infrastructural contexts that shape both individual decision making and broader public understandings of change (*Owens and Driffill*, 2008).

Returning to the issue of low carbon housing, the findings of this thesis are thus particularly relevant to the framing and promotion of low carbon housing options. In contrast to the policy and expert discourses, and despite drawing on the broader discourse of *Environmental concern*, public conceptualisations of low carbon housing activated neither the techno-economic paradigm, nor the radical lifestyle change based discourse of the environmental movement. As discussed in Chapter 7, rather than simply being an abstract idea, the concept of carbon was interpreted differently by the public, through an understanding of the idea of a carbon footprint. Through consideration of resource use and reducing waste, this perspective presented a route through which to implicitly understand the notion of embodied carbon and energy within materials and products, leading to a focus on the reduction of carbon emissions from buildings from this direction (rather than a through reducing energy use in the home). This understanding highlights the existence of an alternative discursive space, one that, instead of implying a purely techno-economic approach to carbon emissions reductions, connects with broader environmental values.

In addition, through the consideration of the discourses surrounding low carbon housing, it has been possible to investigate the discursive construction of a specific and little known mitigation option within the public sphere. Eliciting different responses to those normally identified, the opening of this new discursive space may provide a new direction from which to consider public discourses around climate change more widely. As *Hinchliffe* (1996) highlights in his discussion of the UK Government's 1991 campaign, Helping the Earth Begins at Home, problem and solution frames surrounding environmental issues, and the assumptions embedded within them, can

have a significant influence on public perceptions and the acceptability of the solutions offered. As discussed in Chapter 2, public discourses of climate change tend to fall into two categories: a scientific and environmental conceptualisation of the issue (leading to a discursive focus on uncertainty and scepticism), and consideration of the socio-political questions related to mitigation options (with a focus on the *Small actions* repertoire and conceptions of fairness and responsibility – *cf.*, *Capstick*, 2013). Reducing the focus on the polarising issue of climate change, a new approach, that taps into social values of environmental protection and sustainability through the consideration of issues of waste and resource use, whilst still focusing on the need for large-scale, long-term technological change, as advocated by *MacKay* (2008), may be more engaging.

Whether considering the broader issue of climate change and the need to reduce national carbon emissions, or focusing on specific mitigation options such as low carbon housing, it is not implied that a simple reframing of the discussion alone can act as a 'magic bullet', through which public adoption of low carbon housing and technologies will rapidly increase. Instead, the contention here is that in a sector where the everyday meaning and experience of home is crucial to public acceptance of change, reducing the disconnect between the policy conceptualisation of low carbon housing and the social values through which it is publicly understood is important. As discussed within Chapter 8, and supported by the findings of *Demski et al.* (2015), the acceptability of specific mitigation options at all scales are influenced not only by broader social and environmental values surrounding the desire to move towards a more sustainable future, but also by the more personal values, such as, in the context of low carbon housing, those surrounding the meaning of home, including comfort, control and security.

As such, whilst reframing low carbon housing may provide a framework for public engagement, discussion of specific options and technologies would need to take into account a range of more specific everyday social values. There is thus a need for a more deliberative approach to low carbon housing, promoting an upstream approach to public engagement that would move away from the information-deficit model (*Owens*,

2000), and begin to challenge expert assumptions regarding the public acceptability of low carbon housing. Commonly utilised in relation to the public acceptability of technological risk (*e.g.*, GM foods (*Horlick-Jones et al.*, 2004) or nanotechnology (*Pidgeon and Rogers-Hayden*, 2007)), this approach has been proven to be an effective method for engaging the public with national energy policy (*Pidgeon et al.*, 2014). Incorporating public hopes and concerns, as well as their assumptions surrounding incentives and mechanisms by which change can be achieved, may thus provide a first step towards increasing public engagement with the need to transition towards a low carbon housing stock and enable the construction of a more socially shared vision of a low carbon future.

10.4 Research limitations and further research

A key purpose of this research was to investigate the broader understandings of low carbon housing and allow for a comparison of the meanings and discourses that surrounded this concept within different discursive domains. As highlighted at the beginning of this chapter, this novel approach towards investigating the discourses of low carbon housing was a key strength of this research and was effective in addressing the research questions posed in Chapter 1. However, due to the limited time and budget available for conducting each phase of the research, many interesting avenues could not be explored in the same depth to which they would be should just one discursive domain be under investigation. As such, this section aims to highlight the limitations surrounding each of the research phases undertaken as part of this thesis, and discuss the range of opportunities for further research that have been opened up.

Policy discourses: To some extent treated within previous research (*Pickvance*, 2009; *Goodchild and Walshaw*, 2011), the policy discourses surrounding low carbon housing were not the primary focus of this thesis, but were investigated through documentary evidence in order to provide the necessary context for this research, without which

the media, expert and public discourses could be understood. However, in following the development of the UK policy discourse surrounding low carbon housing, Chapter 4 demonstrated how the understanding of this concept has changed over time, in part due to shifts in the political discourse surrounding climate change and energy policy following the election of the Coalition Government in 2010. Given the recent announcement that the Code for Sustainable Homes is to be scrapped (*HM Gov*, 2015), the general failure of the Green Deal policy (*Guertler et al.*, 2013), and the election of the new Conservative Government in May 2015, there are likely to be significant changes to the framing of UK low carbon housing policy, both in relation to new and existing housing, which may be interesting to follow as this discourse develops. Exploring other avenues, a deeper investigation of the political rhetoric and argumentation, such as that seen within political debates within UK Parliament and Parliamentary committee meetings, may now also be useful in explaining the scrapping of the Code for Sustainable Homes. In addition, with the salience of climate change diminishing within UK politics, research building on *Lovell et al.* (2009) may be warranted, in order to investigate the effects of the broader shifts in discursive focus from climate change to energy discourse that have occurred within UK climate change policies since this time.

Media discourses: In addition to providing an insight into the development of the political discourses of low carbon housing, Phase 1 of this research demonstrated that understanding the representations of low carbon housing within the broadsheet media is important, both as a discourse in its own right and as window into broader political discourses. As advocated by *Boykoff* (2008), in addition to monitoring the development of the broadsheet media discourse, the representation of low carbon housing (and reducing carbon emissions more broadly) within the tabloid press would also be particularly interesting, as it is likely that any representations within these will be considerably different. Whilst these newspapers are less likely to use the term low carbon house, or even focus on carbon emissions more broadly, it is clear, from articles such as the Daily Mail's 'Big brother to switch off your fridge' (*Myers and Beck*, 2013), that the concepts

and technologies surrounding low carbon housing are discussed within the tabloids, and are thus a possible source of information and influence on public perceptions. Found to be a source of public knowledge and interest in this concept within this research, other areas of media discourse may also prove fruitful avenues for investigation, including representations of low carbon housing within television news and documentaries, as well as special interest programmes such as Grand Designs.

Expert discourses: As mentioned above, the broad nature of this thesis inevitably led to a more superficial treatment of some areas of the research. This is particularly true within Phase 2 of this research, and further investigation into the expert discourses surrounding the concept of low carbon housing would thus be particularly beneficial. Although the range of experts included within this research provided a broad and effective sample for addressing the research questions posed within this thesis, a larger sample, incorporating experts from a broader range of backgrounds (including politicians, social housing professionals and landlords, and a wider range of green building and sustainability experts) would undoubtedly provide additional insights into the wider discourses surrounding low carbon (as well as low energy and sustainable) housing. Additionally, whilst the interviews conducted focused on gaining a broad understanding of expert perceptions of both low carbon housing and the wider decarbonisation agenda, some topics of discussion proved more fruitful than others and thus warrant deeper investigation. With hindsight, one key area of interest is the expert visions of the future and the scenarios for future changes to homes and housing that they envisage. Whilst Chapter 6 has explored the Passivhaus and Smart home visions of future low carbon housing options, a deeper investigation of the broader scenarios for decarbonising UK housing stocks envisaged by a wider set of experts would be particularly helpful, both in its own right, as well as in providing more detailed materials for investigating public perceptions and acceptability of future housing options.

In addition, whilst Phase 2 of this research has provided valuable insights into the development of low carbon housing discourse, expert conceptualisations of low carbon

housing configurations and futures, and the role of the public in reducing carbon emissions within the home, this research has not attempted to comment on the influence these understandings have on the material development of low carbon housing options. However, as discussed in Chapter 2, discourses can play a significant role in influencing technical change. As such, building on previous research within Science and Technology Studies (see – *Lovell*, 2005; *Stenberg and Raisanen*, 2006; *Ole Jensen and Gram-Hanssen*, 2008), it would interesting to investigate the practical implications of these expert visions of the future, and imaginaries of the public, on low carbon housing policy and regulations, as well as the material implications for future housing.

Public discourses: Phase 3 of this research highlighted the benefits of exploring public understandings of more specific climate change mitigation options (in comparison to considerations of the broader and more complex issue of climate change). Again, whilst a set of five focus groups (from a range of different social backgrounds - see Chapter 3) was deemed appropriate for addressing the research questions posed within this thesis, conducting further focus groups may also be beneficial for a number of reasons. In particular, increasing the range and diversity of participants is likely to yield further interesting findings and allow for a deeper investigation of specific questions, such as the acceptability of expert visions of future housing options. In particular, it may be useful to specifically explore the perceptions of those at different life stages in more detail in order to investigate how this shapes their understandings of home in this context.

In addition, building on research investigating the perceptions of individuals living within low carbon housing (*e.g.*, *Goodchild et al.*, 2014), it is clear that further research is required to specifically explore the wider public acceptability of new forms of housing in more detail than was possible within this thesis. In particular, in order to allow participants to achieve a more tangible understanding of the realities of low carbon housing, as well as the role of identity, practice and materiality in the home, a broader range of methodologies would be useful (as advocated by *Pink*, 2012; *Goodchild et al.*, 2014). This could include conducting visits and walking tours of existing low carbon

houses, in order to reduce the abstract and theoretical nature of discussions and explore in more detail the role of social values such as comfort, control and security within the material reality of the house.

Finally, the public construction of low carbon housing within this research suggests a number of avenues for future research. In addition to investigating the possibilities of the new discursive space opened up by this understanding (as discussed above), the implicit understanding of embodied energy within materials and products demonstrated within this research is particularly novel, and as such warrants further research. Public understandings of the concept of a carbon footprint would be an interesting starting point to explore public perceptions of the many different options for reducing carbon emissions from the production of both housing and other materials and products. Representing a range of options for both social and technical change, research investigating the reduction of emissions from materials and products thus provides an opportunity to further investigate the public assumptions surrounding the incentives and mechanisms for change identified within this thesis.

Exploring multiple discourses: Whilst each of the discourse domains discussed above would be interesting to explore further in its own right, further research into the connections between these discourses would also be particularly beneficial. Whilst acknowledging that the spread of discourses between the discursive domains is not linear (as discussed in Chapter 2), it is clear that, to some extent, the discursive storylines embedded within each discourse area are shared. This effect is particularly clear when considering the similarities between the policy, media and expert discourses of low carbon housing; a deeper understanding of the more practical mechanisms by which these partially shared discourses have developed would thus be particularly instructive. In contrast, public understandings of the concept of low carbon housing were found to diverge significantly from the existing policy and media discourses. Although this thesis has not sought to suggest that public discourses need to be in some way synchronised with this broader discourse, the disconnect between techno-economic perspective of the

policy, media and expert discourses and the more varied public conceptualisations of low carbon, low energy and eco- housing may have implications for the effectiveness of low carbon housing options. Further research is thus required to explore the deeper causes of this disconnect and identify both deliberative and communications strategies for increasing public engagement with the need to reduce carbon emissions from housing.

As discussed throughout this chapter, this thesis has aimed to explore and compare the discourses of low carbon housing within the policy, media, expert and public discursive domains. The research design and methodology utilised within this thesis proved a novel and effective way of exploring the diverse discourses of low carbon housing within a number of discursive domains. In particular, this thesis has demonstrated the importance of investigating the more specific, and less abstract, mitigation options that will impact the everyday lives of the public. However, whilst this research approach was successful in exploring the specific, and previously under-researched concept of low carbon housing, this comparative approach would be less appropriate when considering broader and more complex (and already heavily researched) issues such as climate change. As such, a key strength of this research can be seen to lie in its ability to provide a range of novel insights and findings regarding both the distinct discursive domains and the broader connections between these; thus demonstrating the value of exploring the discourses of low carbon housing and providing a base upon which extensive further research could be conducted. Beyond this, the research approach adopted within this thesis has demonstrated the importance of exploring the assumptions embedded within discourses of low carbon housing, helping to define the concept within the different discursive domains and providing broader insights into the spread of *Ecological modernisation* within the discourses surrounding climate change mitigation; the influence of which will play a significant role in transitioning towards a low carbon housing stock.

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APPENDIX A

Phase 2 - Supporting documents

Appendix A contains all supporting documents and consent forms relating to Phase 2 of this research, including:

1. Expert interviews: Letter of invitation
2. Expert interviews: Project information sheet
3. Expert interviews: Interview consent forms
4. Expert interviews: Interview protocol

Dear Sir/Madam,

I'm writing to request your participation in a short interview for a Cardiff University funded research project entitled Decarbonisation of the Home: How is it framed and understood by policy makers and the public. Enclosed is a full description of the project, including the study aims and broad research questions and consent forms.

The project is supervised by Professor Nick Pidgeon (School of Psychology), Dr Christina Hopfe (School of Engineering) and Dr Brian MacGillivray (the Sustainable Places Research Institute).

As a key figure in the area being researched your views would be invaluable to this project and we would be very grateful if you would undertake this short interview of approximately 60 minutes. We hope that you will be able to participate in this study as your insights would make an important contribution to this research.

If you wish to discuss any aspect of the project further before agreeing to an interview please contact me on the details provide below and we will be happy to respond to any queries you may have.

Should you decide you can afford to lend some of your time and expertise to this research, please could you contact us via the details provided.

Thank you for your time.

Yours Sincerely
Catherine Cherry (postgraduate student)

Address: 51a Park Place, School of Psychology, Cardiff, CF10 3AT
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Supervisory team: Prof. Nick Pidgeon (pidgeonn@cardiff.ac.uk)
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Decarbonisation of the Home:
How is it framed and understood by policy makers and the public

Project description and research aims

This research is being undertaken by Catherine Cherry, a postgraduate student, based within the Schools of Psychology and Engineering at Cardiff University. Broadly, this research aims to investigate understandings of decarbonisation of the home within different groups of individuals, including experts, the public and the media.

This part of the research will focus on the way in which decarbonisation of the home, and more specifically low carbon housing, is framed, communicated and understood by different experts, including housing sector professionals, local and national government, and NGOs, will initially be investigated.

What will your participation involve?

Should you decide to take part in the research your participation will involve you taking part in an interview that is expected to last for between 60-90 minutes.

The interview will be a qualitative semi-structured interview and will take the form of a guided conversation. There are certain topics the interview will be addressing and the interviewer will deliver some broad questions throughout the interview to guide the conversation. The direction of the interview will however be largely determined your answers and discussion. If possible the interview will be conducted face to face and in a location that is most convenient for you, although a telephone interview is also possible. With your permission the interview will be recorded.

If at any point you change your mind about taking part in the research you can withdraw at any time by contacting us on the details provided below. You may also withdraw in person during the interview or at any other time.

Who is being interviewed?

We are intending to interview stakeholders from as many different areas as possible, these are likely to include: policy makers, housing sector professionals (such as architects, researchers and builders), members of non-governmental organisations and academics. Interviews will be carried out with members of the public later in the study.

Anonymity and confidentiality

All data will remain confidential in accordance with British Psychological Society (BPS) 'Ethical principles for conducting research on human participants'. The option to remain anonymous within this research will be offered to all participants. If this option is selected, actual names will be viewed only by the project team. In addition, all participants will be given an alias which will be used by the project team in day to day discussion of the research. In all related publications, participant's quotes will be made anonymous. In that context, only non-identifying generic terms (e.g., gender, age, profession) and the alias will be used to describe participants. The interview recordings will be stored in a secure location at Cardiff University. Even where anonymity is not requested, consent will still be sought before the publication of any personal quotes/opinions within this research.

Who will have access to the data?

The audio recordings and transcripts will be shared among the researcher and her supervisory team, and with their permission, with other relevant researchers. Participants may ask to see the data or request that it be destroyed at any time, up until the date that the data is anonymised.

How will the data be used?

The data will be used in academic research and will be used to produce reports, presentations, conference papers, and academic publications. The data and/or subsequent publications may also be used for teaching purposes.

Who is funding the research?

The research is being funded by Cardiff University, though the School of Psychology and the School of Engineering.

The research team

Principle investigator: Catherine Cherry (postgraduate student)
Supervisory team: Prof. Nick Pidgeon (pidgeonn@cardiff.ac.uk)
Dr. Christina Hopfe (hopfec@cardiff.ac.uk)
Dr. Brian MacGillivray (macgillivraybh@cardiff.ac.uk)

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School of Psychology, Cardiff University

Consent Form - Anonymous Data

I understand that my participation in this project will involve taking part in a semi-structured interview which will take approximately 60-90 minutes of my time. I understand that I may be contacted after the interview to review, validate and clarify issues or elaborate on themes. I understand that the group discussions will be recorded with audio equipment.

I understand that participation in this study is entirely voluntary and that I can withdraw from the study at any time (up until the date when data is anonymised) without giving a reason. I understand that I am free to ask any questions at any time. I am free to withdraw or discuss my concerns with postgraduate student Catherine Cherry. I agree that data obtained in the session may be utilised in discussion with other researchers, in any ensuing presentations, reports, publications, websites, broadcasts, and in teaching.

I understand that the information provided by me will be held confidentially, such that only the researcher (postgraduate student Catherine Cherry) and her supervisors (Professor Nick Pidgeon, Dr Christina Hopfe and Dr Brian MacGillivray) can trace this information back to me individually.

I understand that I have the choice to remain anonymous within this research and subsequent publications. In this case, once any follow-ups have been carried out, information will then be anonymised. The anonymised data will be held indefinitely. Following this all publications and discussion of the research all information I give will be made anonymous with only pseudonyms and generic identifying features (e.g. profession) utilised for identification.

I understand that I can ask for the information I provide to be deleted/destroyed at any time up until it is anonymised and I can have access to the information at any time until it is anonymised.

I understand that if I choose not to remain anonymous that I will be will be asked for my approval of any quotes/identifications used within the research and subsequent publications.

Please tick as appropriate:

Yes	No	
☐	☐	I am happy for my name to be cited in the research (following personal approval).
☐	☐	I am happy for my institutional affiliation to be cited within this research and confirm that I have the right to act as a spokesman for my institution.

I have been provided with sufficient information on the project to give *informed* consent to the interview session.

I, _____ **(PRINT NAME)** consent to participate in the study being undertaken by postgraduate student Catherine Cherry (supervised by Professor Nick Pidgeon, School of Psychology, Dr Christina Hopfe, School of Engineering, Cardiff University and Dr Brian MacGillivray, the Sustainable Places Research Institute).

Signed: Date:

School of Psychology, Cardiff University

Consent Form – Participant Database

I am willing for my name and contact details to be held in a list (database) so that I may be contacted in future and asked further questions (for the purposes of reviewing, validating and clarifying issues or elaborating on themes, as agreed below.

I understand that I am consenting only to receive a request to answer further questions and that I am under no obligation to answer these questions.

I understand that this list will only be used for the purpose described here and will not be made available to anyone beyond those agreed below.

I understand that I may remove my name from the list at any time by emailing postgraduate student Catherine Cherry (Cherryce@cardiff.ac.uk).

I, _____ (**PRINT NAME**) consent to enter my contact details onto the list held by postgraduate student Catherine Cherry, Professor Nick Pidgeon, Dr Christina Hopfe and Dr Brian MacGillivray.

Signed: Date:

Phase 2 – Expert discourses of low carbon housing: interview protocol

[Recorder on]

- Thank you for agreeing to participate.
- So my research is looking at discourses surrounding decarbonisation of UK homes. This phase of my project aims to understand what experts think of this issue.
- Will be a semi-structured interview, lasting approximately an hour.
- You are free to pull out at any time and if there's anything you don't want to talk about or that you feel you can't give a personal opinion on then just let me know.

Introductory questions – approx. 5min

___ What is your current job title? & how long have you worked in this field?

___ How does your role relate to reducing carbon emissions within homes?

___ What does that involve? What relevant projects you have been involved in?

Decarbonisation – approx. 10min

___ Could you just talk to me for a few minutes about the idea of decarbonisation in relation to homes/housing? What comes to mind when I use that term?

___ Do you think it is important to reduce emissions from homes/housing stock?

___ Could you explain why? (Climate change, energy bills, economic benefits, sustainability *etc.*)

___ How do you think emissions reductions in this area could be achieved?

___ Possible options for decarbonisation? (zero carbon houses, retrofitting, demand reduction)

___ What mechanisms are needed to achieve these? (Financial, regulatory, behavioural change)

___ Do you believe a transition to a truly zero carbon housing sector is possible? When is this likely?

Zero carbon houses – approx. 15min

___ Could you describe to me what a low/zero carbon home is?

___ Is there a definition?

___ What do you consider to be key design aspects that constitute a ZCH?

___ Technical aspects? (Energy efficiency, low carbon energy, passive design)

___ What do you think of the Passivhaus standard?

___ Do you think the needs of the people that live in low carbon houses are considered?

Social aspects? (Comfort, convenience, ease of use, hominess)

___ Is behaviour change required to reduce emissions?

___ Any specific examples?

___ Are there any particular challenges in low carbon housing?

___ What are the economic, technical or social implications?

___ How important is retrofitting existing housing?

Discourses of low carbon housing – approx. 15mins

___ Who would you say is most influential in shaping this agenda and for what reason?

___ What is the role for researchers/scientists, business, Government?

___ What do you think of low carbon housing policy – Green Deal and CSH?

___ Who do you believe should be most influential?

___ Are there any important events/documents that have contributed to the agenda?

Public responses – approx. 5min

___ How do you think the general public currently understand decarbonisation in the home?

___ What level of societal change will be needed in order to achieve emissions reductions?

The future – approx. 5min

___ In the long term, say by 2050, how do you imagine that the UK housing sector will have changed in the future?

Final questions

___ Is there anything important that you think we haven't discussed here?

___ Is there anyone else you would recommend that I contact for interview?

APPENDIX B

Phase 3 - Supporting documents

Appendix B contains all supporting documents and consent forms relating to Phase 3 of this research, including:

1. Public focus groups: Project leaflet
2. Public focus groups: Focus group consent forms
3. Public focus groups: Participant information sheet
4. Public focus groups: Focus group protocol
5. Public focus groups: Video transcripts
6. Public focus groups: Participant demographics

Who is undertaking this research?

This research is part of a PhD research project being conducted by Catherine Cherry, a postgraduate student at Cardiff University.

This research is funded jointly by the School of Psychology and the School of Engineering at Cardiff University.

The project is supervised by:

Prof. Nick Pidgeon (Cardiff University), Dr. Christina Hopfe (Loughborough University), Dr. Brian MacGillvray (Cardiff University) and Dr. Diane Gardener (Cardiff University).

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Public perceptions of low energy housing

Are you interested in taking part in a new research project?

Are you interested in how our homes and lifestyles might change in the future?

CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD

Each participant will receive **£30** as a thank you for your time.

What is the project about?

This project aims to investigate how the British public relate to the ways in which our housing and lifestyles may change in the future.
Understanding public opinions of current options for low energy housing in the UK is important in helping to design effective and acceptable policies that will help reduce energy use within UK homes.

What will participation involve?

We are looking for people to take part in focus group discussions. The discussions will take the form of an informal conversation between you, other participants and the researcher.

You will be asked to discuss topics such as: your current home and lifestyle and how you might live in the future, as well as being shown a number of examples of low energy housing.

The focus group discussion will take around 3 hours (including a tea break) and will be conducted at Cardiff University. As a thank you for your participation, you will receive **£30** for your time.

Who else is participating?

Each focus group will include a group of around 6 similar participants, which will be based on either shared local area, or a shared interest.

How will the data be used?

The focus group discussion will be recorded with audio equipment only.

The data will then be anonymised and analysed by the researcher and her supervisory team.

The data will be used for academic research only and may be used in publications, presentations, reports, websites, broadcasts, in teaching and in discussion with other researchers.

Anonymity and confidentiality

The information and responses you provide will be held confidentially, such that only the project team can trace this information back to you.

The recordings will be transcribed and pseudonyms will be used to make the data anonymous. These will then be used by the project team within all related publications. Only non-identifying generic terms (gender and age) and the pseudonym will be used to describe participants.

If at any point you change your mind about taking part in the research you can withdraw by contacting the researcher using the details provided. You may also withdraw during the focus group or at any other time. Participants may ask to see the data or request that it be destroyed at any time, up until the date that it is anonymised.

School of Psychology, Cardiff University

Consent Form - Anonymous Data

I understand that my participation in this project will involve taking part in a group discussion, and will take approximately 3 hours of my time. I understand that this will involve participating in discussions about you home and discussing examples of low carbon housing. I understand that the group discussions will be recorded with audio equipment.

I understand that participation in this study is entirely voluntary and that I can withdraw from the study at any time (up until the date when data is anonymised) without giving a reason. I understand that I am free to ask any questions at any time or discuss my concerns with postgraduate student Catherine Cherry.

I understand that I can have access to the information I provide or ask for it to be deleted/destroyed at any time up until the data is anonymised.

I understand that once the audio recording has been transcribed into a written transcript, the information provided by me will be made anonymous using pseudonyms and will held confidentially and anonymously, such the information cannot be traced back to me individually.

I understand that once the data has been anonymised, it will be held indefinitely. Following this, any use of the data within publications, presentations, reports, websites, broadcasts, teaching and in discussion with other researchers, will be anonymous with only pseudonyms and generic identifying features (e.g., age and gender) used for identification.

I have been provided with sufficient information on the project to give *informed* consent to the discussion group session.

I, _____ (PRINT NAME) consent to participate in the study being undertaken by postgraduate student Catherine Cherry (supervised by Professor Nick Pidgeon, School of Psychology, Dr Christina Hopfe, Loughborough University, Dr Brian MacGillivray, the Sustainable Places Research Institute and Dr. Diane Gardener, School of Engineering).

Signed: Date:

School of Psychology, Cardiff University

Consent Form – Participant database

I am willing for my name and contact details to be held in a list (secure database) so that I may be provided with the research reports and findings.

I understand that this list will only be used for the purpose described here and will not be made available to anyone beyond those agreed below.

I understand that the contact details provided by me will be held confidentially, such that only the researcher (postgraduate student Catherine Cherry) and her supervisors can trace the this information back to me individually, and will be deleted once the research project has been completed.

I understand that I may remove my name from the list at any time by emailing postgraduate student Catherine Cherry (Cherryce@cardiff.ac.uk).

I, _____ (**PRINT NAME**) consent to enter my contact details onto the list held by postgraduate student Catherine Cherry, Professor Nick Pidgeon, Dr Christina Hopfe and Dr Brian MacGillivray.

Signed: Date:

School of Psychology, Cardiff University

Participant information sheet

No personal or identifying information provided on this form will be used in any way in the publication of the thesis or other publications and all data will be anonymised in the transcripts and subsequent publications.

However, quotations or responses will be referenced using generic descriptions that help to provide context for readers (*e.g.* age, gender, occupation etc.).

This information is requested to help the researcher(s) provide contextual information on the project's participants.

Name: _____

Age: _____

Occupation: _____

What type of property do you live in?_____

Do you own or rent your home?: _____

Phase 3 – Public discourses of low carbon housing: focus group protocol

[Recorder on]

- Thank you for agreeing to participate
- Please sign the consent forms, participant profile sheet and payment form
- Description of my research: possibilities for reducing energy/emissions from housing
- There are no wrong answers/not looking for facts within the discussion. I genuinely want to know what your thoughts and first impressions are on this issue and the houses we will discuss

Part 1 – approx. 60 minutes

Group discussion: Introductions and energy use in the home

___ Please say your name… describe your home and what do you like most about living there?

___ So thinking about the places you've lived in the past,
what is it about a house that makes you feel most at home? Or unhomely?

___ What sort of things are most important to you in choosing a home? And why?

___ In a perfect world, what would your ideal home be like?

___ In your ideal home, do you think your day to day life would be different?

___ Would you use more energy or less?

Prompts

___ Location
___ Space
___ Comfort
___ Décor
___ Leisure
___ Energy

Group discussion: Low carbon homes

___ Have you heard the term low energy home? What does it mean?

___ What about the term low carbon house? Would this be different to a low energy house?

Photo elicitation exercise: Discuss 7 photographs of low carbon houses

Talk through each photograph

___ Which photos jump out at you? And why?

___ What would it be like to live in these houses? What technologies would be included?

___ What sort of people live in these houses?

Tea break: 20 minutes

Part 2 – approx. 60 minutes

Video elicitation exercise: Discuss 5 photographs of low carbon houses

New build low/zero energy houses

Video 1: Modern efficient homes (2.30min)
Video 2: Smart technologies (4min)
Video 3: Passivhaus (2.30min)

Low energy retrofitting of existing homes

Video 4: Traditional retrofit (2.30min)
Video 5: Modern retrofit (4min)

Group discussion: Consider each video in turn

___ What do you think of the:

___ The house as a whole?

___ The design and interior?

___The technology?

___ The appliances/lighting?

___ The heating systems? Lack of radiators?

___ Do you think your everyday life would be different in this house?

___ Would you think about retrofitting your home? Why/why not?

___ If you had to choose one of these types of houses, which would you pick?

___ Do you think these houses are/could be homely?

Prompts on technology

___ 1) Biomass boiler, ventilation system

___ 2) Automatic lights, plus and energy use monitors, integrated PV, heat pump, smart controls (Ipads now)

___ 3) Lack of - MVHR ventilation, solar hot water only, no radiators

___ 4) wood stove, solar PV, LED lights

___ 5) Passive heating pus wood stove

Part 3 – approx. 30 minutes

Broader issues surrounding reducing energy and emissions in the home

___ Thinking about the whole country, do you think we should try and reduce our energy use? Why?

___Why do you think low energy/carbon housing isn't currently being taken up much?

___ What is the best way to increase take up of low carbon housing options? Or retrofitting options?

___ Who should be responsible for this? (Government, public, business *etc.*)

___ Another option to reduce energy use is to change our behaviour in the home, to reducing the energy we use through not doing things, or not buying things. What do you think of this possibility?

___ So from all the house that we looked at in the pictures and the videos and stuff, do you feel more inclined to think about buying a low carbon/energy house or retrofitting your home?

Phase 3 – Public discourses of low carbon housing: video clips transcripts

Video 1 - Inside the 'zero carbon' future home

BBC News – updated Tuesday, 8 September 2009

http://news.bbc.co.uk/1/hi/uk/8243810.stm

[Outside development]

Presenter: I'm at a housing development in Basingstoke in Hampshire where they've built a series of homes according to how stringent the eco rules governing building are going to be as the years unfold. And it all leads up to the year 2016 where we have a carbon zero home. So let's have a look inside.

[Inside the house]

Presenter: If you look at the kitchen lots of appliances as you'd have now, but they're all powered by photovoltaic panels on the roof, providing so much electricity that they'll be selling it to the national grid. Underfloor heating, where the heat comes from I'll show you in a minute. The glass is triple glazed and you can see the wall here is nearly double the size they'd build it under current regulations.

[In the garden]

Presenter: Outside, they're collecting rainwater on the roof which goes into a big tank under the garden and that's used for flushing the loos and for clothes washing. There are also bird boxes and bat boxes, as that gives them extra points according to the Government guidelines.

[Back inside the house]

Presenter: Conserving heat is crucial and they have a system here to try and make sure the heat isn't lost through ventilation. This is the hub of it. It sucks stale and wet air out through the bathrooms and brings in fresh air, but without losing any of the warmth.

[In the garage]

Presenter: Talk about warmth, let' see where the warmth comes from. I'm outside the house now, and this is the clincher for the carbon zero home, it's a biomass boiler and it's using wood pellets here to heat the hot water. The theory is that the carbon dioxide is sucked in by the tree while it's growing and that means it's OK for it to be expelled in this way in the furnace. But the upshot of this is that it costs £50,000 more to build the carbon zero home than it would cost under the current building regulations, and the developers say they wouldn't be able to retrieve that from the homebuyer.

Video 2 – BRE Smart House

BRE Video UK, YouTube- updated 2 October, 2013

https://www.youtube.com/watch?v=AVVH4FIdr7Y Shortened version used

[Outside the house]

Presenter: BRE and partner British Gas have been working to bring the Integer House up to date. Now fitted with a range of ultra-energy efficient features and re-named the Smart Home, we home that this will influence the next generation in the way that the original Integer House did. So the front door used the latest electronic locking technology, just like a car, push the button, locks open, in we go.

[Inside the house – video montage of the rooms]

Presenter: A key objective of the project has been to show the significant energy savings that can be made through smart technologies, alongside fabric improvements like better airtightness. Throughout the Smart Home the latest low energy and LED lighting has been use. A sensor in the ceiling is measuring the light levels and optimising is through the day, the motion sensor in the corner will turn the lights off if the room is unoccupied. An FSC certified kitchen has been installed, and an innovative new to market solar water heating system has been installed. Every socket in the house has an energy monitor connected to it, so users can see the impact of their behaviour on energy use. An intelligent whole house monitoring system is monitoring water use, energy use, security and ventilation in the home. It can also monitor the movements of the elderly, an important part of making sure they're safe in their houses.

[Back outside the house, next to air source heat pump]

Presenter: The original ground source heat pump has been replaced by the latest in air source heat pump technology; this will heat the home via app enabled controls.

[Inside the house]

Presenter: Now the design of this house is unusual. We're downstairs, but in the bedroom, the living areas are upstairs. But building it that way, in the day warm air naturally rises and the living area stays warm and comfortable and at night you can come down here, where it's coo land dark and quiet, and therefore sleep more easily. Throughout the Smart Home, the white painted walls use an innovative new paint with light reflective particles creating the illusion of added light and space in the room. And in the bedrooms, a 3mm insulated plaster is used with the heat reflective pain to improve the thermal performance of the wall.

[Inside the conservatory]

Presenter: So the large conservatory of the original house provided a useful outdoor living space. But now glazed with this innovative translucent PV system, provides most of the power requirements of the house.

Video 3 – Inside the 'green' energy house of the future

BBC News – updated 18 January 2014

http://www.bbc.co.uk/news/uk-england-25403897

[View through thermal imaging camera]

Presenter: This is a thermal imaging camera and it shows up heat. And by pointing this thing at a house, you can get some indication of how much heat is being lost through the walls. Now it's not entirely scientific, but the red areas show the heat that's coming out of the house, and any heat being lost, well that's wasting money. But look at these houses. You're not going to believe this, but a three-bedroom house, like this, can be heated for as little as £120 a year. This type of house is a Passivhaus, and it's seen by many as the eco-house of the future. Basically, it's built with lots of insulation, triple glazing and it reuses the heat generated by appliances and people inside the house. This Passivhaus development in Tye Green, near Saffron Walden was commissions by Hastoe Housing Association and was built 3 years ago.

Presenter: Chris, what makes the Passivhaus so energy efficient?

Chris [Passivhaus architect]: Really I suppose it's about insulation. What we do here is to wrap the whole house in a tea cosy of insulation so that's it's completely wrapped up and kept nice and warm. Then we use really high performance windows and doors, so they're triple glazed with insulated door frames and the like. And finally, one of the things we look at is to avoid any thermal bridging, so where elements join each other, walls to roofs etc., we try and make sure they're fully wrapped up with insulation and make sure they don't lose any heat through that junction. A good example would be the letter boxes here, which are on an independent post outside the porch. SO they don't penetrate the insulation layer and we can keep the house nice and well wrapped up.

[Inside the house]

Chris [Passivhaus architect]: So, come on in.

Presenter: Cor, instantly, you feel it's very warm.

Chris [Passivhaus architect]: Yes, it's a very comfortable environment. There's no radiators, there's no conventional heating system.

Presenter: So how does it heat it then? There's no radiators, how does it make heat?

Chris [Passivhaus architect]: There's a special piece of kit in here [opens cupboard], which does an awful lot of work for us.

[Presenter narrates explanation]

Presenter: The stale air is extracted from the house, the warmth is transferred to the fresh air coming in. A small separate device a bit like a boiler adds heat, if necessary.

[Conversation with homeowner]

Presenter: What's it like living here Becky?

Becky: Oh, it's great. It's always warm, it's lovely, love it.

Presenter: What about the bills, do you have hefty bills or are they quite cheap?

Becky: Err, no. They're about £30 a quarter,

Presenter: £30 a quarter!

Becky: Yeah.

Presenter: You're paying about £120 a year in gas bill.

Becky: Yep.

Presenter: That's incredible.

[Back outside the house]

Presenter: It may cost 15% more to build a Passivhaus, but if energy bills keep rising as they have been, it wouldn't be too long before you'd get your money back.

Video 4 – Saving money through energy efficiency

BBC News – updated 16 November 2011

http://www.bbc.co.uk/news/business-15431389

[Opens the front door]

Hello, I'm Sarah Harrison and this is my house in Highgate, in North London. It's a Victorian house in a conservation area and maintaining its heritage was important to us, but we also wanted to make it a warm, comfortable and energy efficient house to live in. Would you like to come and see some of the things we've done to achieve this.

[Inside the living room]

This is the wood-burning stove which we've installed in our living room. We installed it for two reasons. Firstly because it's just a really good feel good factor and it replaces the Victoria fireplace that was there. But secondly, as part of our energy efficiency, it saves on our carbon emissions, because we don't need to use the gas central heating in the evenings, the fire keeps us beautifully warm.

When we moved into the house, the things we looked at first were how to stop the house losing so much heat through the walls and windows and so, with the walls, what we did was we insulated. We stuck this kind of wood material, all round, quite thick, 100mm and just stick it onto the walls and then plaster over. And hopefully you don't see it, but it makes an enormous difference to the way the house holds heat.

Windows. This is a conservation area, so we need to keep the sash windows, but what we did was replace the original window with double glazed units, which helps to hold the heat very well.

[Upstairs]

We've put in both kinds of solar panels. The one on the roof over there heats the water and it's been really successful, we've had it installed for about 5 years now and between April and October we really don't need any gas to heat our water. These ones here are ones that generate electricity. They've only been in for a year, but it looks like so far they'll generate about £500 worth of electricity a year. They're put in with the Government's feed in tariff scheme.

[In the kitchen]

Here in the kitchen, the final thing we've done is the switch the original low energy light bulbs to LEDs. We did this because they use still less energy, only 22W really for the whole kitchen, which is only a third of one of those old 60W light bulbs and they don't have that slow warm-up period.

All in all the measures we've taken have saved, have cut our electricity and gas bills by over 50%.

Video 5 – Is this Britain's most energy efficient house

BBC News – updated 19 January 2014

http://www.bbc.co.uk/news/uk-england-25763200?post_id=202904149_10100346396178110#_=_

[Outside on the street]

Presenter: Of course another way to save on your energy bills is to make your home itself more fuel efficient. I've heard about one household in Balsall Heath, Birmingham, who've taken things to an extreme level though. Well I've been told, that somewhere around here is one of the world's most energy efficiency houses. It's a zero carbon house, and I have to say, Balsall Heath isn't exactly the place that I would imagine to find such a house, so I'm quite interested to see where this place could be.

[Outside the house]

Presenter: Wow, that is amazing, and totally not what you'd expect to find here. Right let's go inside. No doorbell. I wonder if that's to save a bit of energy from the kick off [knocks on the door].

John [Owner and architect]: Hi there.

Presenter: John, good to see you. Can I come in?

John [Owner and architect]: Do come in, do come in. Come and have a look.

[Inside the house]

Presenter: It comes as no surprise that the owner John Christophers is an architect. I have to say John, when I thought of an eco-friendly house I imagined a kind of cave dwelling, but his door is very futuristic looking.

John [Owner and architect]: It is, it is, but it also has a function, it stops the cold air from pouring in. So we have to shut the front door before we open that second door.

Presenter: This is absolutely amazing, what an incredible living space. Where did it all start John?

John [Owner and architect]: Well we wanted to do a very green house, a zero carbon house, which uses no fossil fuels and would you believe we're in a Victorian house [shows image of house prior to renovation], a two up, two down terraced house, typical of many of our industrialised cities.

Presenter: Why did you decide to build this in Balsall Heath of all places?

John [Owner and architect]: My wife and I have lived here for 25 years, there's a great community spirit. We love it round here.

[Tour of the house]

Presenter: Sunlight plays a vital role in the house.

John [Owner and architect]: We wanted to make this a tall space, so that the natural would flood in from the top. So we don't have to have the lights on nearly as much. But also, more than that, the

more sun that comes into the house, the more it warms up the house, so that really acts as the radiators of the house. There are no radiators anywhere else.

Presenter: Needless to say, insulation plays a big part too.

John [Owner and architect]: So we've got there the old wall, which is the 9-inch brick wall, which had very very little insulation and then inside it, we've put this insulation, which means the insulation value of this wall is 16 times better than it was before we started this work.

Presenter: That's incredible. So how do you insulate this wall, what kind of materials do you use?

John [Owner and architect]: We've used cellulose, which is basically like a chewed up newspaper.

Presenter: Is it something that in the long run would save people money?

John [Owner and architect]: Well it is, and perhaps there's an interesting figure. Because the cost of insulating this wall just up to building regulations standard would be about £60 per square meter. Now if you insulate it to this standard we've done, it's about £65 a square meter, because the overheads, the scaffolding, the labour is all fixed and you're just buying an extra thickness of insulation, which doesn't cost that much more.

Presenter: And in the long run saves you money.

John [Owner and architect]: Absolutely, in the long run, this house will pay for itself in 8 years.

Presenter: That's incredible. Will you build me one John? [Both laugh]

Presenter: This house might feel very modern, but there are plenty of reminders of its more traditional past.

John [Owner and architect]: This is the old chimney, where the chimney was in the old house. And we've kept this because it's the blackened reminder of all the coal that was burned in the last house, all the fossil fuels, but now there's no coal, no oil, no gas.

Presenter: So if there's no coal, oil or gas, what bills do you pay then?

John [Owner and architect]: We have no fuel bills at all in this house.

Presenter: Hang on, rewind [Video rewinds]. Did I just hear that right?

John [Owner and architect]: We have no fuel bills at all in this house.

Presenter: Well that's not all.

John [Owner and architect]: We can actually make some extra money, by selling the excess energy that we generate to the generating company.

Presenter: Wow, that's incredible, that's the future. We've made it to the top of the house, with it's high roof to see the sun above the neighbours house, it's mirrors to reflect heat and light and it's floor made form compacted earth to retain the warmth. What I really love about this house John is it's really beautiful, but everything has a purpose, and I suppose that's what being economical is all about.

John [Owner and architect]: Yeah, absolutely. Everything has a purpose here

Phase 3 – Public discourses of low carbon housing: Participant demographics

Pseudonym	Age	Occupation	Property Type	Rent/own
Focus Group 1: Postgraduate students, Cardiff				
Gemma	25	PhD student	Flat	Rent
Louise	33	University technician	Flat	Rent
Chris	25	PhD student	Flat	Rent
Sarah	26	PhD student	Flat	Rent
Mike	26	PhD student	Shared house	Rent
Focus Group 2: Farming community, Newcastle Emlyn				
Alice	56	Veterinary nurse	Detached farmhouse	Own
Claire	27	Farmer	Terraced house	Own
Gareth	40	Farmer	Cottage	Own
Eleri	27	Veterinary surgeon	Semi-detached house	Own
Deborah	51	Veterinary surgeon, farmer	Detached farmhouse	Own
Owen	31	Farmer	Detached farmhouse	Own
Focus group 3: Church community, King's Lynn				
Bernard	72	Retired	Bungalow	Own
Glen	54	Machine engineer	Semi-detached house	Own
Daniel	54	Service engineer	Semi-detached house	Own
Russell	26	Teacher	Semi-detached house	Own
Edna	87	Retired	Bungalow	Own
Phyllis	80	Retired	Bungalow	Own
Focus Group 4: Grangetown local community, Cardiff				
Ethel	81	Retired	Semi-detached house	Own
Teresa	51	Cleaner	House	Own
Susan	55	House person	Semi-detached house	Own
Lisa	47	Housewife	Terraced house	Own
Thomas	26	Builder	Flat	Rent
Nancy	26	Housewife	Flat	Rent
Focus Group 5: Environmental group, Barmouth				
Mary	65	Retired teacher, sheep scanner	Bungalow	Own
Frank	65	Retired merchant seaman	Stone cottage	Own
Jane	63	Retired physiotherapist, priest	Detached cottage	Own
Peter	60	Lifeboat instructor	Detached house	Own
Joan	60	Retired GP	House	Own
Mervin	68	Retired electrician	Bungalow	Own