

Discourse and Materiality in Environmental Policy:
the Case of German Federal Policy on Thermal Renovation of
Existing Homes

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Abstract

This thesis extends policy discourse theory to enable researchers to take fuller account of the interplays between environmental policy discourse, and the material objects that such policies aim to influence. It defends the social constructivist basis of policy discourse theories, but addresses their lack of methodological means to judge the comparative reliability of competing discourses about the material objects of policy. In particular, it shows how their ontology and epistemology cause them to treat the knowledge of materiality produced in the natural sciences as of no more value than knowledge produced in any other realm.

It proposes a ‘modest realist’ solution that draws on Roy Bhaskar’s historical account of the pragmatic success of natural science, Rom Harrés understanding of science as a ‘moral’ endeavour, and both these philosophers’ robust theorising as to the ‘real’ nature of the objects of scientific enquiry. This approach preserves a thoroughly social constructivist view of knowledge, while showing how we can judge the reliability of discourses about material reality in a way that is adequate for most practical purposes.

It then tests the usefulness of this theoretical framework in a case study, namely an analysis of German Federal policy on thermal renovation of existing homes, evaluating the policy’s effectiveness in achieving its stated aims, which are material in nature.

This trans-disciplinary investigation comprises both policy discourse analysis, based on interviews and document research, and natural science-based research on salient features of the German built environment. It finds clear mismatches between the policy, with its accompanying discourse, and the material realities of its target environment, and makes recommendations for policy change.

The approach developed in the thesis is therefore offered as a useful extension to policy discourse theory.

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Chapter 1 INTRODUCTION TO THE THESIS

1.1 THE QUESTIONS AT ISSUE

This thesis seeks to add to our understanding of the interplays between environmental policy discourse, and the material objects, in the environment, that these policies are designed to influence. It develops a methodology for producing reliable knowledge about these material objects, while remaining true to the social constructivist tenet that all knowledge is a human production formed within a particular social and cultural context. It thereby enables policy researchers to judge between competing claims, within policy discourse, about the nature of the material objects a policy is designed to influence. Using this methodology a researcher can identify points where environmental policies and their accompanying discourses are in or out of step with the material objects that the policies are aiming at. This improves our understanding of the factors that cause policies to develop, stabilise and change the way they do.

While the thesis emphasises the role of discourse in forming policy, and the need to understand policy via discourse analysis, it also shows that there are significant factors outside of discourse that need to be taken into account in understanding what is causing what in a policy domain.

The thesis highlights the strengths of discourse theory approaches to policy analysis, but identifies a weakness common to them: their inadequate theorising of, or reluctance to theorise, the roles played by the material substance of the environment in influencing environmental policy and determining its success or failure. The thesis consequently develops a way of checking the veracity of what passes for knowledge of materiality within policy discourse, using a ‘modest realist’ understanding of natural science. In this it draws upon Roy Bhaskar’s ‘transcendental realism’, a social constructionist philosophy of natural science, together with Rom Harré’s account of science as a ‘moral’ project, and phenomenological insights as to how people become skilled in matching language to the material world. This gives policy discourse

analysts a tool for judging between competing claims about the material objects of policy, while remaining true to a social constructivist view of knowledge.

The thesis also uses the notion of ‘socio-technical systems’ as an analytical device to take account of how materiality and people are often inextricably interwoven in the social structure associated with any particular policy.

The research questions the thesis sets out to answer, in relation to this theoretical framework, are:

In an environmental policy domain:

1. *How does policy discourse interplay with the material realities it is designed to influence?*
2. *In what ways are the interplays between policy discourse and materiality determined by the values and politics of the scientific experts who act for policymakers as the spokespersons of materiality?*
3. *How does policy discourse maintain, reproduce and reform itself in the face of changing understandings of materiality and of the policy’s influence on it?*

The thesis then seeks to address these questions and test the usefulness of the theoretical framework empirically, by undertaking a policy analysis, namely of German Federal policy on thermal renovation of existing homes. This analysis is set in the context of an evaluation of the policy in the light of the German Federal government’s declared aim for it. This aim, as stated in the regulations, is to reduce energy consumption from heating, in the built environment, so as to reduce greenhouse gas (GHG) emissions and thereby contribute to climate change mitigation. The evaluation is therefore guided by the questions:

1. *How well is German Federal policy on thermal renovation of existing homes succeeding in meeting the Federal Government’s declared objective for it?*

2. *How well does the policy contribute to what the international community understands by climate change mitigation?*

This analysis and evaluation presuppose a science-based investigation of the materiality of thermal renovation in the German context, which was begun early in the thesis study period. The more interesting results of this are published separately (Galvin, 2010a¹), and these results and others are drawn upon within the thesis. The major part of the empirical investigation is an analysis of the policy discourse, based chiefly on interviews with policy actors, but also on extensive policy document research, and always in the light of what is known of the materiality.

This chapter introduces the thesis and lays the background to the empirical case study of thermal renovation of homes in Germany. Chapter 2 presents a literature review and critique of policy discourse theory approaches, highlighting their strengths and importance for policy analysis but also showing how they under-theorise materiality. It then shows how materiality can be brought more fully into the picture, and develops the conceptual framework which is offered for empirical analyses of environmental policy domains. Chapter 3 explains the methodology and methods of the empirical research in the light of this conceptual framework. Chapters 4, 5 and 6 report on the results of the empirical research. Chapter 7 draws together the conclusions of each of the previous three chapters, and critically assesses the research and its findings. It also comments on the usefulness and validity of the conceptual framework for wider research, and makes recommendations for further exploration.

In introducing the thesis, this chapter offers, in Section 1.2, a preliminary rationale for the need for materiality to be properly theorised in policy discourse analysis. In Section 1.3 it explains the logic of the empirical part of the thesis as a work of policy *analysis* within the context of the broad notion of policy *evaluation*. It then sets the international context within which this particular analysis and evaluation, namely of German Federal policy of thermal renovation of existing homes, is being performed. This includes concerns about climate change, discussed in Section 1.4, and how thermal renovation is conceived in relation to climate change mitigation, discussed in

¹ There is a printing error in Galvin (2010a). ‘EnEV 2004’ should read ‘EnEV 2002’ throughout.

Section 1.5. In Section 1.6 it sets this policy within the social movement, or meta-discourse, of ‘ecological modernisation’, which very strongly constrains the way energy efficiency policies, such as this one, are thought about among policymakers in Germany and most other western European countries. Key findings of these discussions are drawn together in a Section 1.7.

1.2 POLICY DISCOURSE ANALYSIS AND MATERIALITY

1.2.1 Policy discourse analysis in context

The field of policy discourse theory is now well developed, has a broad and diverse base, and has made a place for itself in policy studies. Approaches within this field range from the theoretical-intellectual, which resist attempts to be pinned down to universally applicable methods and formulae for practical research (e.g. Laclau and Mouffe, 1985; Torfing, 2005), to the overtly methodological and practical (e.g. Hajer, 1995; 2005a; 2010; Fairclough, 2005). It explores such diverse policy, political and policy issues as revolutionary change of government (Laclau, 1995), water supply (Innes and Booher, 2003), local government and governance (Healy et al., 2003), political action by environmental movements (Griggs and Howarth, 2005) and environmental policy (e.g. Burningham and Cooper, 1999; Escobar, 1996; Hajer, 1995; Macnaghten and Urry, 1998; Jones, 2002; and the collection in Braun and Castree, 2001).

Policy discourse theory focuses on the worlds that people produce subjectively in their speech and other semiotic² productions. It acknowledges that this aspect of human functioning drives much of what we do, how we order our lives and institutional arrangements, who gets to govern whom, who controls what resources, how our background social milieu gets formed and re-formed, and how this presses back on what this person or that can credibly say and do. It has great intellectual strength, as its logic and its understanding of the world are informed by major relevant intellectual and social currents of the 20th century: Antonio Gramsci’s

² ‘Semiotic’ means sign-based, where the sign is arbitrary in relation to what it signifies. For example the sound of the word ‘cup’ bears no direct relation to the object we drink out of, but its meaning, for us, has stabilised around this sort of object. Other semiotic forms are symbols, such as in road signs; emblems, such as national flags; diagrams, graphs and charts; three-dimensional models; and certain types of pictures, such as of a politician kissing a baby.

transformation of Marxist theory together with his development of the concept of hegemony; the post-enlightenment, ‘postmodernist’ sentiment associated with the scepticism of Friedrich Nietzsche; the post-structuralism of Michel Foucault and Jacques Derrida; the social constructionist understanding of human knowledge exemplified in Berger and Luckmann’s (1966) seminal work; the de-medicalisation of psychotherapy through Freud and Lacan and, from a different angle, through the social realist philosophy of Rom Harré and his associates; the development of linguistic theory from Saussure through Mikhail Bakhtin, Valentin Volosinov, Lev Vygotsky and Jerome Bruner; the critique of logical positivism as a credible philosophy of science; and the growing understanding of liberal democratic society as a domain of distributed governance rather than mere top-down power.

While policy discourse theory usually situates its practical task within the wider post-war development of policy analysis, in the tradition of Harold Lasswell (1951), its serious engagement with the intellectual and social shifts of the 20th century clearly distinguishes it from what its proponents call ‘mainstream’ policy analysis. It distances itself from post-war attempts within the social sciences to produce a positivist-style discipline after the manner of the physical sciences, in which researchers stand detached from their subject matter and look for rules, regularities, principles and other such universal explanatory features in social structure. This is not to suggest that all non-discourse approaches are crudely positivist, as Lynn (1999) reminds us. Nor are all discourse approaches dismissive of the idea of objectively observable social realities – Fairclough’s ‘critical discourse analysis’ displays a quasi-Durkheimian view of social causality that has parallels with the reification³ of social structure often associated with positivist approaches (see, e.g. Fairclough, 2005). However it is fair to say that policy discourse theory is intellectually *centred* in a different place from most other approaches. While these other approaches tend to cluster round ways of saying true or defensible things about policy from the perspective of a detached, perhaps even neutral, observer, discourse theorists try to study the human subjects of their research as just that – subjects, i.e. meaning-making beings whom we can best understand by engaging in dialogue with them and letting

³ The word ‘reification’ is the noun from ‘reify’, which means, in this context, to treat social structure as if it is a substantial, actual, existing medium.

our (non-neutral) understandings be renegotiated in an I-you relationship (cf. Gadamer, 1975).

1.2.2 Under-theorising materiality

The depth and breadth of the insights that policy discourse approaches have brought to policy analysis have only been possible because of their doggedly faithful adherence to a social constructionist world-view. But this has brought a consistent difficulty: their under-theorising of the place of materiality in policy domains. The epistemology of policy discourse approaches can be summed up in the assertion that all knowledge is an act of interpretation performed by free agents through the social construction of psychological reality. If this is the case, then any statement about materiality, by anyone (politician, practitioner, consumer or cutting-edge scientist) is just another person's interpretation of reality. Within such a world-view there is no basis for claiming that one statement about materiality is closer to the truth than any other.

Yet all government policies have to do with material substance and objects at some point or other, and this is especially so with environmental policy and policy to do with the built environment. Such policies are usually intended to bring about effects in the material world – even if they also have social aims. They are about protecting trees, reducing greenhouse gas (GHG) emissions, insulating homes, purifying water, shielding citizens from radioactive waste. If, as the policy discourse theorists claim, it is the discourse of the policymakers that drives the policy or at least reflects most accurately what it is doing, this begs the question as to how well this discourse reflects the nature of the material world that the policy is aimed at, and in what ways the materiality of the world is influencing the policy, if at all.

To be sure, as Boehmer-Christiansen (1988) points out, policymakers need to take many things into account besides what the best science says about the materiality with which a policy is concerned. Social justice is not always well served by doing what the natural sciences say is best for the material environment. But even where compromises are made, they need to be worked out with full awareness of the

obdurate, non-negotiable nature of the materiality in question, and therefore what the risks might be of going against its tendencies.

For these reasons, analysing policy discourse does not necessarily give the full picture of what a policy is doing. For example, many governments' policies on climate change mitigation were reconsidered in response to the Copenhagen Accord, mild and non-binding though this was (UNFCCC, 2009). We can analyse these policy shifts or rigidities through the discourse being produced and reproduced by the actors contributing to the various countries' policy processes. But this analysis is incomplete if we do not also have a sound grasp of the materiality that this policy field is meant to deal with. It *matters*, for such an analysis, what impact an annual GHG emission reduction of X% will make on the world total of GHG emissions, how this new annual total will affect the long-term accumulated global GHG level, and what this level is 'likely' (to use the terminology of the Intergovernmental Panel on Climate Change - IPCC) to do to the earth's climate.

Here the policy discourse analyst has three broad options (compare Jones, 2002). Firstly, she could switch out of discourse analysis mode at such points, and simply import the IPCC's (or another suitable body's) figures for future climate change as if they were facts, or near enough to facts. This is problematic because the statements of scientists are themselves discursive productions. Treating such statements as brute facts, or at least facts that the policy analyst does not need to question, runs counter to the purposes of a discursive methodology. The same could be said for all the knowledge produced by the natural sciences. Knowledge always comes in the form of statements, utterances, texts, or other discursive productions. To be consistent, a policy *discourse* analyst has to treat them as such.

A second approach is to treat these items of natural science knowledge as discursive productions, with the same significance as any other utterances in the policy realm. In this view, people take special notice of scientific pronouncements only because of the privileged position of scientists in Enlightenment society. This has echoes of Foucault's understanding of knowledge as power, and is consistent with the 'strong

programme⁴ in the sociology of science (Barnes, 1977; Bloor, 1976), which treats the question of the truth or falsity of scientific statements as irrelevant and asks instead what social factors have led the scientist to make this or that pronouncement. As I will show in Chapter 2 Parts 3 and 4, this approach is also inadequate. It ignores the *historical* fact that the physical sciences do make progress and bring about changes in the world that have real effects on human welfare (longer lives and fewer pains, for example), which people at least sense with their bodies, no matter how these changes are discursively construed or constructed. It also ignores the *moral* commitment that drives the scientific community, namely the shared moral obligation to produce knowledge of the world that is reliable for all people everywhere – a commitment that, as Harré (1986) argues, is scarcely evident in other knowledge-producing communities.

A third approach is to take this latter point into consideration. Here, the discourse of science would be treated differently from other forms of discourse, which may have other legitimacies and a different epistemological status – a position I argue the case for in Chapter 2, Section 2.5. Then, the materiality witnessed to by science becomes, in itself, an object of interest to the policy researcher. He is led to ask, for example: How do the heat retention properties of certain buildings affect the policy discussion, and through what routes? What would be the thermodynamic effect, and therefore the economic effect, if this or that government regulation were implemented, to the letter, on this or that building? What aspects of the expert reports, through which scientists inform policymakers, are genuine science and what aspects are the authors' personal values and politics? What misunderstandings of the physics of the 'passive house' have led to it becoming iconic?⁵ Questions such as these can be fully explored only when the materiality is properly understood and its real effects – or absence of effects - on discourse are brought to light.

⁴ The 'strong programme' was a methodology of investigating what influences caused specific areas of scientific knowledge to develop and stabilise. It rigorously confined itself to looking only at the *social* influences on scientific knowledge, leaving out questions of whether or how the shape and nature of the objects of scientific enquiry could also influence what knowledge is produced. See discussion in Hacking (1999), and a critique in Harré (1986).

⁵ A typical example of such a misunderstanding is produced by Anthony Giddens a social scientist, who maintains that, even in sub-zero temperatures, a passive house keeps comfortably warm inside solely through the effects of human activities in the house (Giddens, 2009).

In short, there is a need for a cogent, tightly argued theory of how materiality and discourse interplay in (environmental and other) policy domains, and this thesis sets out to develop such a theory and test its usefulness. The theory is developed in Chapter 2. It is then carried through as a framework and methodology to guide the empirical investigation in subsequent chapters.

The remainder of this chapter deals with the background to the empirical investigation, and how it can be seen to constitute a policy analysis and a policy evaluation.

1.3 POLICY ANALYSIS AND POLICY EVALUATION

A discussion of policy analysis and evaluation is necessary at the outset, so as to explain the logic of this thesis. In brief, the thesis performs an *evaluation* of a policy, using an *analysis* of the policy informed by the theoretical framework discussed above and developed formally in Chapter 2. The elements in this are as follows.

1.3.1 Defining the terms

Crabbé and Leroy (2008) define policy *evaluation* as:

... a scientific analysis of a certain policy area, the policies of which are assessed for certain criteria, and on the basis of which recommendations are formulated.
(Crabbé and Leroy, 2008: 1)

In this view, evaluation gives the big picture. It compares policies with criteria brought in from some wider sphere (such as the commonly held values of a country's prevailing culture, or some material aim that has already been agreed on), and makes recommendations for policymakers on what needs to happen now.

Crabbé and Leroy then make a helpful distinction between analysis and evaluation. *Analysis* 'entails research into the what, how and why of a specific policy context', and must be done in order to *evaluate* a policy, i.e. to see 'how effective, how fair, how enforceable' it is (*ibid*: 1). Analysis, then, can be seen as a relatively matter-of

fact activity, looking at the mechanics of the policy process: how decisions are reached, how power is wielded and distributed, how organisations, institutions, artefacts and individuals interact, what influences what, why this outcome and not that outcome is produced. Evaluation, on the other hand, puts the policy process that is being analysed into a wider context, asking how well it achieves larger goals, some of which have a normative dimension.

This is not to deny that the terms ‘analysis’ and ‘evaluation’ are often conflated in the literature. Dunn (1981), for example, defines policy analysis as:

‘... an applied social science discipline which uses multiple methods of inquiry and arguments to produce and transform policy-relevant information that may be utilized in political settings to resolve policy problems.’ (Dunn, 1981:35)

This goes beyond the ‘what, why and how’ of policy processes, and does not hold to the distinction between analysis and evaluation as defined above. However in this thesis I will use the terms ‘analysis’ and ‘evaluation’ after the manner of Crabbé and Leroy (2008) discussed above. This enables a clear distinction to be made between analytical ‘how, what and why’ questions about a policy, and wider questions of the policy’s worth, effectiveness, fairness, efficiency, or conformity to some stated norm.

Further, there are crossovers between the terms ‘evaluation’, ‘assessment’ and ‘appraisal’ (see, e.g. Hertin, et al., (2009)). The latter two terms have a more bureaucratic function and are more likely to be used in official guides and handbooks for government policymakers.

Evaluation is usually classed as *ex ante* if performed prior to a policy being finalised, and *ex post* if performed after it has been up and running for some time (Hertin et al., 2009). However the distinction is not always helpful, since many new policies come in the form of adjustments to old ones, often quite small, and *ex post* evaluations (of existing policy impacts) can be undertaken from the perspective of proposed changes – hence they serve an *ex ante* function. Crabbé and Leroy (2008: 3) conceive of evaluation as happening in relation to all the phases of the policy cycle, noting that these phases often merge into one another. This is the case with German policy on

thermal qualities of buildings, which has been developing in stages since 1976, was last upgraded in 2009, and is due to be upgraded again in 2012 (Galvin, 2010a).

Policy evaluation has grown to become a significant endeavour since the end of the Second World War, as governments, beginning especially with the US, have attempted to respond to an increasingly complex world and have sought the advice and input of a growing community of policy analysts and experts to help them reflect on the effectiveness of their policies (Crabbé and Leroy, 2008: 22). Within the EU there are now formal procedures for *ex ante* policy assessment or evaluation (EEA, 2001; Jacob et al., 2007; Radaelli, 2005), as in many other OECD countries. As Hertin et al. (2009: 1185) observe, these come with different names (e.g. Regulatory Impact Assessment, Sustainability Assessment, Sustainability Appraisal, Impact Assessment) and have a range of objectives, but share common features: they aim to identify the likely impacts of a proposed policy; they follow a formal administrative procedure; and they result in a report or statement.

1.3.2 Policy evaluation within and outside official circles

In a broader sense, policy evaluation is undertaken both within and outside of the official policymaking apparatus of government. Anything that counts as evidence of the effects of a proposed or existing policy may be utilised by anybody to evaluate policy on their own terms (compare Juntti et al., 2009: 208-209). Such evidence may or may not be taken up by a committee or agency within the governing apparatus and used, formally or informally, to influence policy. Moreover, if, with the proponents of the Advocacy Coalition Framework (Sabatier, 1987; 1988; Sabatier and Jenkins-Smith, 1993) or the ‘argumentative’ policy discourse analysts (e.g. Hajer, 1995; 2005; Fischer, 2003a) we see the policymaking community as extending way beyond ‘official’ policymakers, then we may conceive policy evaluation as a much more fluid and spatially extensive process. Again, if we conceive power post-structurally - as discursively constituted and distributed among many actors, both within and outside of government ranks (Fischer, 2003a; 2003b) – we may see this socially distributed evaluation as having significant effects on policy development, along with the effects of official expressions of evaluation. In other words, too slavish a focus on the official institutions of policymaking may give a distorted picture of what is going on in

evaluation and its effects on policy. The policy evaluation performed in this thesis comes from outside official government institutions but is nevertheless offered as a serious contribution to German policymakers.

1.3.3 Criteria for policy evaluation

This leads to the further question of the *criteria* for evaluation: against what standards or norms are policies evaluated? Crabbé and Leroy (2008: 21 ff) maintain that the earliest criteria in official policy evaluation in the modern era, dating from the 19th century, were ‘juridical’, as audit offices checked the legality and budgetary transparency of government policies. With the advent of large budgets for defence and space exploration in the US after World War II, the need arose to scrutinise government spending more systematically. More general notions, of determining whether policy goals had been achieved, and how efficiently, became criteria for evaluation in the 1960s and 1970s, often under the guise of ‘public management’. This extended the policy areas being evaluated, to include education, employment, and social welfare. The neo-liberalism of the 1980s and 1990s led to evaluation of ‘performance’, i.e. what was being delivered for the money invested. Meanwhile the notion of the ‘legitimacy’ of government policies was gaining ground, with a shift toward participatory approaches to policymaking. Evaluation was broadening to include questions of how acceptable policy was to its target groups and to various political, or values-based, concerns. Hence there is a wide range of criteria for policy evaluation, very much depending on the normative concerns of the persons doing the evaluating or of those engaging their services. This thesis, *inter alia*, undertakes a policy evaluation, conducted from outside the government concerned (i.e. by myself), based on normative concerns discussed below.

1.3.4 Policy evaluation and the logic of this thesis

The bulk of this thesis is a policy *analysis*. But it is situated within a policy *evaluation*. All this is guided by the theoretical framework developed in Chapter 2. In this respect the logic of the thesis is as follows. The thesis seeks to extend policy discourse theory to include the impacts of materiality on policy and its effects and effectiveness, so as to provide a useful methodological tool to analyse a wide range of

policies, though with an emphasis on environmental policies. To some extent this is a philosophical undertaking, in that it expounds and critiques the world-view presupposed by leading policy discourse theories, then introduces findings from the philosophy of science and related disciplines to fill out what seems to be missing in this world view. This is intended to make policy discourse theory a better tool for the analysis of policy – i.e. for finding out the ‘what, how and why’ (Crabbé and Leroy, 2008: 1) of policy stability and development.

I then test the usefulness of this new version of policy discourse theory by performing a policy analysis, using the case study of German Federal policy on thermal renovation of existing homes. This is where evaluation comes in. My *analysis* of the policy is directed toward *evaluating* certain aspects of the policy according to certain criteria. The analysis needs to be done for a given purpose because policy analysis needs to have an aim. It needs to be guided by specific questions – in this case the evaluation questions - which serve as a framework that set the direction of the policy analysis.

1.3.5 Criteria of evaluation in this thesis

In order for this analysis to proceed, then, I need to state what the criteria of evaluation are. The criteria I have chosen are on two ‘spatial dimensions’ (Crabbé and Leroy, 2008: 39), namely national and international. Nationally, I set out to ask how well the German policy on thermal renovation of existing homes succeeds in meeting the Federal Government’s declared objective for it. This objective is stated in the preamble to the thermal building regulations (*Energieeinsparverordnung 2009 – EnEV 2009*) as presented to the German Upper House of Parliament (the *Bundesrat*):

The aim of the *Energieeinsparverordnung* is to reduce the energy consumption in the built environment to a sustainable level. As a consequence of the reduction of energy use, fossil fuels will be saved and the emission of climate-damaging greenhouse gases will be significantly reduced⁶. (BR, 2008: A, my translation)

⁶ My translation of: ‘Ziel der Änderung der Energieeinsparverordnung ist es, den Energiebedarf im Gebäudebereich nachhaltig zu senken. Als Folge der Senkung des Energiebedarfs können fossile Brennstoffe eingespart und der Ausstoß klimaschädlicher Treibhausgase erheblich verringert werden.’

So the aim is to reduce energy consumption so as to save fossil fuel and reduce GHG emissions. A further presentation to the Upper House declared that lying behind this is the Federal government's 'Meseberg Declaration' of August 2007. This outlined an 'integrated energy and climate programme' (BR, 2009) and declared:

With the amendments to the EnEV, the cornerstones of the Federal government's integrated energy and climate programme, decided at Meseberg Castle in August 2007, are implemented. (BR, 2009: 1, translation in original)

This subsumed the goals for energy saving and security of energy supply under the broader climate change mitigation goal of a reduction in CO₂ emissions⁷ of 80% by 2050. Further government statements indicate goals are a 25% reduction of CO₂ emissions from buildings by 2020, in the context of up to 40% reductions overall by 2020, and an 80% reduction by 2050 (UBA, 2007: 2; BMU, 2007: 4-6; Tiefensee, 2006).

Hence the *climate change mitigation goal*, focusing on GHG (or CO₂, depending on which document is being considered) emission reductions, is the key factor. I will be asking whether the policy is bringing about the reductions in fuel consumption required in the residential built environment to enable Germany to reach its goal of 80% CO₂ emission reductions by 2050.

On the international level I will situate this goal within its context on the global stage. In particular, an 80% reduction of CO₂ emissions by 2050 does not mean a sudden drop between 2040 and 2050, but a steady fall, beginning now. Further, there are costs involved in emission reductions, and much international discussion is around how to get the best value for money. The reasoning is that it is better to 'pluck the low-hanging fruits' by making big reductions where it is cheap to do so, than to spend most of our money on ideologically catching but economically inefficient ways of achieving minimal reduction for great sums of money.

⁷ German Federal policy documents often switch between 'greenhouse gas emissions' and CO₂ emissions without explanation, though these are different, since the former includes other greenhouse gases such as methane.

However, I make no claim that these are the ‘correct’ or the ‘best’ criteria to evaluate this policy. As Bourdieu (2000: 49ff) argued, even the most substantial and self-evident intellectual positions are to some extent socially determined. The evaluation criteria put forward here are very much socially determined, in that they arise from the yardstick the German government itself set up as the aim of the policy. There could be other very interesting criteria of evaluation, such as whether the policy keeps people warm; whether it improves public health; how it contributes to national pride; what its effects are on Germany’s aesthetic environment; how it affects the ways people conceive of the home.

Nevertheless, having chosen my criteria of evaluation, I need a view of what the issues are - climate change mitigation and energy saving through thermal renovation of homes – to shape the evaluation questions. These are developed in the following sections. I begin by exploring the international context in which Germany’s climate change mitigation aspirations are situated.

1.4 CLIMATE CHANGE

There is longstanding, robust and deepening consensus among the worldwide scientific community that global average temperatures are steadily increasing, that the most significant cause of this is human-induced GHG emissions, and that this is leading to climate change of a type and intensity unprecedented in the last 8,000 years of the Holocene epoch (IPCC 2007). Despite the persistence of scepticism and its disproportionate media coverage, the global scientific community has consistently and overwhelmingly affirmed the reality of human-induced climate change over the last 10 years (Joint Academies, 2001; G8+3 Academies, 2005; G8+5 Academies, 2007; NASAC, 2007; G8+5 Academies, 2008; Royal Society-NERC-MO, 2009; Royal Society, 2009).

While there is significant debate on the sensitivity of global temperatures to specific increases in GHG concentrations, on the climatic changes likely to be associated with various temperature increases, and on the ability of humanity to adapt to such changes, the broad scientific consensus is that the likely effects, on global climate, of

a 'business as usual' approach to GHG emission levels are so significant as to justify concerted international action to reduce these levels as a matter of urgency.

Due to effective linkages and communication between the global scientific and political communities, particularly since the inception of the Intergovernmental Panel on Climate Change (IPCC) in 1988, this broad scientific consensus has been for the most part accepted by international political bodies such as the United Nations and the European Union, and by a great number of national, state and local governments worldwide. This has resulted in a range of policy commitments and objectives to reduce GHG emissions by significant amounts and within timeframes thought to be broadly compatible with the objectives of the United Nations Framework Convention on Climate Change (UNFCCC), which were agreed in 1992, namely:

- to achieve 'stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system'
- to 'ensure that food production is not threatened'
- to 'enable economic development to proceed in a sustainable manner'
- to accomplish this 'within a time frame sufficient to allow ecosystems to adapt naturally to climate change'

While acknowledging that precise interpretations of key words and phrases in these statements (such as 'dangerous' and 'economic development'), are contested, the practical outworking of the above developments, together with significant input and pressure from citizens groups, religious bodies, individuals and non-governmental organisations (NGOs), has been that policymakers have developed specific GHG emission reduction goals, which are relevant to this study. These have included:

- The Kyoto Protocol, which commits industrialised nations to reduce GHG emissions by an average of 5.2% compared to 1990 levels by 2008-2012.
- The Copenhagen Accord, which, despite its non-binding status, recognises 'the scientific view that the increase in global temperature should be below 2

degrees Celsius' (UNFCCC, 2009: 1) and calls for appropriate GHG emission reductions.

- The European Union's '20:20 by 2020' commitment, to reduce GHG emissions by 20% compared to 1990 levels by 2020, or 30% if other developed nations agree to take similar action, with differentiated targets for different EU members (EU Commission, 2008).
- The UK's Climate Change Bill, which will bind the UK government to achieving a target of 80% reductions by 2050 (Climate Change Act, 2008: 1:1:1)
- The German government's policy commitment to reduce GHG emissions by 40% by 2020 (BUNR, 2007).
- Similar or comparable commitments among other European nations, both within and outside the EU. Examples are Norway's commitment to reduce GHG emissions by 30% by 2020 and become 'carbon-neutral' by 2050 (Stoltenberg, 2008), and Switzerland's legislation, of 1 May 2000, requiring a reduction in CO₂ emissions by 2010 of 10% compared to 1990 levels, together with a raft of detailed measures designed to achieve this (Madlener, 2006).
- Specific GHG reduction targets of sub-national governments, such as states and municipalities, often tied to clearly differentiated sector targets (Bulkeley and Betsil, 2003; Collier, 1997; Collier and Löfstedt, 1997; Demeritt and Langdon, 2004; Lindseth, 2004; Rabe, 2004). Examples are Freiburg (IAÖ, 2007; Galvin, 2008), Newcastle (Flemming and Webber, 2003; Newcastle, 2007) and many hundreds of other European municipalities linked in GHG emission reduction initiatives such as Climate Alliance (Janssen, 2007).

Two features of these targets are especially significant for this study. Firstly, they are generally intended to bring about a peaking of annual GHG emission levels within a certain number of years, followed by a decline, so that the ambient level of GHGs in the atmosphere will stabilise at a level regarded as low enough to prevent what is perceived to be an unacceptable degree of climate change (see Stern et al., 2006: 8.3, pp. 201 ff. for an outline of the dynamics and economics of stabilisation). The precise interpretation of what is unacceptable is contested (Hansen, et al., 2008). Hansen (2007; 2008) maintains that current levels, of around 380 parts per million (ppm) of

carbon dioxide equivalent⁸ (CO₂e) in the atmosphere, are possibly already too high to prevent massive ice sheet collapse and catastrophic sea level rise. Stern et al. (2006: 8.2, p. 195) show the variations in different models' estimates of the probability of holding the rise in temperature to 2, 3, 4 and 5°C, with scenarios of 400-750 ppm of CO₂e. A rough average of these models' estimates is that holding CO₂e concentrations below 450 ppm would provide a 50% probability of keeping global average temperature rise below 2°C, though that probability could be as low as 22%. Some models in Stern and colleagues' study suggest there is a 21% probability that 450 ppm of CO₂e could produce a temperature rise exceeding 5°C.

The question then becomes, how easy will it be for the world to hold ambient CO₂e concentrations at 450 ppm, 550 ppm, or any other level? Anderson and Bows (2008) argue that:

... it is increasingly unlikely any global agreement will deliver the radical reversal in emission trends required for stabilization at 450 ppmv [parts per million by volume] carbon dioxide equivalent (CO₂e). Similarly, the current framing of climate change cannot be reconciled with the rates of mitigation necessary to stabilize at 550 ppmv CO₂e and even an optimistic interpretation suggests stabilization much below 650 ppmv CO₂e is improbable. (Anderson and Bows, 2008: 1)

Despite the pessimism of the above, all these research efforts agree about the general shape of the required curve of GHG emissions: it may continue to rise for a limited time only; then it must be made to fall.

Secondly, the general direction of new scientific reports, studies and interpretations of data is toward more urgency rather than less. Annual GHG emission levels are rising faster than was predicted (Schellnhuber, 2008). The safest ambient level of GHGs in the atmosphere is lower than previously thought, so that annual GHG emission levels have to fall further, faster (e.g. Anderson and Bows, 2008; Hansen, et al., 2008).

Further, the probability curve of climate sensitivity to levels of CO₂e has a longer tail

⁸ Carbon dioxide equivalent (CO₂e) is the amount of carbon dioxide (CO₂) that would have the same global warming potential as a given mixture of greenhouse gases.

at the high temperature end than was thought (Roe and Baker, 2007)⁹. This means there is a small probability that the increase in global average temperature due to CO₂e rises could turn out to be much higher than the mean best estimate.

There are debates around these issues, but their significance for this study is that *reducing GHG emission levels earlier is perceived as better than reducing them later*. The longer we leave it to reduce GHG emission levels, the higher the ambient level of GHGs in the atmosphere will become, and therefore both the severity of climate change, and the difficulties of bringing down ambient GHG levels, will become greater.

The German government's GHG/CO₂ abatement aim for thermal renovation needs to be seen in this context. It does not have moral force merely as a parochial goal for Germany's own internal purposes, but rather in terms of how it can contribute to the global endeavour to reduce GHG emission levels by significant amounts as soon as possible and continue on this downward trajectory in the medium to long term. Hence it is not a straightforward project. If, for example, insulating German homes to EnEV standards turned out to be significantly more expensive per tonne of CO₂ abatement than, say, phasing out brown coal or building wind power stations, then even if the policy reduced GHG emissions from home heating to very low levels, it might still not fulfil its own stated aims. By investing so much money in fixing one sector, it might deprive others of investment that could have far greater effects. This type of consideration needs to be kept in mind as the analysis and evaluation interplay in the research.

Further, as I discuss in Chapter 7, there is no guarantee that reducing GHG emission levels in one sector of one country's economy will actually cause global GHG emission levels to fall, since this might simply make more fossil fuels available for others to consume, and at a lower price due to reduced demand from wealthy countries. However, I will exclude this point from the evaluation question, since it is

⁹ 'Climate sensitivity' is the rise in average global temperature resulting from a doubling of the concentration of CO₂e in the atmosphere. This is given by a probability curve, the mean of which is around 3°C. However, the curve is now thought to extend further to the right (high temperature end) than was previously thought, due to intrinsic uncertainties in the cascading effects of positive feedbacks. For an overview of pre-2007 climate sensitivity estimates see Stern, et al. (2006: 1.1: 9).

anchored in the prevailing global logic that reducing GHG emissions in any sector anywhere contributes to global reduction of GHG emissions.

Further, this evaluation question does not touch on the pressing issue of adaptation to climate change, but is about adding up tonnes of CO₂e. Many will find such an approach unsatisfying (see, e.g. Hume, 2009), but there have to be limits in a study of this size and scope.

1.5 THERMAL RENOVATION IN REDUCING ENERGY USE AND MITIGATING CLIMATE CHANGE

I will now situate the activity of thermal renovation of existing homes within the broader policy questions discussed above.

1.5.1 Space-heating, energy use and CO₂ emissions

Human activities in existing buildings are the cause of around 40% of the world's total primary energy consumption (IEA, 2008). This figure is also 40% for the EU (EPBD, 2009/2003), where space heating accounts for 70% of this energy, leading to just over 25% of the EU's total GHG emissions. About half of this, or 12% of EU GHG emissions, comes from residential space heating (de T'Serclaes, 2007). In Germany space heating accounts for around 75% of household GHG emissions, and this figure rises to 87% if water heating is included (DENA, 2006). Total energy used for home space heating in the EU is increasing, mainly due to the increasing number of households and larger size of dwelling (Enerdata, 2004; IEA 2008a; 2008b).

Comparative levels of energy consumed in space heating and other household activities, for a range of countries in 1990 and 2004, are displayed in Figure 1.1. As this graph indicates, annual space heating energy use in Germany increased only slightly from 1990 to 2004, when it was about 25 Gigajoules (GJ), or 7,000 kilowatt-hours (kWh), per capita. To make this figure meaningful, at a cost of €0.06 per kWh it equates to €420 per person per year for space heating, or around €1000 per household per year.

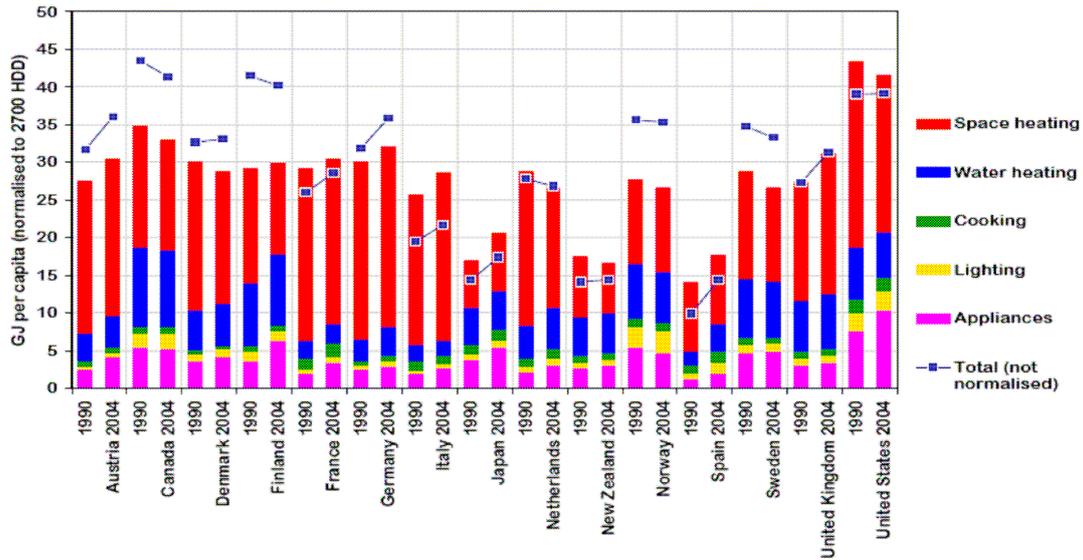


Figure 1.1. Household energy consumption in selected IEA countries. Source: IEA, 2008b.

1.5.2 Perceptions of thermal renovation as a means of CO₂ reduction

Thermal renovation is frequently estimated to hold the greatest potential for CO₂ emission reduction of all sectors worldwide (IEA, 2008; 2008b; de T'Serclaes, 2007). Atkinson, et al. (2009) calculate that applying a layer of insulation is the most economically efficient way of reducing CO₂ emissions from old buildings, bringing positive returns as energy prices increase, if designed carefully. As indicated in Figure 1.2, the European Insulation Manufacturers Association (EURIMA) maintains, using McKinsay and Company's (2007) methodology, that insulating walls could produce a positive gain of €160 per tonne of CO₂ saved, in comparison with, for example, solar energy, which would incur a cost of around €25 per tonne. Naturally an association of insulation firms has an interest in promoting such figures, though this graph also appeared in *The Economist*¹⁰ in its 'Special Report on Business and Climate Change,' of 2nd June, 2007. Particular costs are highly dependent on local factors, methods of cost-benefit analysis, degree of thermal improvement undertaken, and impeding factors such as building aesthetics (Galvin, 2010a). Nevertheless there is a dominant,

¹⁰ www.economist.com

prevailing view that refurbishing buildings can be a cheap, or even cost negative, means of reducing GHG emissions very deeply and quickly (IEA 2008; 2008b; de T'Serclaes, 2007, Power, 2008; Sustainable Development Commission, 2006).

2030

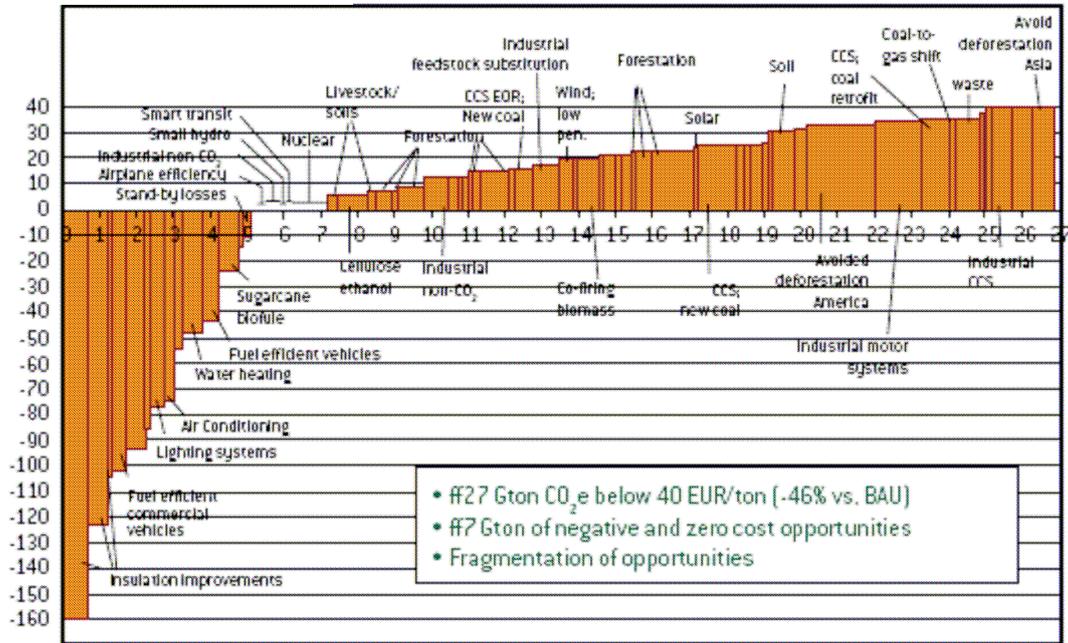


Figure 1.2. Cost of abatement of CO₂ (€/Gt), with rankings 1-27 as seen by EURIMA, 2009: 3.

For this reason there is much interest in the refurbishment of the world's building stock, especially in industrialised countries situated in frigid or temperate zones. Recent reports by the International Energy Agency explore the potential for energy savings in residential buildings in industrialised and transition countries. A number of case studies are offered, such as Japan, the United States, the UK and Germany (IEA, 2008); so-called 'barriers' to the uptake of apparently profitable thermal renovation opportunities are identified (de T'Serclaes, 2007); and the building codes of selected nations are examined with respect to energy efficiency (IEA, 2008b). The potential fuel savings and GHG emission reductions perceived to be winnable from thermal upgrades have now become a ubiquitous theme in reports of energy and economic

agencies, government policy documents, the media, and green NGO literature. The following are typical of the hundreds of references to this issue:

- ‘An annual £5 billion investment in domestic energy efficiency would create around 55,000 jobs directly. Hundreds of thousands of jobs would be created indirectly. And every year it would reduce emissions of carbon dioxide by about 1.6 million tonnes while also addressing fuel poverty.’ - Greenpeace UK, 30 March 2009
- ‘Cavity Wall Insulation is one of the simplest ways to reduce your heating bills – by up to £160 per year. You’ll also save 800kgs of CO₂ per year when it’s installed... Insulating your loft is one of the most effective ways to save energy. You could save between £60 – £205 a year on bills depending on your existing level of insulation and around 1 tonne of CO₂ per year.’ – The Mark Group¹¹ (UK building renovation firm).
- ‘With some simple energy saving home improvements, you can save money, improve the comfort of your home and help fight climate change. Insulating your home is one of the most effective ways of improving the energy efficiency of your home. For example, insulating an uninsulated loft can save around £150 and around 800kg of carbon dioxide a year.’ – Energy Savings Trust website¹².
- ‘Our building stock holds the greatest potential for energy saving in Germany. Existing buildings require around three times as much energy for space heating [as new buildings]. About 87% of energy consumed in the home is used for water and space heating. Through properly targeted thermal renovation and modern building technologies up to 80 percent of this can be saved’ (my translation). *Deutsche Energie Agentur*¹³ (DENA - German Energy Agency).
- ‘The Government will unveil tomorrow a home insulation subsidy scheme for private home owners to be funded via councils, banks and power companies... Prime Minister John Key yesterday said he was excited about the scheme.
“The Government's scheme will help many more New Zealanders make their

¹¹ <http://www.markgroup.co.uk/home-insulation/?gclid=CJnpiMqSmJsCFZgU4wodiBgQnQ>

¹² <http://www.energysavingtrust.org.uk/Home-improvements>

¹³ <http://www.dena.de/themen/thema-bau/>

homes warmer, drier and healthier. The economy will benefit from increased employment in the building and construction industry, and the environment will benefit from increased energy efficiency.” – New Zealand Herald¹⁴, 27 May, 2008.

- ‘Renovate your home, protect the climate, save money – that’s how it is with the Federal Government’s “Programme to reduce CO₂ emissions from buildings.” Its success is threefold: It creates jobs, improves the quality of dwellings, and protects the environment’ (my translation). - *Bundesregierung Online* (Federal Government Online) No. 123, December 2008.

Hence there is much popular discourse maintaining that thermal renovation of homes will save fuel, reduce GHG emissions, and bring increased comfort, while also bringing financial benefits to both homeowners and society. Further, the ‘win-win’ theme prevalent in such statements is indicative of the discourse of ‘ecological modernisation’ discourse, discussed in Section 1.6 below.

1.5.3 The EU’s Energy Performance of Buildings Directorate

The European Union has incorporated energy efficiency of buildings into its climate change strategy, most directly through the Energy Performance of Buildings Directorate (EPBD, 2009/2003). This came into force on 4 January 2003 and had to be implemented by the EU Member States by 4 January 2006.

The four key points of the Directive are:

- a common methodology for calculating the integrated energy performance of buildings;
- minimum standards on the energy performance of new buildings and existing buildings that are subject to major renovation;
- systems for the energy certification of new and existing buildings and, for public buildings, prominent display of this certification and other relevant information. Certificates must be less than five years old;

¹⁴ <http://nzherald.co.uk>

- regular inspection of boilers and central air-conditioning systems in buildings and in addition an assessment of heating installations in which the boilers are more than 15 years old. (EPBD, 2009/2003)

There are no specific thermal retention parameters prescribed in the EPBD. This is left to member states, in consultation with their respective building industries and with reference to local conditions and climate. Further, there is no preferred method of dealing with the differing requirements of new builds and existing buildings. This flexibility is important because the technical issues in producing high thermal retention characteristics for each of these sectors are very different.

1.5.4 Germany, the Energy Performance of Buildings Directive, and the building code

Germany was quick to respond to the EPBD, having already developed an advanced infrastructure and regulatory framework for thermal retention in buildings. This can be seen as a continuation of development since the end of the Second World War, which brought massive destruction and damage to Germany's building stock. With low fuel prices and material scarcity, millions of buildings were repaired and millions more built quickly and relatively cheaply, with little attention to thermal retention. Consequently almost half Germany's building stock dates, effectively, from 1945, and has relatively poor thermal performance (IWU, 2003). With regard to residential properties, 29 million dwellings, or 75% of the total, were built prior to 1976, when thermal retention rules for new builds first came into effect, and have been described as 'energy-gobblers' (*Energiefresser*) (Braun, 2009).

Germany first introduced energy efficiency regulations for buildings in its *Wärmeschutzverordnung* (Heat retention regulations) in 1976 (came into effect in 1977), in the wake of the oil price shock of 1973-1974. These were focused on heat retention parameters for specific components, such as windows and walls, in new buildings and in comprehensive rebuilds, and were steadily upgraded. A major change came with new legislation and the *Energieeinsparverordnung* (EnEV – Energy saving regulations), which came into force in 2002. This extended the scope of the thermal regulations to include renovations of existing buildings, even when the proposed

renovations were of a minor nature. In line with EPBD requirements the focus was shifted to the overall, integrated energy performance of the building, giving designers freedom in terms of the heat retention values of specific components, as long as the building as a whole met prescribed standards. These regulations were further refined in 2004 and 2007. Thermal standards were tightened by 30% in 2002 and again in 2009. A further 30% tightening is planned for 2012.

1.5.5 Germany as a case study in thermal renovation of existing homes

Germany is widely seen as a front-runner in regulations and infrastructure for thermal retention of buildings (IEA, 2008). In addition to stringent regulations, the Federal government promotes thermal renovation through its ‘CO₂ - *Gebäudesanierungsprogramm*’ (‘CO₂ building refit programme), which amounts to a set of subsidised loans, and in some cases direct subsidies, through the German Development Bank (*Kreditanstalt für Wiederaufbau – KfW*¹⁵). These are targeted at renovation projects which outdo the standards in the building regulations by 10% or more. Meanwhile the German Energy Agency (*Deutsche Energie Agentur – DENA*) has developed a database of over 300 homes renovated to high thermal standards, as a resource showing what is possible in thermal renovation. Both DENA and the Ministry of Transport, Housing and the Built Environment (*Bundesministerium für Verkehr, Bau und Stadtentwicklung – BMVBS*) provide paper and internet information over a range of expertise-levels on all aspects of thermal renovation, from minute details of joinery to questions of finance and project co-ordination.

Largely due to the style of building and restoration after the Second World War, over half Germany’s buildings are of plain façade and simple, cuboid shape, with solid walls and either flat or geometrically simple peaked roofs (IWU, 2003; Statistisches Bundesamt Deutschland, 2010; and see Figure 1.3). The small number of decorative brick or stone walls means that external wall insulation can usually be applied without compromising aesthetic qualities. Unlike in Britain, cavity walls are found in only a small minority of houses in Germany, mostly in the north of the country where bricks are plentiful. Hence there is a need for external wall insulation, and a strong infrastructure has developed to provide this. Further, many of Germany’s elegant 19th

¹⁵ www.kfw.de

century building façades were damaged in the Second World War and restored as plain or simple façades, so the proportion of buildings requiring relatively complex thermal renovation is lower than in the UK.

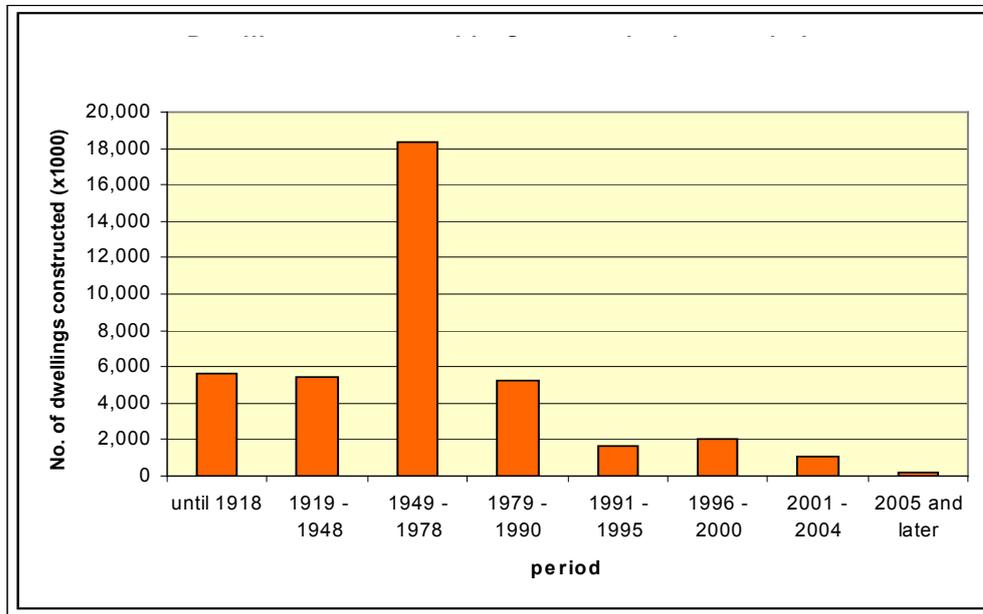


Figure 1.3 Number of dwellings (in 100s) in Germany, by year built (Source: Statistisches Bundesamt, Germany).

Some 29 million dwellings are seen as potential candidates for thermal upgrading. Putting aside questions of cost, for the moment, most of these would require fairly standard technology and methods, in a well-regulated system with a strongly developed infrastructure. All these factors together make Germany a suitable ‘critical’ case study (Flyvbjerg, 2006) for examining how thermal renovation proceeds in this relatively straightforward, well-resourced environment.

A further feature of the context in which German thermal renovation is taking place is a particular orientation toward environmental concern and sustainable consumption, known as ‘ecological modernisation’.

1.6 ECOLOGICAL MODERNISATION

The German government's approach to thermal renovation of existing homes can be understood as being situated within a framework resonant with, if not directly informed by, the approach to environmental protection known as 'ecological modernisation' (EM). EM refers to a broad cluster of approaches that explore how we can reduce our impact on the environment proactively through the right kind of technological progress, within the context of current economic and political structures (Huber, 2000; 2008; Jänicke, 2008; Mol and Sonnenfeld, 2000; Young, 2000). Rather than seeing our consumer oriented, industrially powered way of life as necessarily at odds with environmental protection, EM explores how industry can modernise in such a way as to reduce its negative environmental impact and simultaneously increase its profits – a classic 'win-win' solution.

Thermal renovation resonates with this approach, as it is a technical solution to an ecological problem and demands no significant lifestyle or social-structural changes. It offers the same or better services (space heating) for significantly lower environmental impact, at lower running costs, without demanding a change in lifestyle. This approach is specifically endorsed in the EU's Energy Performance of Buildings Directive (EPBD, 2009/2003). The Green Paper associated with the EPBD (EU Commission, 2006) declared specifically that increasing the energy efficiency of buildings 'does not mean sacrificing comfort or convenience'. Instead, it means making 'cost-effective investments' in order to reduce the waste of energy, thereby 'increasing the standard of living' and 'saving money'. Similar claims are made in the texts of, and promotional literature around, Germany's successive updates of its thermal building regulations, i.e. its *Energieeinsparverordnung* of 2002, 2004, 2007 and 2009.

Because thermal renovation policy is conceived and promoted within this 'EM' framework of understanding of environmental issues, we need to be aware of EM's major features.

EM can be seen as both a *description* of changes actually happening in industrialised societies (see, for example, the collections in Jänicke and Weidner, 1997; Weidner

and Jänicke, 2002; and studies such as Midttun and Kamfjord, 1999; and Wells and Orsato, 2004; Young, 2000;), and a *normative account* of how well governments and industry are responding to environmental problems in terms of technical solutions (Frijns et al., 2000; Jänicke, 2008). It can also be seen as a *social movement*, and its intellectual commentators have been largely social scientists in Germany (Joseph Huber, Martin Jänicke, Volker von Prittwitz, Udo Simonis and Klaus Zimmerman), the Netherlands (Gert Spaargaren, Maarten Hajer and Arthur P.J. Mol), and the UK (Albert Weale, Maurie Cohen and Joseph Murphy). Some commentators also focus on how lifestyle issues intersect with EM-oriented technology development, in the context of aspirations for sustainable consumption (e.g. Spaargaren, 2000; Spaargaren and Van Vleit, 2000).

Of more direct significance for this thesis, Hajer (1995; 2005a) has explored EM as a *discourse* or *socially constructed perception* of reality, which has now achieved dominance in western environmental policy discussion. The core discourse of EM is that industry can modernise in an ecological direction and thereby continue within a framework of economic growth and unbridled consumerism while reducing levels of ecological destruction. Hajer (1995: 73-103) describes how this discourse arose from a convergence of the concerns of radical environmental movements of the 1970s, mainstream conservationist movements such as the International Union for Conservation of Nature (IUCN¹⁶), and pragmatic mainstream capitalist interests represented in bodies such as the Organisation for Economic Co-operation and Development (OECD¹⁷). EM is now, in Hajer's view, 'the dominant way of conceptualising environmental matters in terms of policy-making' (Hajer, 1995: 100). Although many policymakers would not recognise the term 'ecological modernisation', it is now commonplace, argues Hajer, that to sound credible in the policy community, environmental concerns need to be couched in EM terms.

In evaluating German Federal policy on thermal renovation in the terms described in Section 1.4 above, the dominance of EM discourse as an influence on the way the policy is conceived will need to be considered. If the policy is shaped and bounded by EM discourse, we will need to ask how this affects its ability to achieve the

¹⁶ www.iucn.org

¹⁷ www.oecd.org

government's stated aims for it. For one thing, EM discourse tends to contain or restrict discussion to the one-dimensional issue of how we can save energy, reduce pollution and get benefits, in case-by-case projects. It does not provide a conceptual framework for exploring the more complex impacts of such projects, for example of how the saving in energy affects the wider economy and consumption of fossil fuels. Further, it avoids questions to do with overall structural causes of pollution, such as the world's continuing, unabated extraction of fossil fuels despite large gains in energy efficiency in recent decades. It therefore provides no theorising as to how the total GHG emissions from our full mix of energy-consuming practices can actually be reduced.

This issue will be revisited in Chapter 7. Meanwhile it is important to note that, although the evaluation questions that this thesis seeks to answer are situated within an EM-type understanding of climate change mitigation, this does not necessarily mean that the research is advocating such a framework for policy evaluation in general. However there need to be limits and boundaries in a work such as this, so a critique of EM as a way forward for an ecologically endangered human population will have to wait for another time.

1.7 SUMMARY

This thesis develops a conceptual framework that incorporates consideration of materiality into policy discourse analysis. In such a framework, materiality itself, i.e. the material objects of policy, would be considered by the researcher in a scientific way in conjunction with his investigation of policy discourse and its framing of these material objects. The researcher would be alert to materiality's influence on policy discourse both via the discourse that policy actors produce regarding it, and directly, through the physical constraints it puts on people and their social relations. Developing this conceptual framework will involve expounding how current policy discourse theories work and what they do well, while also identifying their weaknesses with respect to materiality. It will re-work relevant aspects of these with insights from the philosophy of science, outlining a 'modest realist' approach to scientific knowledge, and enriching this analytically with the concept of socio-technical systems from science and technology studies.

The usefulness of this conceptual framework will be tested by performing a policy analysis of German Federal policy on thermal renovation of existing homes. This analysis will serve the purposes of evaluating the policy in terms of how well it is achieving the stated objective for it, namely contributing to climate change mitigation by reducing GHG emissions. Attention will be paid to how well the policy enables these emissions to be reduced rapidly and deeply, along with the costs of doing so in comparison with the costs of other means of GHG emission reduction.

The concept of ecological modernisation has an important place in this study, if not always explicitly, at least as background. The discourse of EM tends to set the agenda for governments' attempts to reduce GHG emissions, and this is evident in goals and discourse with respect to thermal renovation in Germany. Its points of contact are its emphases on technical solutions, its assumption that energy efficiency in one sector will result in global reductions in GHG emissions, its extolling of win-win solutions to environmental problems, and the notion that environmental protection does not imply a threat or challenge to comforts or lifestyle.

The science-based work, on understanding the materiality of thermal renovation in the German context, is a prerequisite to this thesis, and much of it was done ahead of the collection and interpretation of discourse-based data (Galvin, 2010a).

Having set the stage for the thesis I now move to a review of literature on policy discourse theories, followed by the development of a theory as to how consideration of materiality can be incorporated into a practical approach to policy discourse analysis.

Chapter 2 LITERATURE REVIEW: POLICY DISCOURSE THEORY AND MODEST REALISM

2.1 INTRODUCTION

This chapter reviews literature on approaches to policy discourse theory, in order to outline what they claim and assume about the world, to draw out their strengths and, in particular, to show how, why and in what ways they avoid direct consideration of the role of materiality in the policy process. It then develops a way of reintroducing materiality into policy discourse theory while preserving its basic tenet, namely that all knowledge is an act of interpretation performed by free agents through the social construction of psychological reality.

In Section 2.2 I clarify the meanings of certain terms and concepts of a philosophical nature that are used throughout the thesis. In Section 2.3 I examine policy discourse theories in relation to their intellectual underpinnings. Here I show how these underpinnings give these theories considerable effectiveness in investigating the how, what and why of policy, yet at the same time make it difficult for them to judge the relative nearness to truth of policymakers', scientists' and others' claims about the materiality at which environmental policies are aimed. In Section 2.4 I review the main attempts, among policy discourse theorists, to remedy this, drawing out the limitations and inadequacies of these attempts. In Section 2.5 I develop a proposed 'modest realist' solution, based on the early work of Roy Bhaskar, the longstanding and continuing work of Rom Harré, and some key insights from Margaret Archer. In Section 2.6 I pick up some important, related themes that arise in the discussion, including the relevance, to this thesis, of 'critical realism' and some points on agency and structure. In a Section 2.7 I summarise the salient findings of the chapter.

2.2 CLARIFYING TERMS AND CONCEPTS

This section explains how I will be using certain words, phrases and concepts. It is intended, partly, to assist readers who are unfamiliar with the specialist uses

philosophers make of some quite mundane words. It will also indicate some of the points of reference from which I am arguing my case. I make no claim that the definitions given below are 'correct' or standard. They are, however, stated or implied in much of the literature here reviewed.

2.2.1 The world

In his *Tractatus* Wittgenstein (1922: § 1) used the term 'the world' to mean 'everything that is the case'. This includes physical things, mental states, feelings, the forces of nature, and so on, wherever they occur, both inside and outside of the universe. My use of the term is ontologically similar but geographically less ambitious. In this thesis, 'the world' means everything, of every possible type, that occurs, or simply is, within the geographical boundaries that human beings are ever likely to traverse. This limitation will free me from having to justify statements about, for example, laws of nature that might not apply in obscure places such as black holes and other universes.

2.2.2 Being and Knowledge

'Being' is anything that exists, i.e. any particular thing or set of things in the world. 'Knowledge' is a sub-set of being, i.e. it is one type of being among many. Berger and Luckmann (1966: 13) define knowledge as 'the certainty that phenomena are real and that they possess specific characteristics.' I would add two words, to give the definition: 'the *sense of* certainty that phenomena are real and that they possess specific characteristics.' This makes it clear that 'knowledge', as defined here, is a phenomenon, a thing that people are doing and producing, not necessarily a correct understanding of the way the world is. This enables us to investigate the knowledge(s) of various cultures, tribes, policy groups and individuals, while we suspend judgement as to how well or poorly these knowledges might reflect the things in the world they purport to refer to.

It also enables us to keep a clear distinction, at least linguistically, between 'being' and 'knowledge'. While 'being' is there throughout every part of the world, 'knowledge' is something that happens in people. The knowledge people produce

about the world is not the same thing as the world. Most of the major policy analysts reviewed here claim to hold to this distinction (see, e.g. Hajer, 1995: 17; Howarth and Stavrakakis, 2000: 3; Laclau and Mouffe, 1985: 108), though many lapse from this at times, and others happily reject the distinction outright (e.g. Dingler, 2005: 223).

The approach of these latter is what Bhaskar (1978 [1975]: 36) called ‘the epistemic fallacy’: the view that statements about being can always be reduced to statements about knowledge. Many of the statements of policy discourse theorists do seem to be of this type, as we shall see. But whatever one’s position on this, keeping a separate vocabulary for the two domains, of ‘being’ and ‘knowledge’, at least enables us to keep the issues in the debate clear.

2.2.3 Heuristic and representational models

Scientists, in both the natural and social sciences, produce mental models of the phenomena they study. Many of these are comprised of metaphors, such as ‘black hole’ or ‘landscape’; others are based around diagrams, e.g. using blocks, arrows and labels.

Some of these models are ‘heuristic’, meaning that they are not intended to represent any real or tangible thing in the world, but rather to provide a stable framework for our thinking and communicating, so we can ‘get a handle’ on a difficult and complex subject. One such example, familiar to policy analysts, is the ‘stages heuristic’ (Martell and de Leon, 2003; Parsons, 1995: 77). This presents a way of thinking of various ‘stages’ of a ‘policy life cycle’ (such as ‘problem definition’, evaluation of options’, ‘implementation’) and how these interlink. Nobody expects to be able to find these stages and linkages actually existing in some robustly identifiable form in the world, except in the minds and utterances of policy actors and analysts, so the model does not ‘represent’ any things that have some kind of independent existence in the world. Another such example, well known to environmental social scientists, is Geels’s (2004; 2005) three-tier model of sustainable technology transition.

Other models, however, are ‘representational’ (Harré, 2009: 137-139). While they, too, usually consist of metaphors and diagrams, they are intended to point to, or

represent, things that possibly *are* there, and could be found. Genes, for example, were originally a heuristic device posited by Mendel to facilitate coherent discussion of plant variations, then after further research they came to be seen as representing entities that could possibly be found in nature. Using this new, representational model as a guide they were eventually found. ‘Black hole’ is also a representational model, as it points to entities which, though neither black nor holes, are genuinely thought to exist, and possess characteristics analogous to these concepts.

The model being put forward in this literature review is intended as more than a heuristic device. It is a claim that aspects of the world really are what they are here argued to be. My reading of discourse theorists, from Berger and Luckmann’s (1966) seminal work through to most of the policy analysts considered here, leads to the conclusion that these theorists believe that aspects of the world are indeed the way they argue them to be: people do produce knowledge in categories that are meaningful to them; people do express this knowledge verbally in attempts to get others to do what they want; people do form groupings based on discursive commonalities and, through such groupings, get politically powerful people to adopt their ideas; listening to their discourse and observing which groups produce and reproduce what discourse can bring reliable insights into the ‘what, why and how’ of policy change. This is not just heuristics; it is a claim about the way things actually are.

Further, the model I develop, of how we can judge the truth-value of various scientific statements in a good-enough, practically adequate way, is also intended as more than merely heuristic. While it may at times function merely as a useful model for ordering our thoughts about complex phenomena, it is also a claim about the way the world is. The reader may therefore approach this literature review from a highly critical standpoint, judging not just its presentation and critique of theorists and theories, but whether, indeed, it has said something that is ‘the case’.

Nevertheless I will also put forward various heuristic models along the way, simply to provide convenient anchors and staging posts for the journey through my subject matter. I will make it clear, at the time, which models are intended as heuristic as distinct from representational.

2.2.4 Phenomenology

I use the terms ‘phenomenology’ and ‘phenomenological’ throughout this thesis. Here I mean something broader than Husserl’s classic definition of phenomenology as the systematic reflection on, and analysis of, structures of human consciousness (Farber, 1943). I broaden it to include reflection on and analysis of *the processes by which humans form perceptions of the world*. This is principally a reflective, philosophical activity, which may be informed by empirical studies, but draws conclusions mostly from reflection about how human functioning appears to work. A classic phenomenological study in this sense is Berger and Luckmann’s (1966) account of how people produce knowledge of the *social* realities around them. Archer (2000) takes this a step further, drawing upon Merleau-Ponty’s (1962; 1963) phenomenology of perception in developing an understanding of how people form perceptions of the *material* world. It is this tradition I am drawing on in my use of the terms.

However I will also use the words ‘phenomenon’, and its plural ‘phenomena’, in an everyday, general sense, referring simply to things that appear to be happening.

2.2.5 Subjective and objective

I will frequently refer to the realities people ‘subjectively’ produce or construct in their discourse or thinking. This is not meant to denigrate these things, as if subjective realities were less important than ‘objective’ realities, whatever these might be. It is simply to distinguish them as a particular class or type of being, that exists psychologically, in people’s heads, as it were. For example, the images and views a policy actor is producing when she talks about a thermal renovation job in her home town, are subjective realities, even though the house she is referring to may well exist in concrete form. In using the word ‘subjective’ in this way I follow Berger and Luckmann (1966: 149ff). These authors also use the word ‘objective’, to refer to social realities we produce jointly, such as rules, institutions, games and policies (*ibid*: 65ff). However I will avoid using the word ‘objective’ wherever possible, as its meanings vary widely in policy and social science literature. For example it can mean

‘existing independently of human thought’, ‘unbiased’, i.e. ‘not contaminated with values’, ‘not socially constructed’, or ‘material rather than social’¹⁸.

2.3 POLICY DISCOURSE THEORY

2.3.1 Preliminary issues

Policy discourse approaches have explored such diverse policy areas as acid rain (Hajer, 1995; 2005a), global economics (Smart, 2006), colonial withdrawal (Flowerdew, 1998); ethnicity (Hensel, 1996), official languages (Wodak and De Cillia, 2006), wind power (Szarka, 2004), deliberative governance (Fischer, 2003a), and recent European policy (Howarth and Torfing, 2005), to name but a selection. Here I will critically examine a spectrum of such approaches, with two aims. Firstly, I will explore the logic and content of these approaches to show why they have so much to offer in analysing the how, what and why of policy. At the same time, however, I will show why this logic and content gives them an inbuilt limitation: they cannot deal adequately with materiality in their current form. More specifically, they have inadequate methodology or criteria for judging whether this or that statement about the material objects of environmental policy is any nearer the truth than any other statement. Indeed, I will argue, their methodology, together with their conception of what science is, precludes them from entering into natural science debates on the same terms as the scientists, and from developing credible methods of testing scientific discourse in terms of how well or poorly it maps to the material things it purports to refer to.

This is a serious limitation because environmental policy has material objects, such as forests, seas, species, the ozone layer, and CO₂ emissions from home heating. If a policy does not match up with what the materiality is and how it behaves, it will fail, regardless of how appealing or convincing the policy discourse is to its protagonists.

The headings in this section correspond to the main strands of thought that have been incorporated into policy discourse theory to make it what it is. Each of these strands contributes to the theories’ logical structure and its strengths. At the same time, each

¹⁸ See discussion in Sayer (2000: 54ff) and Hacking (1999: 1-34).

strand of thought, or at least the way it sits within the theories, contributes to their weaknesses in respect of materiality. Further, some policy discourse approaches are more reflexive and intellectually self-conscious than others, and write extensively about their intellectual provenance, while some do not, though virtually all have been influenced by the same strands of thought, often with varying emphases.

The strands of thought are: decentring and the post-modern project; post-positivism; social constructivism and the linguistic turn; post-structuralism; and post-Marxism with its concept of hegemony. These strands are by no means as discrete and distinct as this taxonomy might suggest. Some of them interweave, and the thinkers who are drawn upon by policy discourse theorists have not necessarily embraced them all. Similarly, policy discourse theories themselves cover a wide range, in their exposition of what they regard ‘discourse’ and ‘discourse analysis’ to be, and in their intellectual roots. Expositions of the differences between various discourse theories may be found elsewhere (e.g. van den Brink and Metzger, 2006: 15-16; Wetherall et al., 2001a; 2001b). However, as a heuristic device this taxonomy can help us see our way through the intellectual thickets of policy discourse theorising and its provenance, particularly in relation to the problem explored here regarding discourse and materiality.

2.3.2 Decentring and the post-modern project

The policy discourse approaches considered here situate themselves within *post-modernism*, a cultural and intellectual critique which, in the words of Dryzek and Dunleavy (2009: 290), ‘... can be traced to nineteenth century reactions against the Enlightenment and [against] modern notions that saw society as properly organised on the basis of reason ...’ It is characterised by iconoclastic scepticism toward accepted norms and authorities or, in the words of Jean-Francois Lyotard (1984 [1979]) ‘incredulity toward meta-narratives’. Friedrich Nietzsche (1844-1900), who radically questioned the notions of objectivity and truth, is often seen as one of its earliest exponents. His remark, ‘there are no facts, only interpretations’ (Howarth, 2005: 347), exemplifies this stance.

The door is thereby opened to considering knowledge as the product of acts of interpretation rather than an ensemble of facts, or true things about the world. ‘In this line of reasoning,’ note Feindt and Oels (2005), ‘the idea of a single rationality is abandoned in favour of a close analysis of how texts produce effects through establishing differences or disguising alternatives (cf. Dingler, 2005; Shapiro, 1981).

The main interest of policy discourse theory is therefore the ways people are interpreting the world, or building their own worlds of meaning, rather than the way the world actually is. In Berger and Luckmann’s (1966: 149-204) terms, it is people’s ‘subjective’ constructions that become the focus of interest. This ‘decentres’ the world of facts and truth, as it shifts consideration from the solid stuff of the world, to subjective interpretations or expressions of meaning, and how these are communicated in statements, pictures, graphs, etc. These subjective realities – the worlds people construct and communicate in discourse – are the driving force of much of policy development. Policy discourse theory focuses on these subjective realities and therefore has a very sharp tool to explore the how, what and why of policy development.

The problem is, however, that this approach pushes the materiality to which policymakers refer (e.g. cold homes, insulation materials, CO₂ emissions, thermal bridges), right out of the field of consideration. If all truth is decentred, we have no consistent methodology for judging the nearness to truth of one statement about such things from another.

Nowhere does this come more sharply into focus than in debates about the value of science, which I now turn to consider.

2.3.3 Post-positivism

The twentieth century’s dominant paradigm for theorising of science was logical positivism¹⁹. This argued that only detached observational evidence was valid for forming knowledge, and that truth about the world could be arrived at by rational constructs based on these observations. The facts being studied were rigorously

¹⁹ For an insider account of logical positivism see Ayer (1952).

separated from the values of the researcher, who was specially trained in maintaining this distinction.

In the post-war era many universities made a concerted effort to develop social science along these lines, and policy science eagerly took this up, seeing itself as ‘...part of the development of world history, devoted to promoting the realisation of a mature and orderly industrial civilisation’ (Torgerson, 1986: 36). By adopting a positivist methodology, policy science made the general claim that it was producing reliable knowledge of objectively existing realities that drive policy development. In short, it took its place among the sciences.

This is the point where many policy discourse theorists part company, intellectually at least, from their colleagues in the Lasswellian tradition of policy analysis (Torfing, 2005). Many social scientists, including leading advocates of this ‘technocratic approach’ (Hartle, 1976), came to see that the attempt to separate facts and values - the ‘fact-value dichotomy’ (Bernstein, 1976; Proctor, 1991) - only served to strengthen the politics and vested interests in the regimes where the policy analysts were working. These analysts were ‘consciously or unconsciously, guns for hire ...’ (Hartle, 1976: 24; quoted in Torgerson, 1986: 37). They were ‘blinded to political reality’ (Torgerson, 1986: 37). Their alleged political neutrality ‘can be grasped as an illusion which tends to suppress critical questions about the political context in which policy analysis is applied’ (*ibid*: 38).

So, for example, Fischer (1998; 2003a: 1-20; 2003b) argues that when social science attempts to emulate the physical sciences and produce knowledge of social phenomena based on detached observations, this knowledge cannot be value-free because the observer cannot form meaningful knowledge without adopting an interpretive position. Further, as Danziger (1995: 435ff) argues, such interpretive positions are not merely the individual researcher’s bias, but are inherent in a research discipline’s ‘philosophical point of departure’. They are ‘constructed socially and politically, man-made rather than dictated by God or nature²⁰.’

²⁰ For a fuller account of the positivist/post-positivist division in social science see deLeon (1998), and for a defence of mainstream policy analysis against post-positivist critique see Lynn (1999).

A discourse analytic approach, therefore, does not claim to separate facts from values. Instead, it makes its values explicit up front. Its post-positivist stance, informed by a postmodernist-style decentring of truth, provides policy discourse analysis with both its own choice of points of departure, and a powerful critique of other policy analysis streams that might claim, implicitly or explicitly, to be standing on neutral ground.

Fischer (2003a: 124) reinforces this point by drawing on Gadamer's (1975) insight that one *needs* values, positions, even prejudices, to engage meaningfully with a conversation partner. One's understanding of the other person's words forms in relation to one's position, which can then shift as a result of the encounter.

So, for example, my point of departure in the empirical part of this thesis is not some allegedly neutral, value-free position, but the policy evaluation question explicated in Chapter 1. I am not asking how good, valuable, morally right or ethically correct the German Federal government's policy on thermal renovation is in relation to some allegedly neutral and universal standard, but (a) how effectively it fulfils the government's stated aims for it, and (b) how effectively it contributes to global climate change mitigation efforts, which are part and parcel of the German government's stated aims for it. My point of departure is unashamedly biased but openly expressed. It is possible that, when I begin the research, my focus on these questions will turn out to be unproductive or inappropriate in trying to understand how and why German policy actors put forward the views they espouse on thermal renovation. But I will not find this out until I ask the questions and hear the responses. From that point on, my understandings will change, as will the way I ask my questions and the responses I get, so that I will get a better and better appreciation of the worlds that the policy actors are constructing in their discourse.

In relation to the *natural* sciences, however, the situation is less straightforward, and here we get to the core of the difficulties that policy discourse theory has with materiality. The post-positivist/postmodern sentiment also decentres truth in *natural* science research. Fischer asserts that natural science research is permeated with the values of the researcher (Fischer, 2003a: 122-132). In Fischer's attempt to 'decentre' science he cites well-known arguments against logical positivism: the internal inconsistency of its non-scientific status as a theory; the falsification principle

(Popper, 1959); the shifts within some biological sciences from a 'fixed' Parmenidean world-view to the Heraclitean conception of flux (Toulmin (1990); and the apparent arbitrariness of scientific paradigm shift (Kuhn, 1970 [1962]). He then dismisses the objectivity of natural science with Latour's (1987) argument that science is not so much a case of using tools to discover what is there, but rather, '... reality is discovered to be fitted to the empirical instrument'²¹ (Fischer, 2003a: 126).

Fischer concludes that '... a proper assessment of research results has to go beyond empirical data to examine the practical judgements that shape both the instrument and the object' (*ibid*: 126). This is very close to the 'strong programme' tenet (e.g. Barnes, 1977; Bloor, 1976; 1999a; Pickering, 1984, 1995) that to judge the value of scientists' claims we have to understand the sociology of the laboratory and the scientific community, rather than the physical material they claim to be objectively studying (see discussion in Hacking, 1999: 63-99, and a lucid and succinct critique of the core logic of the strong programme by Harré, 1986: 13-14).

This type of scepticism (cf. Healy, 2005) can form the basis of a penetrating analysis of the knowledge scientists produce, and in Chapter 5 I apply it, with modifications, to the reports of experts who are commissioned by the German government to provide scientific knowledge of key aspects of the material effects and costs of thermal renovation. However it still begs the question as to what the materiality itself is like, in comparison to statements scientists make about it. This issue comes sharply into focus with Torfing's (2005) commentary on Derrida (1978) and Rorty (1989). Torfing asserts:

Truth is not a feature of externally existing reality, but a feature of language. Hence there is no extra-discursive instance, in terms of empirical facts, methodological rules, or privileged scientific criteria, which can safeguard either Truth or Science. Truth is always local and flexible, as it is conditioned by a discursive truth regime which specifies the criteria for judging something to be true or false. (Torfing, 2005: 13-14)

²¹ Latour has since modified his position. See Latour (2004; and 2005: 99ff).

In its most ontologically sceptical form, advocated, for example, by Dingler (2005), this approach maintains that:

... the perception of materiality shifts from an essentialist account of static matter to a perspective where matter is a temporary manifestation of the performative practices of human and non-human actants. (Dingler, 2005: 223)

While this view might provide a tool to critically examine the practices of scientists or even the most apparently objective scientific statements, it also puts the shape and nature of the material objects of both science and policy beyond the reach of what can be considered in the analysis. This is exemplified in Feindt and Oels's (2005: 168) remark that 'scientific knowledge about nature is as valid as, for example, any poetic concept of nature, depending on the discursive setting.'

To be sure, scientific understandings of many aspects of environmental issues are deeply contested, even among scientists themselves. However such blanket scepticism does not allow for the possibility that the material substance of, say, a certain type of existing home, may be such that certain scientific statements about it are, quite simply, correct (or far closer to the truth than others), and that *this* is what is motivating the scientific policy advisor to say what she says. To see what effects specific materialities are having on a policy domain, and vice-versa, we need to find ways of speaking of materiality which cannot be deconstructed into arbitrary expressions of discourse or performative practices: we need to speak of what is nearer to or further from the truth: what is there or not there, and what this materiality does when prodded this way and that. Only then can we properly theorise the interplays between materiality and discourse.

In short, we need to be able to produce reliable knowledge of materiality, or at least judge reliably between the knowledges on offer. This point will be revisited as this literature review proceeds.

Further aspects of policy discourse theory also point to this issue, as we shall see. Meanwhile, however, it must be noted that there is also a softer version of this scepticism of scientific knowledge. If it could be shown that a scientist's claim about

materiality itself were indeed correct, there would still be a problem of how this is taken up by policymakers. Policymakers are not usually interested in pure scientific facts, like Ohm's Law²² or the behaviour of zinc at absolute zero, but rather in how these relate to pressing social issues. Hence, when scientists advise governments, knowledge that might have a kernel in sound science can become biased in its communication. In Herrick's (2004) words, 'The socialized nature of rational inquiry means that empirical characterizations can vary according to the context of their application or assessment.' Quoting Longino (1990), Herrick continues: '[a] given item, event, or state of affairs can be correctly described in different ways depending on the points of view and interests of those describing it.'

In this way, even sound science – if there is such a thing – becomes politicised. Further, as Sarewitz (2004) observes, different policy actors may enrol the science of different disciplines, because the predominant values of one branch of science might suit them better than those of another. This is partly because of the different 'lenses' through which different scientific disciplines look at the world (*ibid*: 391), and partly because of social biases that tend to become associated with particular disciplines over time.

Hence we need some way of knowing which elements of policy discourse are influenced by the genuine science coming from experts' contributions, and which are influenced by the values and politics that might also be present in these contributions.

Further features of policy discourse theory also point to this issue, as I will argue as this literature review proceeds.

2.3.4 Social construction and the linguistic turn

Policy discourse theorists maintain that the realities people deal with every day are socially 'constructed' through language and other semiotic forms (such as the use of graphs, schematic diagrams, and symbols like 'stop' signs and national flags). Instead of language (and other semiotic forms) being a system of signs that point to referents

²² Ohm's Law states that the magnitude of electric current flowing through a medium is directly proportional to the magnitude of the difference in electrical pressure across the medium.

outside of conversation – as in logical positivism - it is seen primarily as a practice in which people construct and communicate meaning through their linguistic interactions.

This view has roots in the linguistic theory of Ferdinand de Saussure (1974), the experimental psychology of Lev Vygotsky (1986 [1934]) and the social theorising of Valentin Voloshinov (1973) and Mikhail Bakhtin (1986). It was popularised in the social sciences through Berger and Luckmann's (1966) phenomenological analysis of human knowledge of the social, and applied systematically in social psychology by Rom Harré (1983; 1993), John Shotter (1993; 1998) and Keneth Gergen (1985; 1994). These theorists showed how the realities people produce in language are in thought categories specific to particular cultures and social milieus. The sociological foundations Berger and Luckmann set out for this view are evident, either implicitly or explicitly, in the works of major policy discourse analysts (e.g. Hajer, 1995: 43; Fischer, 2003a: 50; Laclau and Moufe, 1985: 107).

Social constructionist theory provides an epistemological and methodological basis for policy discourse analysis. In this understanding, policymaking happens by means of subjective psychological realities constructed in the utterances, discussions and pronouncements of policy actors. Language 'becomes part of data analysis for inquiry, rather than simply a tool for speaking about an extra-linguistic reality' (Shapiro, 1981: 14). Since speech acts and other semiotic productions construct the realities that form the worlds of the policymakers, studying these semiotic productions gives a researcher direct access to the how, what and why of policy development.

Policy discourse analysis thereby avoids the assumption that there is an objectively discernible social world, against or within which policy formation happens. Drawing on Berger and Luckmann's (1966) insights, Hofmann (1995) proposes that:

... political strategies cannot be de-coded as natural responses to objective problem contexts, power relations or constraints on action, but rather must be seen as operationalized interpretations of these elements. Political power struggles and conflicts of interest, as self-evident as they might seem, are necessarily shaped by

specific interpretations, experiences and expectations, which depict social reality only indirectly. (Hofmann, 1995: 128)

Hence it is the interpretations, or socially constructed realities, which policy actors produce and communicate, that are the raw data of policy discourse analysis. We are dealing with the world as they see it, or make it to be, rather than moves and ideas in relation to a self-evident world that looks the same to anyone with the tools to discern it.

Berger and Luckmann's treatise dealt almost entirely with the ways people perceive *social* realities, like institutions and social rules. Other theorists brought the same type of approach to the social study of natural science, i.e. how people perceive *material* realities. Chief among these were Kuhn's (1970 [1962]) study of how scientific theories change, and Feyerabend's (1979) sceptical account of scientific method. While Kuhn did not mention 'social construction' in his account, his view is seen by many policy discourse theorists, and others, as much the same thing by another name (Fischer, 2003: 126; Hajer, 1995: 117; and see critical discussion in Hacking, 1999: 98-99).

A social constructivist view, of how people produce the meanings and perspectives that form their knowledge, provides an effective methodology for understanding how policy works. For example, in Hajer's (1995) study of acid rain policy, a crucial theme is the way the problem, and its solution, were 'constructed' among Dutch and British interest groups. Hajer shows that policy change can be understood in relation to the ways these social constructions developed, not simply in relation to the specific material features and effects of what we now call 'acid rain'. Similarly, in this thesis I will show how German thermal renovation policy develops in response to how the built environment, and thermal renovation of it, are socially constructed.

A limitation of this approach, however, is that it leads back to the scientific scepticism outlined in Subsection 2.3.3 above. How is a policy analyst to know whether one group's social construction of thermal renovation, in a particular economy and built environment, is more in tune with the material realities of that environment than any other group's? We need a social constructivist approach to do policy discourse

analysis, but, once again, it must be one that enables us to produce reliable knowledge of these material realities.

Further, social constructivism dovetails well with the ‘post-structuralism’ of Michel Foucault and Jacques Derrida and the post-Marxist ‘hegemony’ theorising that originated with Antonio Gramsci²³. Hence these streams of thought are also well-represented among policy discourse theorists, as I will outline below.

2.3.5 Post-structuralism

The policy discourse theories considered here are further informed by the ‘post-structuralism’ of Michel Foucault and to some extent Jacques Derrida (1978) and Roland Barthes (1967a; 1967b). This represents a complex and, in places, contorted discussion in much policy discourse literature, but the essential points are: normality; social structure; power; and ‘governmentality’.

2.3.5.1 Normality

A common, dominant thread throughout most of Foucault’s writings is the insight that any particular society and culture – such as that of the late 20th century western world – tends to be blind to its own characteristics, or see them as ‘normal’. Foucault alerted us to their strangeness by interpreting our society in the light of other epochs in history. For example he compared modern notions of madness and sanity with those of other epochs (Foucault, 1965 [1961]), and showed that the sexual attitudes and behaviour that are regarded as normal in one age can be seen as deviant in another (Foucault, 1976). Foucault was a historian ‘in search of the present’ (Baert and da Silva, 2010; 204), who used the past to illuminate our society’s peculiarities today. His work ‘draws upon the unfamiliar to gain access to the familiar’ (*ibid*: 203).

This point is not well developed explicitly in policy discourse theorising, but I would argue it is immensely useful in policy discourse analysis. I draw upon it in Chapters 6

²³ It also dovetails well with the ‘pragmatism’ of Richard Rorty, though as this plays a minor role in policy discourse theorising (e.g. Torfing, 2005) I will leave it out of consideration here, except where theorists interweave it with other themes.

and 7, where I question the increasing acceptance of discourse about the inevitability of the ‘zero-energy home’ and of CO₂ offsetting using on-site micro-generation.

2.3.5.2 Social structure

The main concern of policy discourse theorising with respect to Foucault is his ‘later’ post-structuralism. In his early *‘archaeological writings’* (e.g. Foucault, 1975[1963]; 1968; 1985[1969]), Foucault was indebted to the French structuralist approach to history and society, a school of thought associated with Durkheim, Saussure, Lévi-Strauss and Bourdieu²⁴. Here he worked out his ‘history of the present’ against a backdrop of structures of thought and social life that stretch back over long periods of time (e.g. Foucault, 1985[1969]: 3-17). These include such things as capitalism, modern medicine, and the institutions and dogmas of modern psychology.

One of Foucault’s key insights was that these structures – including their material, non-discursive features - influence not only what people do, but also what they say and how they think: they set the rules of discourse. Hence the discourse of any particular epoch determines what human beings are like and how they interrelate: it *constitutes* social subjects, forms of self, and social relationships. For policy discourse analysis, this implies that many aspects of policy discourse that purport to be the truth about the way the world is, can be seen, rather, as commonly held assumptions, specific to our stage of history, and very much influenced by the large, overall structures that prevail today – such as capitalism, and the way crime, health and sanity are perceived. This type of awareness is often incorporated into policy discourse theorising (e.g. Fairclough, 1992: 39ff; Hajer, 1995: 48; Howarth, 2005: 318, referring to Foucault, 1985[1969]; Torfing, 2005: 7ff).

In Foucault’s later *‘genealogical writings’* (e.g. 1977 [1975]; 1976) he moved away from the notion that the rules of discourse are conditioned by non-discursive relations or structures, such as economy and class struggle (Torfing, 2005: 7; Baert and da Silva, 2010: 188ff). Instead, current discourses determine everything, including the rules by which discursive interplays happen. There are no extra-discursive restraints

²⁴ For a succinct discussion of structuralism see Baert and da Silva (2010: 12-48).

limiting or partially determining the shifts and developments in discursively formed social structure.

Hence it is current discourse that makes the social structure, and the current social structure that constrains what discourse may be credibly uttered. As Hajer (1995: 49) expresses it, referring to Foucault (1971), discourses ‘imply prohibitions since they make it impossible to raise certain questions or to argue certain cases.’ Further, the discourses set the rules as to *who is allowed to participate* in the discourse; and they are embedded in *disciplines* (such as the medical profession or the law courts) which are characterised by widely accepted rules as to how their particular discursive order is to be maintained and under what conditions a discourse may be drawn upon (Hajer, 1995: 49). Discourse thereby ‘positions’ people, as insiders, outsiders, authorities, learners, enemies, objects of pity, etc. Discourse ‘is itself part of reality, and constitutes the discoursing subject’ (Hajer, 1995: 51).

For the practical work of policy analysis, this implies that these positionings, prohibitions, and other such manoeuvres happen within the policy community and influence what kind of discussion and deliberation can take place. In investigating the field of thermal renovation policy, for example, we need to note which people get listened to by the dominant policy community (engineers? plasterers?) and which people’s voices are marginalised (architects? landlords?). The content of their discourse may have little or nothing to do with how well it is received. I will return to this point in Chapter 5, when considering which ‘experts’ get routinely chosen to write definitive reports for the German government on how homes should be insulated, and in Chapter 6, when considering what can lead to change or stability in policy discourse.

However this also has implications for discussion of the materiality that is the object of a particular policy. If not only the policy discourse itself, but also the rules under which it operates, are set by local or current discursive interactions, what happens when the prevailing discourse gets out of step with the way the materiality is, or when those who are denied the right to speak actually understand the materiality better than those whose discourse is routinely accepted? Similarly, what happens when those who are routinely permitted to speak begin to describe the materiality in ways that are at

odds with the content of the prevailing discourse – with what is allowed to be said? How can discourse change, if at all, in response to changing material conditions, or at least to changes in the way the materiality is understood?

Hence the theme of how policy discourse can change, in relation to the way its material referents are, or are said to be, is one that needs further exploration. I will return to this point in Section 2.6 of this chapter.

2.3.5.3 Power

In contrast to views of power as direct domination and repression, Foucault conceived power as an effect of discourse, which shapes persons' identities and capacities, and their relations of dominance and subordination (Foucault, 1980). In particular, he related this to the way modern societies manage populations – not so much by force from above, but by a myriad of 'micro-techniques', such as examinations and professional-client relationships, the rules and expectations for which are distributed throughout society and reproduced through discourse (cf. Fairclough, 1992:50). This is 'productive' power, in that it produces, or brings into being, various popular behaviours, rather than merely preventing some and permitting others. As Torfing (1999:155-167) puts it, power is not an expression of wills. It has a circular structure, being produced everywhere through discourse: the discourse makes institutions and rules come about, and these put people into certain roles and places, and they then reproduce this type of power as they reproduce the discourse. It operates through 'normalising regulations' and through 'disciplinary techniques', and is 'unmasterable' by any particular person.

This concept enables policy discourse analysis to focus on the ways power is *informally* produced and wielded *within* policy actor communities, in the actual genres and nuances of conversation. For example, when policy actors talk about the need for all homes to be thermally renovated, a researcher would keep alert for 'positioning' manoeuvres in the actor's speech – where, for example, he might speak of refusers as 'misinformed', and the compliant as 'modern'. When actors' words and expressions are heavily laced with values, praise and condemnation, it is likely that this type of power play is most evident.

It also raises an important point about materiality and scientific knowledge. Some of the claims and counter-claims within policy discourse are statements imported from the natural sciences. These claims might indeed be used, by policy actors, in ways that wield power over opponents. But this might not be the whole story, because such claims might also be being used simply because they consist of reliable, high-quality scientific knowledge which we ignore at our peril. A discourse analysis approach which sees such claims only in terms of their power and positioning features may well miss a good deal of what is going on in the policy domain. Once again, then, the policy discourse analyst needs to be able to produce reliable knowledge of the material objects of policy, though here it is to enable him to better understand the power plays in the discursive realm.

2.3.5.4 Governmentality

‘Governmentality’ is a term that combines government, rationality and mentality (Burchell et al., 1991). It is not just that governments govern, but that we all govern ourselves through reproducing the discourses that discipline us along certain lines. The state itself is decentred (Brown, 2006: 72). As Hajer (1995: 47) notes, Foucault used the term ‘the disciplines’ to express how discourses can structure aspects of society so effectively that people often obey their tenets without even being aware of them. Dryzek and Dunleavy (2009) point out the implications of this for environmental politics. Discourse about responsible individual environmental behaviour ‘is pervasive in contemporary Western societies’. It involves a plethora of individual practices such as

... recycling, minimising waste generation, installing insulation in houses, using public transport wherever possible, conserving fuel and water ... (*ibid*: 292)

These writers call this form of governmentality ‘environmentality’, and maintain that it ‘deflects attention away from the *structural* causes of environmental decay that are intrinsic to the capitalist political economy’ (*ibid*: 292). This represents a scepticism toward post-structuralist approaches, which tend to down-play the effects of long-term, materially embedded social structures.

This has important implications for my overall policy evaluation questions. Even if thermal renovation policies are successful in inducing individuals to reduce their individual ‘carbon footprints’ (another interesting socially constructed concept!), could this have the effect of shifting responsibility for global GHG emissions from the big, structural polluters, such as oil companies, industry, transport and food production, to individuals who might actually have relatively little scope to bring about significant GHG emission reductions? In this respect, too much emphasis on post-structuralism, at the expense of a structuralist understanding of how the industry and economy run, could reduce the effectiveness of policy discourse analysis. I will return to this point when discussing the policy evaluation question in Chapter 7.

2.3.6 Post-Marxism and the concept of hegemony

The discourse of many individuals scattered throughout society is hardly likely to bring about momentous changes in the way governments run countries. But policy discourse theorists maintain that these disparate discursive utterances combine and coalesce, in powerful ways, to become a major force in political change. To show how this happens they draw on currents of 20th century thought originating with Marxist activist Antonio Gramsci.

Gramsci sought to broaden Marxist politics to incorporate widely disparate groups into and alongside workers’ movements for dominance over capital and the state apparatus. He reconceived the notion of ‘hegemony²⁵’ (e.g. Gramsci, 1971 [1933-34]), and applied it to how one group exerts social dominance over others in maintaining power. He argued that political subjects – ordinary people - are not, as Marx had argued, ‘pre-constituted’ as a specific political grouping (such as ‘the workers’). Rather, all groups of every social kind can become political actors, through political, intellectual and moral leadership. Politics, therefore, argue post-Marxist policy discourse theorists Laclau and Mouffe (1981: 20), ‘encompasses the whole domain of social relations’, *constitutes* political groups rather than merely being

²⁵ From the Greek ἡγεμονία – *hēgemonía* : ‘the dominance of one political group or person over others’. In the 19th century the concept had been used mostly in international contexts concerning political dominance.

carried out by them, and involves local power struggles rather than a radical break involving the seizure of power. 'For if the articulations of the social whole are political articulations, there is no level of society where power and forms of resistance are not exercised'.

Informed also by Foucault's post-structuralism, Laclau and Mouffe (e.g. 1985) saw this localised politics as happening by means of discourse. Further, the discourse of various, and often disparate, groups can coalesce around a central idea (such as liberation or women's rights), and a coalition of groups and individuals comes into existence, united by the common discourse. The discourse can then become so dominant and self-reinforcing that it takes over, squeezes out competing discourses, and becomes the driving force of policy change. This is what these writers understand as hegemony, and this understanding of hegemony has become a central part of the frameworks of all the leading policy discourse theorists considered here (Fairclough, 1992; Fischer, 2003a: 78-79; Hajer, 1995: 59; Torfing, 1999; 2005; Howarth, 2005)²⁶. In environmental policy discourse theorising, however, the ethics based, social revolutionary sentiment of post-Marxism is difficult to find, and instead there is an emphasis on the mechanics of hegemony in discursively conceived policy processes.

This is well developed in Hajer (1995; 2005a; 2010), who is concerned with the mechanics of how a particular discourse or set of discourses can form around a coalition of actors and become hegemonic, i.e. come to dominate and control a policy domain. Policy change, he argues, is the outcome of struggles among political decision-makers to achieve 'discursive hegemony' (Hajer, 1995: 59), i.e. to get the environmental problem and its solution, as they construct these, adopted within policy. When a new or emerging discourse (ensemble of ideas, concepts and categories) reaches a certain level of appeal within a policy domain, the actors within that policy domain have to adopt it to remain credible. Borrowing terminology from Giddens (1984), Hajer calls this 'structuration'. If this discourse gets translated into policy and institutional arrangements, it has achieved 'institutionalization.' A discourse that has achieved both structuration and institutionalization is now

²⁶ For Laclau and Mouffe, and to some extent Torfing, the establishment of a new discourse in the governing power might not always happen peacefully, but can come through violent revolution. However, most policy discourse analysts leave that aspect of post-Marxist thought out of their schemas.

‘hegemonic in a given domain’ (Hajer, 1995:59). The key players have adopted it as their view of the world, and have devised laws, regulations, bureaucracies and enforcement agencies to put it into practice. A hegemonic discourse also has the effect of constraining what may be said, by whom, in what context, in relation to the policy. Hence the policy is stabilised by the hegemonic dominance of its own discourse.

This understanding of hegemony provides policy analysis with a very useful analytic tool to explore how a particular set of interrelated discourses comes to hold sway among policymakers and control what laws, regulations and policies are put in place. But it also raises the question as to what happens to hegemonic policy discourse when it is challenged by changes in, or new knowledge or interpretations of, the material objects of the policy. How much discursive pushing and shoving does it take to topple a hegemonic discourse? It also draws attention to the central question of this thesis, as it leads us to ask about *critique* of hegemonic discourses. When policy analysts critique a hegemonic discourse, should they not, *inter alia*, check out the veracity of assertions within it about the materiality of the policy? To do this, they need, once again, a stable platform from which to judge these assertions against reliable knowledge of the material world.

2.3.7 The solution and its problem

In this section I have argued that policy discourse theories offer a powerful and effective means of bringing to light the influences that lead policy to develop the way it does. Being *postmodernist*, they focus on policy actors’ formulations of the truth about the world the policy is aimed at, rather than what that world is like in itself. Their *post-positivist* approach frees them from looking for objective causes and effects within a reified social structure, and from the pretension that one can perceive what is going on in society from a politically neutral, value-free standpoint. Their *social constructivist* epistemology alerts them to the meanings and perceptions policy actors construct subjectively and communicate in their speech, writings, graphs, etc. and which form the subjective worlds that drive policymaking. Their *post-structuralism* directs their attention to the local, contextual relations between those who communicate ideas in the policy community, and the power relations and ‘positioning’ that goes on here, to win allies and disempower opponents. Meanwhile

their concept of *hegemony* provides a theory as to how a particular discourse or set of discourses can unite the efforts of widely disparate groups, such that one formulation of the policy issue comes to dominate over others and to get enshrined in laws, regulations and institutional practices.

The problem for such approaches is their under-theorising of the materiality which environmental policy aims to influence. In particular, the very strengths of these theories, in focusing on the worlds people produce in discourse, prevent them from developing a methodology for judging which statements about materiality, and which formulations of the problem and its solution, are nearer to the way the world is, than which others.

Within policy discourse theorising there have been several attempts to address this problem. As a heuristic device I would classify the main ones as: 'Relativism is OK', 'Degrees of social constructedness', 'Democratising science', 'Human and material symmetry', and 'Critical realism'. In the next section I look critically at these.

2.4 PROPOSED SOLUTIONS TO THE PROBLEM

2.4.1 Relativism is OK

One group of discourse approaches can be seen as attempting to solve the problem by arguing it is *not* a problem if seen in a certain way. Torfing (2005: 18-19) notes the 'common objection to discourse theory that it is adrift in a relativist gloom', or in the words of Geras (1987) and Howard (1987), that it entails 'nihilistic relativism'. Following Rorty(1989) and Mouffe (1996), Torfing accepts the premise of these critics' argument, namely that 'since there are no bedrock foundations, and everything is discursive, it is impossible to defend any particular set of claims about what is true, right, or good' (Torfing 2005: 19). Our standards for judgment can only ever be relatively determinate, he says, since:

We mortals are tied to a particular discursive framework within which we define and negotiate our criteria for accepting something as true, right or good. (*ibid*: 19)

However, he argues, we are not trapped in these frameworks but are continually exposed and open to those of other cultures, traditions and contexts. This, he points out, leads to ‘agonistic dialogue’, in which our frameworks are contested and ‘contaminated’, and their boundaries ‘continuously breached and redrawn’. This happens through mutual learning, political struggles, or violent conflicts.

In short, the relativism of discourse analysis is not nihilistic, because one group’s views of the world, in its particular discursive categories, will be challenged by other groups’ views, and this will influence all to modify their views.

Fischer (e.g. 2003a: 136-138) puts forward a similar case (though elsewhere his position differs, as we shall see). To begin with, he argues that those who criticise discourse theory for its relativism – namely ‘neo-positivists’ and ‘neo-empiricists’, whom he calls ‘dogmatic ideologues’ (*ibid*: 136) – actually stand on relativist ground themselves. Their assertion, that truth claims can be verified or falsified by some universal frame of truth, is itself a discursive construction. Like Torfing, Fischer argues that ‘multiple realities necessarily characterise the social world’, and that recognising this has ‘socially liberating effects’ (*ibid*: 137).

Drawing on Haraway (1991: 188-201), Fischer further argues that ‘the issue of relativism can be redefined as a question of *location* rather than *criteria*’ (Fischer, 2003a: 137, emphasis added). Those located at the bottom of the social hierarchy see the world differently from those at the top, whose power affords their world-view a privileged position as the truth. Hence ‘the local knowledge of those on the periphery provide (sic) the key’ (*ibid*: 137) to transforming social reality. Fischer notes that Foucault (1985 [1969]), too, urges us to ‘focus on the “marginal man” standing outside the mainstream of events’, and concludes that the alternative to the ‘single- visioned relativism of universal theory’ is ‘the partial, locatable, critical knowledge’ that makes for shared conversations leading to solidarity in politics (*ibid*: 138).

This view, also expressed by Bobrow and Dryzek (1987: 161-182, esp. 171), has much to offer, in that the environment and society can look very different from the perspectives of different groups, such as (e.g. in the arena of thermal renovation) building physicists, low-income home-owners, wall insulation firms, social housing

tenants, architects, private landlords, and environmental activists, to name but a few relevant actors.

However it does not solve the problem of materiality and discourse, in that it does not offer the means to compare discourses with the actual nature of the materiality that is the object of the policy. For example, dialogue of this kind will not necessarily come to reliable conclusions about the way insulation materials affect the thermal performance of buildings or the complexity and cost of affixing them. We still need a way of judging whether one statement about the material behaviour of some particular type of German house, for example from a building physicist, is nearer to the truth than another from, say, an architect or union leader.

2.4.2 Degrees of social constructedness

A second proposed solution involves dividing discourse into two discrete categories. In the first are statements that are regarded as so straightforward that they simply describe the material things that are there, without any overlay of social construction. In the second are statements that contain values and judgements.

The most explicit expression of this view is in Jones (2002), who introduces the notion of 'levels' of 'constructedness' (*ibid*: 249, 250) of various material realities. Quoting Blaikie (1984) she notes that 'there are aspects of the environment that are, as it were, more socially constructed than others' (Jones, 2002: 249). In a similar vein she draws upon Dear's (1988) suggestion that some parts of science have relatively few 'degrees of freedom' around their explanations, while others, especially the social sciences, are 'beset by varying degrees of ambiguity' (Jones, 2002: 249).

To make her point she uses the example of trees and soil:

The direct observation of a tree being cut down is highly unlikely to be disputed. Satellite imagery used to measure deforestation is likely to generate very slightly different results depending on the researcher and methodology employed. The view that such deforestation is unsustainable is even more contested. Similarly, the direct observation of soil movement downslope is less socially constructed

than the labelling of it as soil erosion and further, the view that it is a problem.

(*ibid*: 249)

In each of these examples an event is described in a three-stage progression: a simple description of the event itself (a tree being cut down; soil movement downslope); an interpretation of the event along the lines of a category in environmental discourse (deforestation; erosion); and a value judgement (unsustainable; a problem). The force of Jones's argument is that it is possible to observe and describe something without adding any social constructedness – so that everybody would agree on the description – and it is also possible to describe the same events with increasing layers of judgement, or social constructedness, as to what is happening.

In support of this reasoning Jones draws upon Little's (1991) distinction between 'concepts', which define or refer to 'ordinary objects', and 'higher level beliefs' about the 'properties' of those objects. Most cultures, she says, share a common set of beliefs about ordinary objects, but may differ in their general beliefs about the world.

Fischer (2003a) also offers a solution of this type. He maintains that '...all knowledge can be located across a continuum according to the degree to which it is based on subjective assumptions' (*ibid*: 152).

Leaving aside, for the moment, the question of the internal logical coherence of this view, would such an approach solve the problem?

It would not, because we would still need some criterion to decide, first of all, where the boundary lies between a 'definition' of an 'ordinary object', and a 'higher level belief' about it. Presumably, the boundary lies where people start contesting each other's views, but this is just where we need criteria to judge between one person's construction of an object and another's. Similarly, we would need criteria for deciding whose construction of the object was the right one. With regard to the descriptions scientists offer of the material world, we would still need to know how to judge whether they were simply describing what is there, or making value judgements.

Fischer's (2003a) approach also suffers from this difficulty. He maintains that 'instead of simply uncovering reality, scientific work is better understood as a mix of discovery and construction of reality' (*ibid*, 124). But we would need to ask, then: who decides which bits are discovered and which are constructed, and using what criteria?

So even on its own terms, the 'degrees of social constructedness' approach does not solve the problem.

Its internal logic is also flawed, namely in its claim that people can describe an event or object without socially constructing it. This is inherently contradictory, since descriptions are composed of words, and words are both socially constructed and socially constructing. Calling something a 'tree' is *already* imbuing it with values and interpretive categories. Is it really a 'tree'? It might be a 'bush' or a 'sapling', or, in New Zealand, a *rakau*, a Maori word for 'tree' which makes clever puns with sexual connotations. Is it really being 'cut down?' Perhaps it is being 'culled' or 'thinned' or 'cleared'. The phrases, 'cutting down a tree,' 'clearing the bush', and 'thinning the plantation' may be descriptions of the same sets of movement of material in time and space, but they are different in meaning and, from the point of view of humans in a discussion, describe different things. Similarly, the physicist's seemingly neutral phrase 'high thermal resistance' is not purely descriptive but contains value judgements: 'high' generally implies better; 'resistance' can connote success or survival. Even 'thermal' is socially constructed, because 'heat' is not a property of nature but the feeling we get when certain natural processes meet us²⁷.

As Wittgenstein argued (1967 [1953]: e.g. § 8e), language happens on a different plane from the things and events it may or may not refer to. We use words to make and express meaning in relation to the elements we pick out and highlight, of the multitudinous amount of sense experience that is constantly coming at us. Accepted meanings of words tend to stabilise around specific experiences of the world, though this is also culturally dependent to some degree. Further, there is no guarantee that the

²⁷ Ironically, the more mathematically convenient way of talking about thermal resistance is to use its reciprocal, measured in 'U-values'. Here, the lower the U-value, the more effective the resistance. This creates promotional problems for builders trying to explain their products to the public, as a 'lower' value seems to imply it is not as good as something with a 'higher' value.

meaning of a word will stabilise around a correct (or even practically adequate) interpretation of a physical reality. The phrase, 'the sun goes round the earth' was stable in many cultures for hundreds of years, but wrong. *Everything* we say, in respect of *anything*, is 100% socially constructed. Therefore it cannot escape being permeated with values and judgements.

Laclau and Mouffe (1985) make this point carefully, while affirming that it is not a denial of the existence of the material world. Material realities do indeed exist independently of human thought, but they cannot 'constitute themselves *as* objects outside any discursive conditions of emergence' (*ibid*: 108, emphasis added). It is *we* who constitute them as objects, i.e. as discrete, simplified, useful, communicatively effective selections, by means of words.²⁸

This realisation, also implied in Hajer (1995: 17), avoids 'degrees of constructedness' and accepts that the content of all human utterances is fully socially constructed²⁹. However in so doing it also serves to highlight the problem being addressed in this thesis, that we need to find some way of judging how well or poorly this knowledge and language in the policy realm relate to the material objects of the policy. To do this, we need to be able to distinguish between better or worse, more true or false, statements about the materiality. If there is no logical link between discourse and its material objects, how can we say one formulation is any nearer the truth than another?

2.4.3 Democratising science

A third solution on offer involves what may be termed 'democratising' science in environmental policymaking. This is exemplified in Lövbrand and Ölberg's (2005) response to calls for a more constructive role for science in the policy process than simply as the authoritative spokesperson of the material world (here these authors are

²⁸ This view may need to be modified, since non-linguistic beings, such as cats, also seem to use modelling strategies to make aspects of the world, such as mice and big fierce dogs, discretely significant to them. Hence our constituting of significant realities may also involve pre- or extra-linguistic skills, as Archer (2000) argues.

²⁹ Hajer (1995: 17), ostensibly drawing on Žižek (1993: 4), refers here to the 'Real' as a material reality, a 'hard kernel which resists any process of modelling, simulation or metaphoricisation'. He seems to have misunderstood Žižek at this point, as Žižek's 'Real' is a psychological entity, 'the impossible decision between two determinate poles' (Žižek, 1994: 64). 'In short,' says Žižek, '*the status of the Real is thoroughly non-substantial*'.

responding to Harrison, 2004, Herrick, 2004; Oreskes, 2004, Pielke, 2004; Sarewitz, 2004). Since all knowledge is socially constructed, science, it is argued, can only ever offer a provisional account of the truth about the material objects of environmental policy. Lövbrand and Ölberg (2005) argue that therefore the notion of science having a privileged position as a provider of authoritative knowledge needs to be abandoned. The boundaries between science and non-science need to be removed, so that the public can more fully participate in the scientific process. This will produce knowledge that is more attuned to the needs of the wider community and ‘build a more socially accountable science’ (*ibid*: 197). Drawing on Nowotny, et al. (2001), Lövbrand and Ölberg (2005: 197) also argue that a ‘socially robust science’ needs to involve ‘social scrutiny of scientific results’.

Aspects of this approach have merit in several important ways. Firstly, in data collection, the public can assist science, and hold it to account, in ensuring it does not miss data that is relevant to the issue. As Callon et al. (2009 [2001]) argue, often the scientific community can have its *scientific* understanding broadened by hearing the perspectives of local people and others who engage in daily life with the (material) policy objects in question. If, for example, a homeowner or architect finds that mould forms in a newly renovated house where physicists have said it cannot form, this item of data needs to be allowed to inform the science.

The public can also hold science to account in doing its job *as science*, rather than using the kudos of scientific authority to go beyond its remit. For example, building physicists are qualified to produce reliable information about the thermal properties of various types of joinery, insulation materials and air-flows. However, as I will demonstrate in Chapter 5, they often mix their scientific reports with their opinions on such things as how old or run-down a house has to be before it must be renovated, what aspects of a renovation job you count in the calculation of economic viability, how long the job should take to pay back. The public could be more active here in clarifying for them which aspects of their knowledge are science, and which are values and politics³⁰.

³⁰ This approach has parallels with notions of ‘deliberative policy governance’ (e.g. Hajer and Versteeg, 2005; Hajer and Wagenaar, 2003a; 2003b; Sorensen and Torfing, 2007), in which a wide

But a serious problem with Lövbrand and Ölberg's approach is its call for social scrutiny of scientific *results*. For example, no matter how well-meaning the public is, only a person trained and skilled in biology can produce reliable knowledge on, say, the sensitivities of worms to various chemicals in the soil. The worms might not do very well if this knowledge becomes modified with knowledges produced by groups who have an interest in promoting or suppressing the use of various fertilisers for reasons of their own. One only needs to read the history of 16th century science to see how plagued it was by public and (in those times) church interests who were determined to scrutinise its results for what they saw as the wider public interest (Sobel, 1999). We still need a more rigorously based methodology to assess the veracity of statements of scientists and others who claim to speak for the material aspects of the environment.

2.4.4 Human and material symmetry

A fourth proposed solution, found in Actor-Network Theory (ANT), otherwise known as 'the sociology of translation' rejects the distinction between discourse and materiality (Callon, 1986; Latour, 1983; 1987; 2005; Law, 1989). This is based on ANT's rejection of the 'divisions traditionally thought to prevail between humans and non-humans' and therefore of 'the traditionally accepted division between natural and/or social explanations of environmental change' (Murdoch, 2001: 115-116). ANT analyses social phenomena as consisting of 'networks', that include all the human and non-human entities that influence each other. There is 'symmetry' between these entities (called 'actors') in that no distinction is allowed between the types of causal powers³¹ they exercise. Human actors, and inanimate actors such as metals and bacteria, are all spoken of in both human-like, and inanimate terms. For example, Callon (1991) maintains that inanimate things 'make', 'seek', 'rework', 'test their identities,' and 'are not as dumb as we think' (*ibid*: 135-136). A nuclear power station, he says, has the 'right' to be an 'actor' (*ibid*: 141), and it is 'increasingly difficult to distinguish between humans and non-humans' (*ibid*: 139).

range of views is brought into policy discussion, and Habermas' (1981) theory of communicative action, in which this is extended such that efforts are made to keep the discussion open and rational.

³¹ For an account of discussions on the concept of causal powers see Harré and Madden (1975).

Further, ANT rejects a social constructionist paradigm and argues instead for ‘co-construction’ (Haraway, 1991; Latour, 1993; Pickering, 1995, see Murdoch, 2001: 117) of society, in which humans and non-humans together form the complex interdependencies that we all live within.

With regard to science, a formative case study for ANT is Latour’s account of Pasteur’s discovery of the anthrax bacillus and subsequent production of a vaccine (Latour, 1983). Latour notes that Pasteur could only discover the bacillus by bringing a great number of diverse actors together into a network configuration. Further, it was only through the laboratory apparatus that the bacillus became visible, and consequently, argues Latour, both Pasteur and the bacillus are ‘modified’ in the laboratory, i.e. they are ‘co-constructed’. They ‘mutually exchange and enhance their properties’ (Latour, 1999: 125).

In an ANT-inspired policy analysis, therefore, we would set out to explain the how, what and why of policy development by investigating how materiality (such as home insulation) and policy actors co-construct each other. With regard to the science that informs the policymakers, ANT would investigate the work of building physicists and other relevant actors within the context of their material laboratories, computers, modelling devices, together with the demonstration projects they have produced, and the complex arrays of other entities, including policy actors, building sites, funders, practitioners, weather, thermodynamic laws, etc., with which they are networked.

This approach could shed much light on how and why certain configurations of scientific knowledge become dominant in a policy arena while others are marginalized. It might illuminate the complex linkages and interplays between the substance of policy and its material objects.

However it would still leave us with the problem of how to judge whether the dominant knowledge embedded in the policy is a good reflection of what the materiality actually is. We would still need to evaluate, for example, the ubiquitous claim, within German policy on thermal renovation, that the thermal standards required by the building regulations always pay back within 25 years (Galvin, 2010a).

This would involve an independent investigation of policy experts' claims about thermodynamics, properties of insulation materials, range of types and shapes of houses, current costs of doing various insulation jobs, and so on. For this we would still need a theory of how one claim about materiality can be better, or nearer to the truth, than another. Hence we would still need a robust theory of knowledge with respect to science.

Further, as Bloor (1999a; 1999b) argues, understanding natural science and its material objects is not enhanced by attributing human-type agency to inanimate objects. There is a strong philosophical case for the view that, if material things 'act', it is only because they are caused to do so by the mechanisms of nature, whereas humans act intentionally, reflexively, and with a much wider degree of freedom (cf. Harré and Madden, 1975; Harré and Gillett, 1994; Harré, 2009).

Latour (1987: 89), Akrich (1992) and Latour and Akrich (1992) challenge this objection with the claim that material things are able to produce meaning in themselves, having semiosis inherent in them. We are to imagine that, say, a natural insulating material, at the moment of its discovery, produces, in itself, the *semiotic* property of what humans socially construct as 'insulation'. But this is philosophically untenable, since meaning is something produced by living, autonomous, intentional beings, not inanimate matter³². A material might respond in certain ways to temperature differences across its boundaries, but it is *we* who construct this as 'insulation', with all the connotations of that word. And this, indeed, returns us to our central issue, since the problem is that different actors attribute different meanings to the same object, and we need a way of judging which one is nearer to the truth. Why should we accept one actor's claim about the meaning inherent in an object if another actor makes a counter-claim?

This also raises a further important point. It is never clear whether ANT is being proposed as a *heuristic* model of the world, or as a *representation* of the way the world really is (cf. Harré, 2009: 137ff, and Subsection 2.2.3). As a heuristic it can be

³² In more recent work Latour (2005: 10) softens this claim, declaring that to qualify as an 'actor' a non-human entity must have '... a type of agency that is more open than the traditional natural causality – but more efficient than the symbolic one...' Yet even this is problematic, since material objects do not have such agency. They simply slavishly obey the laws of nature.

useful, provided its limits are made explicit. But as a representation of reality it is misleading. In environmental politics we are dealing with a real world that kicks back at us if we (mis)treat it in certain ways. We therefore need a robust theory of the knowledge of materiality that enables policy actors' and others' knowledge to be tested against the real nature of the world.

2.4.5 Critical Realism

One influential strand of policy discourse theorising is the 'critical discourse analysis' (CDA) of Norman Fairclough and colleagues (Fairclough, 1989; 1992; 2005; 2008; Chouliaraki and Fairclough, 1999). In many respects CDA is similar to the broadly-based approach of Laclau and Mouffe, though it also incorporates a highly technical appreciation of the linguistic features of discourse. More important here, CDA argues that both discursive and non-discursive realities need to be considered in the 'lifeworld', which includes material elements, in the context of the social practices of the people producing policy-related discourse. Fairclough and colleagues suggest using Bhaskar's (1978; 1989; 1998[1979]) 'critical realist'³³ insights to weave together the semiotic and the non-semiotic aspects of social reality. 'Indeed,' they conclude, 'one might be able to construct a continuum ranging from technological systems through to religion in terms of the relative weight of semiosis and materiality in their overall logic' (Fairclough, et al., 2001:10).

The central tenet of critical realism, drawn upon in CDA, is that, while all utterances are social constructions through and through, humans are also skilled at matching their utterances to the way the social world is in itself, and the way the material world is in itself. Further, it is argued, people can be trained to do this to a high level of competence using scientific methodologies (Bhaskar, 1989).

The core arguments of critical realism, especially with respect to social realities, are intellectually demanding and highly contested (for a discussion of the sticking points see Harré, 2009; Harré and Bhaskar, 2001; Patomäki and Wight, 2000; Steinmetz,

³³ 'Critical realism' is a term coined by Roy Bhaskar's interpreters to describe the second phase of Bhaskar's philosophy, which dealt with social structure. It is often incorrectly applied to the first phase of his work, which dealt with natural science, and which he called 'transcendental realism'. See Bhaskar (1998[1979]; 1978; 1993).

1998; Varela, 2002), and I would argue that it is not clear that Fairclough and other CDA advocates have woven them intelligibly into their policy discourse theorising. It is one thing to proclaim, ‘We can take materiality seriously because we are critical realists’. It is quite another to unpack the term ‘critical realism’ and show quite specifically how it might enable us to bridge the gap between the socially constructed realities that exist subjectively in the minds and conversations of conversers, and the objective realities, material or social, which (it is claimed) exist regardless of what people say or think.

One of Fairclough’s co-authors, Andrew Sayer, does explore aspects of this issue in detail elsewhere (Sayer, 2000), but this is in relation to broader sociological issues rather than the materiality which is the object of policy. Its main focus is on causative realities said to exist within social structure, and this in itself is a problematic concept, as I argue in Subsection 2.6.2, below.

Nevertheless, critical realism was a later development of Bhaskar’s (1978 [1975]) early ‘transcendental realist’ philosophy of science, which is much more directly applicable to issues of the knowledge of materiality, as its focus is on *natural* science, not *social* science (nor both). As such, it has not been brought into policy discourse theorising in any identifiable way. I will consider it in Section 2.5. I will return briefly to critical realism in Section 2.6, in discussion of the issue of agency and structure.

2.4.6 A problem without a solution?

In this section I have examined approaches within policy discourse analysis literature that address the problem of how we can obtain reliable knowledge about the material objects of policy so as to be able to speak credibly about how well the policy and its discourse match up with the material objects of the policy. In the first approach, socially based differences between ways of knowing the world are valued, but we are still left with no reliable means of arbitrating between competing claims about the way the material world works. The second approach fails to recognise the socially constructed nature of all human utterances, and also, even on its own terms, fails to show how we could distinguish, reliably, between ‘levels’ of ‘social constructedness’.

In the third approach, the privileged position of science is questioned, perhaps wisely, but I have argued that making the knowledge that science produces subject to public scrutiny would not solve the problem of how to judge which scientific knowledge is nearest to the truth about the material world. The fourth approach, ANT, offers a useful heuristic device for exploring how material and human entities interact in society, but fails to theorise the causal powers of human and material entities in a credible way. The fifth approach allies itself with critical realism, but neither explains how the logic of this theory actually works in policy analysis, nor engages with the debates about how convincing critical realism is as a social theory.

In the following section I will propose a solution of my own.

2.5 MATERIALITY AND NATURAL SCIENCE

The solution I am proposing is ‘modest realist’. It is *realist*, in that it regards the world as not only ‘there’, but also knowable, at least to a certain degree and for most practical purposes. It is *modest*, in that it does not make the high claim that we can know things about the world perfectly, completely or infallibly, or that we can be 100% sure that one piece of knowledge is closer to the truth than another. It thereby avoids the ‘fallacy of high redefinition’ (Harré 1986: 6), in that, unlike logical positivism, it does not claim that there is a *deductive* certainty about knowledge of the world. Hence it does not seek logically tight solutions to the problems posed by the verification principle, the inductive argument, and the falsification principle (on these see Popper, 1959, Chapters 3 and 4). The ‘modest’ nature of this solution should become clear in the exposition that follows.

My solution is in two main parts. I begin with ‘transcendental realism’, a philosophy of the natural sciences developed by Roy Bhaskar in his early work (Bhaskar, 1978 [1975]). I also suggest how this can be made more rigorous, in places, with a more systematically developed, phenomenological understanding of how humans learn language in relation to material things. I then overlay this, as it were, with Rom Harré’s (1986) understanding of science as a ‘morally’ grounded discipline. This sets Bhaskar’s view of science in the context of the motivational basis of the scientific community.

2.5.1 Transcendental realism

Bhaskar developed an alternative to the positivist tradition in the philosophy of science, without embracing the ontological scepticism that characterises many social constructionist views. His epistemology is still, however, deliberately and thoroughly social constructionist. He argues consistently that the physical world does not cause us to know what it is like, but that we produce knowledge as a free act of interpretation formed in a specific social context. In this respect he is in agreement with Torfing (1999; 2005), Howarth (2005), and Bloor's (1973) 'strong programme'³⁴, in science studies.

Where he begins to differ, however, is in his ontology: the way he theorises the physical objects of our knowledge. Although he argues that '...knowledge is a social product, produced by means of antecedent social products', he also maintains that '...the objects of which, in the social activity of science, knowledge comes to be produced, exist and act quite independently of men' (Bhaskar, 1978[1975]: 16).

So on the one hand there is human knowledge, imperfect and always building upon previous knowledge, and on the other hand there are the things our knowledge is about, which are what they are, and do what they do, regardless of what we know about them. Hence Bhaskar avoids the epistemic fallacy (see Subsection 2.2.2), which fails to make a clear distinction between these two realities.

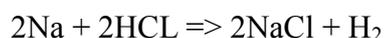
Further, argues Bhaskar, the mental models scientists produce, to interpret the natural world, are descriptions, however tentative or partial, of 'mechanisms' or 'tendencies' that do actually exist in nature (Bhaskar, 1978[1975]: 25; 145-148) (hence these models are 'representational' see Subsection 2.2.3). Here Bhaskar is drawing upon earlier work in the philosophy of science by Anscombe and Geach (1961), further elaborated by Hesse (1974) and Harré and Secord (1972). For Anscombe and Geach, a 'law of nature' is not merely a 'Humean description' of an empirically observed regularity (two things that just happen to happen in sequence with each other), but 'a tendency of natural agents to act in certain ways when impediments to their action are

³⁴ See footnote in Chapter 1, Subsection 1.2.2, on the aims and approach of the 'strong programme'.

removed' (Harré, 1976: 628). Hence when looking at closed systems – i.e. in careful experiments designed to nullify the effects of countervailing or interfering tendencies – we can observe the effects of, and thereby infer the existence of, specific tendencies which operate at all times and places but are normally hidden.

For Bhaskar, such a model is a step along the way to getting a more and more accurate picture of the 'tendencies' in nature, as science is a social activity that takes place in a *historical context*. What we know today may well be *surpassed* by what we discover tomorrow, but not necessarily *replaced* by it (cf. Barrow, 2010: 366).

Bhaskar cites theories of chemical reactions as an example (Bhaskar, 1978[1975]: 169). He notes that the formation of common salt in the formula:



was originally explained by the theory of atomic number and valency. This is 'Mechanism 1'. But this mechanism was later explained by the theory of electrons and atomic structure. This is 'Mechanism 2'. Attempts to explain this mechanism by competing theories of sub-atomic structure would lead to scientists positing Mechanism 3'. Each of these 'mechanisms' represents a further step in understanding the world³⁵. However, Bhaskar notes, there is no end to this process. We must not think we will eventually get to the whole truth, as there is always the possibility that a description with more explanatory power will be developed. But this does not negate the fact that we are now closer to the truth than we were before.

In more populist terms this process has been described by cosmologist and mathematician John D. Barrow:

In practice, the process of improving central theories of physics usually involves a process of replacing the theory by a deeper or broader version that *contains the original* as a special or limiting case. Thus, Newton's theory of gravity has been

³⁵ Harré (2009) refines this somewhat, noting that it is not always 'mechanisms' that are represented in scientific models, but often other material things that are not yet directly observable. These things, he points out, may be the products of yet other material things, but eventually one gets to the level of 'mechanisms' or 'tendencies', such as electromagnetic forces.

superseded by Einstein's theory of general relativity but not replaced in some type of scientific "revolution". (Barrow, 2010: 374, emphasis added)

Hence Bhaskar's concept of shifts in scientific knowledge differs from that of Kuhn (1970 [1962]). Though thoroughly social constructionist, Bhaskar is not talking of paradigm shifts as the norm for scientific theory change. A change in scientific theory cannot be explained simply by social factors among the scientific community.

Nevertheless, for Bhaskar, science is a thoroughly social activity, in that it constantly builds upon past knowledge, and uses 'retroduction', i.e. 'tries to make sense of newly observed phenomena by drawing on metaphors and analogies with mechanisms that are familiar' (Baert, 1996: 516). Here Bhaskar seeks to avoid depending on formal concepts of deductivism, inductivism, verification and falsification, which loom large in the debates on positivism of the latter half of the 20th century, though there is discussion as to whether his position achieves this. It may be that 'retroduction' is an attempt to afford more certainty to scientific knowledge than the transcendental realist position actually allows³⁶ – hence my remarks on Harré's 'moral' approach, below.

Bhaskar does, however, strengthen his case in a crucial way, with a novel appeal to history. He points to the simple fact that science as a human social activity has steadily progressed, in the sense that it has become more and more proficient in producing knowledge of a type which has enabled billions of human beings to live relatively comfortably, compared to how few could live that way before the dawn of science, and at the same time given humans the ability to wreak untold damage on the earth. It is not logically or contingently *necessary*, he observes, for a project such as science to arise in the universe, but it *has* arisen, and therefore we must explain 'what must be the case for science to be possible' (Bhaskar, 1978[1975]: 29). Clearly, he says, 'the world is such that science can occur' (*ibid*: 29). Therefore, 'given that science does or could occur, the world *must* be a certain way' (*ibid*: 29).

Bhaskar is not saying there is an *a priori* argument for transcendental realism. Rather, he rests his argument on the *contingent* fact that natural science, as a social project, has produced enormous amounts of knowledge that has been found to be extremely

³⁶ As Baert, (1996) points out, Bhaskar's notion of 'retroduction' does not, by itself, provide a means of judging between the worth of explanations which do, or which do not, admit to genuine fallibility.

reliable in manipulating the material world, and that this demands an explanation³⁷. Hence Bhaskar avoids the fallacy of high redefinition. He admits there is no watertight, logico-deductive argument for the reliability of science. Instead we have to look to the more down-to-earth reality of its persistent success in recent history.

Bhaskar then has to explain how it is that human knowledge, which is socially constructed, has accumulated these reliable assertions about the hidden mechanisms that make the world behave the way it does. Social construction, he points out, implies that persons are in charge of what they come to know. We are not *caused* to know something by events in the world. We have to do *work* to *produce* this knowledge (Bhaskar, 1978[1975]: 57). We have to interpret the sensory shifts in our vision, hearing, smell, taste and touch in such a way that we match our knowledge to the way the world is. How is it, then, that we can get reliable knowledge of the world?

Bhaskar again appeals to a contingent (not a logico-deductive) fact: human beings have developed the skill of matching their interpretations of reality to the reality in the world in a good-enough way, such that they are able to get about in the world. More recently Archer (2000), following Merleau-Ponty (1962: e.g. 326), has made a strong phenomenological argument for this point. Children, she argues, learn language in practical, everyday situations in which they are seeking to achieve goals in relation to material objects and events. They need to make the matches effectively in order to get what they want from the adults around them. From its very beginning, then, language is tied to material things, a point also argued in some detail in Harré and Gillett (1994). Language must not be treated, in our discourse theorising, as if it arrived yesterday, with no historical relationship, in an individual or a society, to the material things it purports to refer to. It always has a longstanding connectedness, in every speaker, with everyday situations in which words and material things have been related in practical ways.

³⁷ However it does not follow that the world is such that *social* science is possible, as the existence of real effects of social science are far more diffuse and contestable. I would argue that this puts a question mark over Bhaskar's later attempt (Bhaskar, 1998[1979]) to apply transcendental realism to the social sciences. In deLeon's (1998: 150) words, 'In a Kuhnian sense [social science's] findings are more critical of each other than they are cumulative in nature ...'

For Bhaskar, the social project of natural science involves rigorous training in refining this natural ability for use in controlled, laboratory-type situations. And employing this ability, he says, is ‘work, and hard work at that’ (Bhaskar, 1978[1975]: 57).

Hence there is a flaw in social constructionist arguments that reject the notion of the acquisition of reliable scientific knowledge on the grounds that materiality does not impose itself on our knowledge (e.g. Bloor, 1973; Torfing 2005: 7). The transcendental realist claim is not that materiality *causes* scientific knowledge, but that the latter has to be *worked for*. Discourse does not mediate events in any direct, cause-and-effect way. It is entirely the product of human meaning-making. Scientists, however, and any other persons who wish to say reliable things about the way the world is, *must work* hard to gain understanding of mechanisms and events and produce intelligible discourse about them.

A further feature of Bhaskar’s argument is the difference between the *mechanisms* of the universe, which we do not directly experience (such as magnetic fields), and the events and things we see and experience (such as compass needles), which are the *effects* of these mechanisms. He labels the former the ‘real’ (not to be confused with the psychic ‘Real’ of Lacan³⁸) and the latter the ‘actual’. Further, since it is possible for an ‘actual’ thing to occur or exist without anybody experiencing it, there is a third realm, the ‘empirical’ which covers just those instances of the ‘actual’ which are experienced by at least one person (Bhaskar, 1978[1975]: 56).

Bhaskar’s argument can be summarised as:

- (a) History shows us that natural science has produced knowledge that has proven reliable among people everywhere as a means to manipulate material reality, therefore
- (b) the world must be a certain way, i.e. there must be mechanisms in nature which occur regardless of human experience of them, and

³⁸ Hajer (1996: 17) appears to confuse these, incorrectly attributing the same view to Žižek. However Žižek (1989; 1993; 1994) clearly interprets Lacan as posing a psychic ‘Real’, as a part of the human psyche that is pre-discursive. The person who chooses to utter this or that discourse is this the Real. See also footnote 29, Subsection 2.4.3.

- (c) it must be possible for appropriately trained investigators to discover and produce knowledge of these mechanisms at sufficient depth to be able to make use of them, and
- (d) this knowledge has been developing and deepening over the course of time.

Of course this provides no firm guarantee that the knowledge science produces of the world will be totally correct, or even sufficiently reliable for all practical purposes. Even if there are ‘mechanisms’ causing material things to behave the way they do, and even if scientists are well-trained in matching their discourse to these things in practical ways, they can still make catastrophic mistakes, or even behave like charlatans. A further step is needed, hence I turn now to consider Harré’s view of the ‘moral’ basis of science.

2.5.2 A moral basis for science

Science happens in a specific community that aims to produce knowledge about the world. Harré (1986) argues that the scientific community ‘exercises quality control over its products... by the informal yet vigorous maintenance of a *moral order*’ (*ibid*: 12, emphasis added). Hence:

... ‘science’ is not a logically coherent body of knowledge in the strict, unforgiving sense of the philosopher’s high redefinition, but a cluster of material and cognitive *practices*, carried out within a distinctive moral order, whose main characteristic is the trust that obtains among its members and should obtain between that community and the larger lay community with which it is interdependent. (*ibid*: 6)

The abiding and overarching characteristic of the scientific community is this (in Harré’s words) ‘moral’ commitment. While there are huge variations in method and worldview among different branches of science, as Feyerabend (1979) has shown, the one thing common to them all is that they put themselves under the moral imperative of producing knowledge which is reliable and trustworthy for everybody everywhere: ‘knowledge on which one can rely’ (Harré, 1986: 13). This is ‘a remarkable and rigid

morality'³⁹ (*ibid*: 6). Even though individuals and sub-groups within the 'science tribe' may err and stray from this imperative at times, their colleagues in the wider scientific community continually and consistently distain such waywardness, shaming and disciplining 'sinners' so as to keep the moral project on track. Harré comments:

I believe [science] to have been the most remarkable moral achievement of mankind, and that antirealism⁴⁰, which, like it or not, seeps out into the lay world as antisience, is not only false but morally obnoxious as a denigration of that amazing moral phenomenon. Alongside the moral order of the scientific community our social and commercial moralities look pretty squalid. (*ibid*: 6)

An example of how this morality works may be found in the response to the 'climategate' affair at the University of East Anglia (UEA) of late 2009. The implied accusations, of subverting the peer review process and suppressing data and evidence, were of *moral* import. If climate scientists had used power and position to exclude contrary views from publication, they would have seriously tainted the credibility of the climate science community. However the moral commitment of the scientific community was demonstrated in the response: a willing acceptance of three separate commissions of enquiry.

Of course, this moral commitment does not guarantee that all scientific knowledge will match its material objects better than all other knowledge. However, combined with a transcendental realist approach, it should give us far more reason to look to the scientific community for our knowledge of how material objects behave, than to other communities. For the past 500 years the scientific community has been producing knowledge that has accumulated huge successes in providing technological and everyday benefits (and new risks and damage) that we all feel. The community that

³⁹ This is quite a narrow usage of the word 'moral'. It has nothing to do with broader questions of the moral impact of science's work on society and human wellbeing. Harré is not claiming that science has a commitment to moral imperatives such as social justice, human rights, or environmental protection. His use of the word 'moral', here, refers only to science's sense of moral obligation to produce knowledge that is reliable and trustworthy everywhere. This is the meaning of 'moral' as used in this thesis in respect of this aspect of science.

⁴⁰ The 'antirealism' Harré refers to here covers a major tradition in the history of philosophy, with a number of branches, in which, generally, there is strong denial that human beings can produce knowledge that maps more or less to the way the world is. This tradition is strongly represented among policy discourse theorists.

produces this knowledge is fiercely committed to producing a quality product: knowledge that is reliable and trustworthy for everybody everywhere (it even worked on the moon!⁴¹). No other community dealing with knowledge of material things has a moral commitment that comes anywhere near this. There is no such code among, for example, homoeopaths, acupuncturists, creationists, journalists, or those who call themselves climate change sceptics (see discussion in Goldacre, 2009). Further, science as a community is open ‘round the edges’, so that anyone can read its publications, and it can be made to open up its everyday procedures for public scrutiny.

These points do not add up to a logically tight argument for the primacy of science, and it is my contention that we will never get one. They do however point to the following three considerations.

2.5.3 Science in the environmental policy arena

Firstly, the substantive, universally reliable nature of natural science knowledge can be brought fully in to environmental policy discourse theory. Scientific knowledge is not on the same level as traditional knowledge or culturally contextual knowledge. It has a special status that can help policy discourse analysts better understand the materiality that policy is trying to influence. And because this offers reliable knowledge of this materiality, it enables us to address, in concrete, empirical situations, the following question, which becomes my first research question:

In an environmental policy domain:

How does policy discourse interplay with the material realities it is designed to influence?

We can know the nature and characteristics of these material realities through the knowledge produced in natural science. But this does not mean that everything a natural science expert says to the policy community must be accepted as reliable

⁴¹ The failure of Apollo 13 enhances the ‘modest’ side of the ‘modest realism’ advocated here. Science is by no means infallible. *Caveat emptor!*

knowledge. The policy researcher must herself investigate relevant scientific claims, along with doing her social research, and be prepared to critique scientists on their own ground. She must *produce* reliable knowledge of a natural science type. Only thus can she differentiate the reliable knowledge from the politics and values the scientist might be importing into the policy discussion – as I touched upon in Subsection 2.3.4, above. If she can make this differentiation, she can then better understand the interplays between policy discourse, and the materiality the policy is aimed at. Hence a second research question comes into focus, namely:

In an environmental policy domain:

In what ways are the interplays between policy discourse and materiality determined by the values and politics of the scientific experts who act for policymakers as the spokespersons of materiality?

Addressing these questions requires a trans-disciplinary familiarity with both the natural science area in question, and policy discourse theory and methodology. To undertake such a critique, the policy discourse researcher must play the role of a natural scientist. She must employ the methodologies of the relevant branch of science, in dialogue with the international scientific community in respect of that branch. She must also commit herself to the same rigid moral standards of the scientific community, in being morally obligated to producing knowledge that is reliable for all people everywhere.

The empirical work for this thesis therefore includes an investigation of this type, namely the thermodynamics and building-physics of thermal renovation, together with a detailed, practical familiarity with Germany's housing stock and the costs and problems of renovating to various thermal standards. The core of this has been submitted to a peer review process and published separately, while later findings are presented in this thesis in conjunction with the policy discourse analysis.

Secondly, a means of judging the reliability of knowledge, such as that outlined above, provides another dimension to thinking about what might be influencing discourse in a policy realm. This relates directly to both the research questions above.

Some discourse statements and claims will be influenced by shifts in values; others by effective rhetoric; others by vested interests. But some will be strongly influenced by robustly reliable scientific knowledge i.e. by scientifically credible discourse. It is not good practice to assume that the nature of the physical world does not play a role in shaping discourse. Again, this is not to claim that the geometric forms of houses or the laws of thermodynamics *cause* people to utter certain discourses. People have to work to match up their discourse with the way the world is, as I argued in Subsection 2.5.1, above. But when they do, this can create currents of discourse that have real effects on policy discussion. Researchers need to be aware of these, rather than assuming there are social or rhetorical reasons for all discourses.

Thirdly, not all domains of science are as certain as physics. Environmental policy, in particular, takes place against a background of incomplete science and contested paradigms, amidst great physical complexity. But researchers must avoid the assumption that this means there is a level playing field amongst all discourses. For example, while the science of climate change is incomplete, there are some areas of scientific knowledge in this field that are robustly reliable: that CO₂ absorbs outgoing infra-red radiation and thereby warms the earth; that human activities are increasing the earth's annual production of CO₂ and other GHGs; that heat tends to melt ice; that sea level rises when heat expands the oceans and when their mass increases from melting land-based ice. On the other hand, the knowledge of how hurricane intensity correlates with global average temperature is far less certain. The 'modest realist' approach is very helpful because it challenges us to tease out the natural mechanisms that are already scientifically established, from theories that are candidates for mechanisms, and yet others that are currently mere hypotheses. In relation to my second research question, it also reminds us to pay special heed to which aspects of scientists' reports are sound science and which are heavily influenced by the scientists' values and politics.

We now have a framework for investigating both policy discourse, and the materiality that policy is aiming at, while remaining true to a social constructivist theory of knowledge. This framework enables us to investigate the interplays between discourse and materiality in an environmental policy domain. It also provides the means to distinguish between reliable, science-based knowledge, and scientists' personal values

and politics, in the advice given to policymakers by experts. However there is a further pillar to the issue of how policy discourse and materiality interplay. How does reliable knowledge of materiality actually impact on the policy discourse? Assuming that there is such a thing as reliable knowledge of material things – at least in a good-enough, practically adequate sense consistent with the modest realism I have outlined above – what happens when this knowledge nudges into a policy discourse arena? Do policy actors simply adopt it and change their discourse, or do other factors come into play? I will now address this question. The two main features of it are policy story-lines, and what is generally referred to as social structure.

2.6 STORY-LINES, SOCIAL STRUCTURE, AND POLICY DISCOURSE CHANGE

2.6.1 Story-lines and policy development

Hajer (1995) observed that a policy discourse, when it comes to dominate a policy domain and become ‘hegemonic’, takes the form of a story, or ‘story-line’ (*ibid*: 52ff). Drawing on Davies and Harré (1990), Hajer notes the role of stories as devices we use to ‘make sense of our own and others' lives’. Through storytelling we impose order on the complexity and ambiguity of our world and make meaning, through a sequencing type of narrative which may broadly be likened to a ‘story’ (cf. Bruner, 1987; Czarniawska, 2004). Walter Fisher (1984) is credited with being first to apply the narrative paradigm to the analysis of politics, while Harré et al., (1999) have produced a landmark study of the ‘stories’ of environmentalists.

Hajer sees story-lines as devices we use to make order out of complexity (Hajer, 1995: 63); to give meaning to our experience (*ibid*: 56; 63); and to moralise (*ibid*: 64). Following Davies and Harré (1990: 2-3) he argues, further, that we use story-lines to position ourselves and others within various social structures, and hence as a means by which we set up the status, credibility and relationality of various actors within a discursive realm. Story-lines also enable different actors with different areas of expertise to put together their diverse knowledge of an issue, like the pieces of a jigsaw puzzle (Hajer, 1995: 63).

For Hajer (1995: 62ff; 2005a: 302ff; 2010), the notion of story-lines helps us understand how both the content of policy, and the workings of policy domains, function. Story-lines are ‘essential political devices that allow the overcoming of fragmentation and the achievement of discursive closure’ (Hajer, 1995: 62).

Fischer concurs, saying:

Storylines (sic) function to condense large amounts of factual information intermixed with the normative assumptions and value orientations that assign meaning to them. As social constructions of particular events, storylines serve to position social actors and institutional practices in ongoing, competing narratives. (Fischer, 2003a: 87)

Ginger (2000) shows how story-lines are not only to be found among policy discussion, but get written into official documents by agency personnel as they compose texts designed to link facts together and argue a cogent case. Similarly Roe (1989) observes the role of stories in smoothing out the ambiguities within policy:

Bureaucratic stories and narratives are ... frequently the way public managers, government policymakers, and politicians articulate and ... structure the ambiguities attached to important policy issues. (Roe, 1989: 263; cf. Roe, 1994)

Hajer argues that an essential feature of a discourse, if it is to become structured, is that it must form a compelling story. Importantly, it is not that people have to be convinced that its assertions are true, but that it holds together well and appeals to listeners as a view of the world they want to go with. The scientific credibility of assertions in the story, about material reality, does not necessarily play a role in the appeal of a particular story-line. As Herrick (2004) asserts:

In a very real sense, then, a policy is a story, and the utility of any particular scientific characterization depends at least as much on its place and role within the overall narrative as it does upon internal factors such as precision, bias, or statistical power. (Herrick: 2004: 430)

This view is common in policy discourse writings. A related assertion is that these successful, satisfying story-lines will have the tripartite form of ‘a beginning, a middle, and an end’ (Fischer: 2003a: 162, 181; Hajer, 1995: 62; 2005a: 302; originating perhaps from Kaplan, 1993).

But do policy makers really adopt policies just because all the elements of a good story are present, or do they change their stories and tolerate narrative glitches and awkward plots when reliable knowledge of material realities challenges the elegance of the story-line? Hence a further question needs to be asked, and this becomes my third research question:

In an environmental policy domain:

How does policy discourse maintain, reproduce and reform itself in the face of changing understandings of materiality and of the policy’s influence on it?

To address this question in a particular policy realm the policy analyst needs to have a good grasp of which aspects of the story represent more reliable knowledge about the world than others, i.e. she needs a methodological framework akin to the modest realist one developed above.

However she also needs a view of what the medium is in which policy discourse takes place, i.e. in which the story-line lives. Hence a word needs to be said about what is commonly spoken of as social ‘structure’.

2.6.2 Social structure

Are there ‘structures’ – real but invisible features of society, possessing causal powers - in which discourse and story-lines live, and that can constrain or enable people to achieve goals, make changes, and respond to challenges? If so, what role do these structures play in facilitating or shaping policy discourse?

There is a vast literature on the question of the nature of social structure⁴², but policy discourse theorists generally argue that no such invisible structures exist. Instead, they maintain, discourse and habitual social practices produce and reproduce ‘rules’ that people feel constrained to live by but can, at least in principle, choose not to.

Hajer (1995: 47ff; 2005) offers one of the most cogent expositions of this view. Following Davies and Harré (1999), he argues that ‘the rules and conventions that constitute the social order have to be constantly reproduced and reconfirmed *in actual speech situations ...*’ (Hajer, 1995: 55, emphasis added). In this so-called ‘immanentist’ view of social structure, Davies and Harré (1999) argue that ‘... there are only *actual* conversations, past and present’ (*ibid*: 1⁴³, emphasis added). These conversations may continue in the memories of hearers, but they do not exist in some reified realm detached from their actual instances. Hence the ‘rules and conventions that constitute the social order’ do not gain a kind of independent existence that exerts influence back upon people. If these rules and conventions are not repeatedly taken up and reproduced, they stop existing.

Drawing on Billig (1987⁴⁴), Hajer (1995: 42ff) argues that this frees up the social structure for rhetoric and argument to have an effect. The creative proclamations of rhetoricians and other argumentative individuals can break out of the positioning power of social structure when it is not being reproduced by routine discourse – or even when it is.

Harré, the philosophical source of much of Hajer’s thinking on social psychology, expresses this view more strongly, declaring:

All we have to do is to show people that they are trapped in the silken but fragile shrouds of a pattern of discourse conventions. (Harré, 2009: 142, emphasis in original)

⁴² For succinct accounts of the major debates on this, see Baert and da Silva (2010).

⁴³ The page numbers used here for Davies and Harré (1990) are those in the reprint of the article from Massey University, New Zealand (<http://www.massey.ac.nz/~ALock/position/position.htm>).

⁴⁴ The edition consulted for this thesis was Billig (1996).

Torfinn, following Laclau (e.g. 1993a) and Žižek (1989; 1994), takes a similar position, but drawing on post-Freudian psychoanalysis, via Lacan (e.g. 1977), rather than the discursive social psychology of Davies and Harré. Fischer (2003a: 86) takes a parallel approach, reminiscent of Žižek (1989; 1993; 1994), asserting that an opposition group can open up and exploit ‘contradictions and paradoxes’ in the ruling group’s position, and thereby bring to light other (discursive) realities that are concealed in this position. New discourses can then develop around these freshly brought-to-light realities.

However there is a difficulty with these approaches, again related to materiality, which Hajer acknowledges: If all social constraints come from discourse, and if its effects are only operative where and when the discourse is being produced and reproduced, there is no explanation for social constraints that operate extra-discursively. This might include capital flight, jails, exclusions from meetings, withdrawal of party funding, allocation of government research grants, strikes and lockouts, or simply the shape of the building an organisation is housed in. In defence, Hajer argues that ‘even money power assumes some sort of discursive interchange’ (Hajer, 1995: 58). But that is stretching the point, for the impact of the loss of a fortune is of a different character from the impact of utterances about it, just as being in jail feels very different from the threat of jail. Hence we need overt theorising about physical, material things that get lodged within the social milieu, to better explain the constraints and enablements within it.

In other words, social structure in an immanentist approach is not, I would say, ‘thick’ enough: it brackets out all the material stuff humans interact with, such as which organisation has the best infrastructure for winning contracts to write expert reports, or how many German houses are the right shape to take 16cm of external wall insulation un-problematically. These factors have real effects on what can happen socially, on what discourses and story-lines can become or remain dominant, and on how well these discourses relate to their policy objects.

In this respect, insights from socio-technical systems literature are helpful. This explores how technology and society mutually form each other (e.g. Bijker et al., 1997; Hughes, 1983; 1987; MacKenzie and Wajcman, 1985) and has been applied to

environmental issues (Berkhout, 2002; Freeman, 1994; Irwin, 2001; Jamison and Rohrer, 2001; Kemp, et al., 1998; Weber, 2003) and to housing and energy issues (Lovell, 2007).

These approaches see material, technological objects as formed and shaped by the people who interact with them, and people as formed and shaped by the material, technological objects they interact with. For example, a home-owning family is constrained in its decisions about home renovation not just by the discourse that constructs the subjective worlds of its members, but also by the material nature of the house. Conversely the house, a material object, cannot be understood merely as brute materiality, but in conjunction with how it is perceived and lived in by this particular family.

This insight adds an important dimension to the scope of my first and second research questions, as the ‘materiality’ that policy is concerned with may not be free, as it were, to behave, within the policy domain, simply in accordance with the natural mechanisms that drive its behaviour. Instead it may also lie under the constant influence of human action or inaction. Reliable knowledge about it would have to take this into account.

As a heuristic device, modelling relevant aspects of society as socio-technical systems can help us see where materiality is constraining and enabling people, and where people and their habits, wants and limitations are modifying what technology can do. However this is not a ‘critical realist’ claim that there are causal powers emanating from ‘structures’ made up of habits, rules, and the various shapes of institutions, as Bhaskar (1998[1979]) seems to be claiming in his later work⁴⁵. Rather, it is a claim that material things get between and amongst people, and that the actual nature of these objects modifies how social interaction takes place, and vice versa. There are only two types of causal power: the mechanisms of nature and the actions of people (Harré, 2009), and often we can think more clearly about each of them if we keep alert to how they continually impact on one another. This is especially important in addressing the third research question. It means that, when we look for how and why

⁴⁵ For wider discussion on this see King (1999), Varela (2002) and Harré (2009), against Patomäki and Wight (2000), Sayer (2000) and Collier (1994).

policy discourse changes or resists change, we will not be looking for influences from invisible social structures, but from other discourses and from material things relevant to these discourses.

2.7 SUMMARY AND REFLECTIONS

In this chapter I have argued that policy discourse theories offer the advantage of providing direct access to the major determining factor in environmental policy development: the discourse produced by policy actors in respect of the policy. They do this, firstly, by adopting a decentred view of truth, characteristic of postmodernism, in which attention is on the discursive realities produced by policy actors rather than the truth or falsity of what these actors are saying. Secondly, in their critique of positivism as a philosophy of science, these theories avoid the assumption that policy analysts can take a neutral stance toward their subject matter and thereby produce detached, value-free knowledge of a policy community. Instead, they make explicit the perspectives and values from which they perform a policy analysis. Thirdly, drawing on a social constructionist epistemology, discourse theories assert that all knowledge is a human interpretive production, constructed through semiotic productions in specific social and linguistic contexts. Further, there is no direct causal connection between the material world, and the knowledge human beings produce in respect of it. Fourthly, drawing on post-structuralism, these theories show how people use language to wield power over each other in everyday situations, so that policy development is a discursive struggle for dominance of one view over another. Fifthly, Gramsci's notion of hegemony provides the basis of a theory as to how various interest groups coalesce around a common discourse, which can come to dominate a policy domain.

The major weakness of the policy discourse approach is its failure to deal directly with the material objects of a policy, and with the materiality that is enmeshed in social happenings and that helps sustain routines. This weakness arises out of the central strength of policy discourse theory, namely its social constructionist focus on the realities people produce in language and other semiotic means. This prevents them being able to theorise how to judge which knowledge of the material objects of policy is nearer to the way the world is, than which other knowledge. Hence they cannot

reliably judge how well a policy is achieving its objects, nor assess the impact of the material objects of policy on the content of the policy discourse. Nor can they reliably distinguish between genuine science, and the politics and values of the scientists, in particular those who produce scientific advice for policymakers.

Attempts among policy discourse analysts to remedy this flaw are not convincing. Two of these, namely 'Relativism is OK', and 'democratising science', fail to offer any criteria for assessing which claims about material reality are nearer to the way the world is, than other claims. The attempt to solve the problem by assigning 'degrees of constructedness' to utterances of knowledge fails for the same type of reason, and also due to its flawed internal logic. Actor-network theory can offer a useful analytic device for tracing the links and influences among human and non-human entities in a policy domain, but also fails to offer a criterion to adjudicate between claims about materiality, not to mention its questionable ontology of causal powers. Critical realism, with its clear distinction between ontology and epistemology, has also been offered as a solution to the problem, but without a convincing explanation of how this distinction would actually be worked out in a policy analysis setting.

The solution I have offered is a modest realist account of what natural science is. It maintains that we have to account for the success of science in producing such an overwhelming body of practically reliable knowledge of the world over the last 500 years. A credible explanation for this success lies in the notion that there are hidden mechanisms causing things to happen in the world, and that people trained in scientific disciplines can reliably infer what these approximately are, with this knowledge improving over time due to ongoing scientific investigation. The world does not cause people to have this knowledge, but they produce it, based on their natural survival skills of matching their knowledge to the contours of the material world, and scientific training enhances this ability. Further, the scientific community is grounded in a strong moral commitment, namely to produce knowledge that is reliable and trustworthy for everyone everywhere.

This does not amount to a logically tight argument for the truth of any particular piece of scientifically produced knowledge. Rather, it offers compelling and good-enough reasons as to why we need to engage with the scientific community, giving it primacy

of place and respecting its moral self-criticism, in order to obtain the best possible knowledge of how the world works.

This view is fully consistent with a social constructionist account of the world. It does not require us to adopt the positivist stance of assuming there is some neutral ground from which we can see the world objectively, correctly, and without bias.

The theoretical framework I have developed here represents a new contribution to learning⁴⁶. It does so by bringing together policy discourse theory and a robust theory of how natural science produces reliable knowledge of the world, within an epistemological framework that is fully compatible with the social constructivism of policy discourse theory. To be sure, the insights about science outlined above are not my own original ideas. They have been developed over the past 35 years, but have largely remained within the philosophy of science. Even critical realism, which grew out of Bhaskar's early work and has found its way into many branches of social science, has not had much impact on understandings of materiality, as it has been preoccupied with a quest – I would say a fruitless quest – to maintain that social structures have causal powers. The discussion of realism in the natural sciences, by theorists who adopt a social constructivist epistemology, has gone on almost entirely outside policy discourse theorising. My contribution is an attempt to bring it right into the centre of this field, and to articulate the connections between these two great areas of thought.

As policy analysts we can use this account of science to enhance our investigations of the how, what and why of policy development. Prior to or alongside our discourse analysis we need to adopt the role of natural scientists and investigate the scientific, and other, claims about the materiality that is the object of the policy. Then we can recognise which elements of policy discourse are nearer to the truth about the world, than which other.

⁴⁶ I use the phrase 'contribution to learning' throughout this thesis, rather than the more usual 'contribution to knowledge', because the word 'knowledge' has a specialised meaning in this thesis, which is quite different from that used to attribute worth to a PhD.

This can help us in three main ways, each represented by one of my research questions and worked out in its own dedicated chapter in the empirical section of this thesis.

Firstly, it helps us to see where politics and values are driving the discourse, and where the discourse is the way it is because the world itself is a certain way. It also helps us see where policy and its accompanying discourse are in or out of step with the way the material world actually is. This relates to my first research question, and is explored in Chapter 4.

Secondly, it helps us to see where the experts who advise policymakers are being scientific and where not, and how this influences the relevant policy discourse. This relates to my second research question, and is explored in Chapter 5.

Thirdly, it helps us to see the extent to which the policy storyline develops, on the one hand, as a consequence of it being a good story and of power-plays and positionings of actors, and on the other hand the extent to which it shifts and changes due to its inconsistencies with reliable knowledge about the world to which it refers. This relates to my third research question, and is explored in Chapter 6.

With this framework in mind I now turn to a discussion of how the methodology implicit in my theoretical framework is worked out in terms of methods for investigating how well the German Federal government's policy on thermal renovation of existing homes is achieving the stated aims of the policy.

Chapter 3 METHODOLOGY AND METHODS

3.1 INTRODUCTION

This chapter explains how the methodology inherent in the theoretical work of Chapter 2 leads to the methods used to obtain and process relevant and valid data to address the research questions, and then outlines these methods in detail. Section 3.2 gives a general outline of methodological issues. This leads on to a discussion of methods in Section 3.3, which examines the two types of data required for this investigation: the hermeneutic (interpretive, meaning-based) data of discourse analysis and the material-based data of natural and applied science and socio-materiality, together with the different methods needed to obtain each of these. I also outline the more general investigative methods that supported and formed a background to the data gathering. In Section 3.4 I explain what specific sets of actors were important for gathering the hermeneutic data, in terms of their roles within, and in relation to, the policymaking community and processes. Section 3.5 explores the question of the validity of data in relation to the two main types of discourse community investigated: policy actors and private homeowners. In Section 3.6 I explain how I analysed the data, a process that began early on in the interviewing phase and was formalised and systematised after data gathering was completed. Section 3.7 looks at ethical issues and how I addressed these. This is followed, in Section 3.8, by a summary of the conclusions of the chapter. Lists of interviewees, from the two types of policy community, are presented in Tables 3.1 and 3.2 at the end of the chapter.

3.2 METHODOLOGICAL CONSIDERATIONS

The methods used in a research project derive from the methodology one is employing, and this derives from, and is entwined with, the ontology and epistemology one is working with. Moses and Knutsen (2007) point out the difference between these three ‘ologies’: Ontology is ‘the study of being’. Its fundamental question is, ‘What is the world really made of?’ (*ibid*: 5). It explores issues such as: Which of the things people talk about exist in their own right, and which are merely useful productions of human imagination and language? For example some would say

that magnetic forces are of the first type, while Little Red Riding Hood and the rules of poker are of the second – though not all would agree.

Epistemology ‘denotes the philosophical study of knowledge,’ and its basic question is, ‘What is knowledge?’ (*ibid*: 5). Is human knowledge a one-to-one mapping of the world people experience, or is it something people produce in a deliberate, volitional way? If the latter is the case, then what is the relationship, if any, between the knowledge people are producing, and the world this knowledge purports to be about?

Methodology is about *how* we know. ‘It refers to the ways in which we acquire knowledge’ (*ibid*: 5). In relation to a research project such as this, it deals with how I, the researcher, can come to know useful or viable things about the field I am studying.

Because it is about the ‘how’ of knowing, methodology includes questions of how people produce the knowledge they have: is it imparted to them directly through sense experience; is this sense experience filtered through the understandings of the world they already have; if so, are these understandings produced by the individuals alone or through society and culture; and is knowledge acquisition a deliberate act by an autonomous being or does it come automatically through human involvement in the world?

It will therefore be clear that, in this particular research project, many of the questions explored in Chapter 2 are, effectively, methodological questions. The chapter asks, *inter alia*, what a policy analyst can know about a policy. It argues, firstly, that an interpretive, social constructionist approach enables a policy analyst to know significant things about a policy’s life within the community that develops, fosters, defends, institutionalises and implements it. Secondly, it argues that, while remaining firmly in social constructionist mode, a policy analyst can also engage with natural science to acquire or produce reliable knowledge of the material objects of the policy, and how the policy affects these. Thirdly, it argues that in this same mode she can investigate certain other material entities which might not be direct objects of the policy under investigation, but which affect policy development and implementation by the way they ‘thicken up’ (to use the metaphor introduced in Chapter 2, Sections 2.6.2) the social structure.

However, there is an important difference between the first of these aspects of research and the other two, and this bears directly on methodology. Knowing about a policy's life, from a social constructionist standpoint, implies the need to find out the socially constructed meanings and interpretations that relevant policy actors are producing and communicating to each other and to the people they are trying to influence. This can best be done by engaging directly with the policy actors and talking with them. Indeed, as Harré (1993; 2009) and Davies and Harré (1990) argue, such meanings and interpretations (in this case those produced by the policy actors) only exist in the discursive world of human conversation and text-making. They are not solid things like children's books or playing cards, nor do they have the universal existence of mechanisms of nature like Ohm's Law or the First Law of Thermodynamics. Hence one *has* to use an interpretive, meaning-finding method of research – such as conversations – in order to find these things out.

For this reason, this research project is not about investigating social or political phenomena from a detached standpoint one step removed from the field of meaning-making of the social actors. This will also be clear from my comments on positivist social science in Chapter 2, Subsection 2.3.3.

With regard to the material objects of policy, and the materiality that thickens up the social structure, in one sense the interpretive, conversational approach is also useful, in that the policy analyst can converse with relevant members of the scientific community to see how these experts, who are regarded by policymakers as the spokespersons of materiality, construct the nature and meaning of these objects. However, that is not sufficient if the researcher wants to find out how true these scientists' constructions are to the materiality in question. Here the researcher must shift gear and adopt methods appropriate to the relevant branch of science. She must do some measuring, some calculating, perhaps even some controlled experiments of her own on the materiality that is at issue, and this must be done under the *moral* yoke of the scientific community's commitment to produce a high-quality product, namely knowledge that is reliable and trustworthy for everyone everywhere. Examples of my own work in this regard, within the context of this research project, are offered in Galvin (2010a; and 2010b). Nevertheless, this does not remove the researcher from a

social constructionist worldview. The texts (utterances, written papers, etc.) she produces, to formulate and communicate her findings, are very much social constructions, along with all the other productions of the scientific community. They are only as reliable as science can be, in the terms I have argued in Chapter 2 Section 2.5. But, if produced according to traditional scientific canons, they are highly likely to be more reliable than knowledge of materiality produced by other means.

My choice of research methods follows from these methodological considerations.

3.3 METHODS NEEDED TO OBTAIN DATA

3.3.1 Hermeneutic⁴⁷ (interpretive, meaning-based) data

To find out the content of the policy discourse will require a qualitative investigation, of policy actors' utterances and texts, on three interrelated levels: conversations with key policy actors in the form of pre-arranged, semi-structured interviews; listening to key policymakers' speeches and the ensuing engagements between them and their audiences; and reading texts produced by policy actors and their policy promoters (Hajer, 2005a). All of these give direct access to the realities constructed by policymakers, i.e. the nature and characteristics of the problem and its solution as these people see it. However interviewing the policy actors directly has special advantages. Firstly, my understandings of their discursively generated realities will be checked and corrected within the interviews, as in everyday conversation. Part of the skill of interviewing is to validate the data being received, by asking frequent check-questions, such as, 'If I understand you correctly, you seem to be saying ...' Hence there is very little chance that I will misinterpret my interviewees or fail to grasp the realities they are constructing.

Secondly, my own values can be transparent in these encounters, so that the interviewees can re-produce their version of the problem and its solution in relation to my position. Objects observed from a detached perspective do not have this power.

⁴⁷ 'Hermeneutics' in this context is the theory, methodology or practice of interpretation. It refers to what people do in everyday conversation in order to grasp each other's meanings, but also to what social scientists do in order to grasp the meanings intended by the speech, writings and other semiosis of their research subjects.

Material and socio-material things, such as a mould sample or an apartment block, do not adjust their form so as to reveal what they are despite the researcher's prejudices or ignorance. Objects such as these have no sway over the researcher's frame of reference whatsoever. An interviewee, however, has plenty.

At the second level, listening to speeches and audience interactions, I lose these advantages because I am not interacting directly with the speaker. However, listening to audience questions, and the speaker's responses, provides a check as to whether my interpretation of the speaker's words is correct. Further, by not asking questions myself, I obtain a cross-check on whether policymakers say the same things in response to others' questions, as they do in response to my own formulation of questions in interviews. Hence in my research I decided not to ask questions or make comments at public forums where policy actors spoke.

The third level, reading documents, has more disadvantages. There is no inherent opportunity to cross-examine the writer so as to find out the weight of each of the ideas in the text, clear up ambiguities, or discern the motivation behind the ideas expressed – i.e. which ones are of key importance, which are there to provoke a response, and which are merely routine. However, documents can be very revealing. Promotional documents can show how statements of the problem and its solution become ossified and packaged for a target audience, and how the meanings of key words and concepts are 'policed' (Derrida, 1988: 134-135) by authors so that readers have to take them in the intended way; press statements can reveal quick reactions to threats to the policy, or attempts by marginalized groups to elbow their way in or make an impact; policy discussion documents can reveal the richness and diversity of the policy discussion that then gets melded into a coherent story-line (Hajer, 2005a). All these can reveal stock phrases, such as '*Es ist immer wirtschaftlich*' (It is always economically viable), that occur and recur within both the written and spoken discourse.

To include all these features of hermeneutic data in my research I needed to (a) organise a comprehensive set of face-to-face, semi-structured interviews with key policymakers, in their native language, and record and transcribe these where permitted; (b) attend events where key policymakers were speaking to a live public

audience on relevant aspects of the policy; and (c) study a range of types of documents on the policy.

3.3.2 Natural science, applied science, and socio-technical data

Because this thesis concerns not just policy discourse, but how it interplays with its target material and socio-material reality, I had to develop a very deep and detailed understanding of these realities. These include the thermodynamic characteristics and behaviour of buildings; the types and peculiarities of residential buildings common in Germany; the physical aspects and challenges of doing thermal renovation to the required standard on a range of building types; and the costs involved in doing this, in the current German context. It was important to be able to read the expert reports of physicists, engineers and micro-economists that inform the policy discussion, to the level of being able to discern what is natural science and pure mathematics, and where the expert's values and politics are at play. It was also essential to be able to gather my own samples of physical and economic data from specific thermal renovation projects or potential projects, develop my own engineering and economic analysis tools, and produce independent results on the costs and effectiveness of German thermal renovation policy in specific situations.

I also needed to understand: the development and rationale of the German thermal renovation regulations, including their intricacies and quirks; the strategies that have been established by the government for getting this policy implemented; and the formal processes by which expert knowledge is brought into the policy domain in order to guide policymakers in their choices.

All this involved: reading and digesting German scientific, engineering and economic in-house reports and published papers on thermal renovation, supplemented by Swiss and Austrian publications⁴⁸; close scrutiny of the thermal building regulations since 2002, when thermal renovation standards were incorporated; attendance at a one-day workshop in Augsburg for building physicists, engineers and architects on the 2009 regulations; the development of several mathematical models to calculate the costs

⁴⁸ There are strong interconnections between German, Austrian and German Swiss knowledge communities on thermal renovation issues.

and benefits of various standards of thermal renovation on various types of building; data gathering on actual projects and their effects; and close reading of particular expert reports which are or have been heavily used in policy formation.

These aspects of the research were begun early, and some of the more interesting findings were published in ‘Thermal upgrades of existing homes in Germany: The building code, subsidies, and economic efficiency’ (Galvin, 2010a). These, and other such findings, are used throughout the thesis to cross-check the claims of policymakers. The research I conducted on mould growth suppression in homes (Galvin, 2010b) also has relevance to this thesis⁴⁹.

These findings, of a natural and applied science type, together with what I had learnt of the policy and its associated discourse from policy document research, were well advanced before the interview phase. When I started the interviews I already had a comprehensive understanding of the technical and economic aspects of thermal renovation, the material context where it was being applied, the developments in German Federal policy on the issue, and the process by which expert knowledge was officially brought into the policy arena. This enabled me to shape my questions quite specifically in terms of the effects of aspects of the policy on features of the materiality and socio-materiality.

3.3.3 Qualitative and quantitative data

All the hermeneutic data for this study is qualitative data. Statistical, quantitative social data on relative occurrences of various viewpoints, and their correlation with each other, is only marginally appropriate in this study, if at all. To begin with, the study focuses on narratives, which can be produced by an actor quite independently of other related or non-related narratives. There does not have to be a logical or rational consistency between the narratives uttered by a particular person (Harré and Gillett, 1994: 25; 36). Further, people do and say things for reasons of their own, not as a result of measurable causes (Žižek, 1994). As Harré and Gillett (1994: 121) express it, following Davidson (1980: 217), what people do and say is ‘... not subject to lawlike

⁴⁹ This research was motivated by the ubiquitous concern, expressed in German publications, about mould growth in homes, and the very expensive solutions usually proposed in this literature.

or scientific generalisations that exclude the need for reference to their own commitments and states of mind.’ Hence any attempt to explore a quantitative-style rationality in narrative analysis would be looking for things that are not relevant to the study, if indeed they exist.

Further, I would not substitute or supplement interviews with questionnaires to the key policy actors, even if these were designed to collect qualitative data. To begin with, a written questionnaire would fix my questions, so that my subjects cannot renegotiate them with me. This limits the scope of what they can meaningfully say, and can miss points that are most significant to them. It also deprives me of the opportunity to change my views and understandings in the midst of an encounter, so that my subject and I can re-explore issues from a new point of departure. Further, it fails to simulate the situation in which policy discourse is normally produced, i.e. in dialogue and argument with agonists and antagonists. Policy discourse does not develop by policy actors responding to fixed written questions, but through living discussion. Even when this is in a written form, it is argumentative and full of manoeuvres, not usually a straightforward response to an enquirer’s standardised questions. Semi-structured interviews, with a researcher adopting or role-playing various subject positions, are much closer to actual policy discourse situations and therefore much more likely to reveal the arguments, power-plays and manoeuvres that take place within the policy discussion itself.

Returning to quantitative data, there is no need for statistical analysis of what proportion of policymakers are of such-and-such a view compared to those of some other view. Such numbers would not explain why any particular view is dominant in the discursive community. Discursive dominance does not work by numbers, or by adding up votes on privately held opinions. It happens publicly and overwhelmingly, when one argument beats another in the context of a particular social issue (Fischer and Forester, 1993; Hajer, 1995: 58ff). This occurs in an open, public arena and has nothing to do with percentages or proportions of antagonists.

Nevertheless there are several extant quantitative social science research studies on German homeowner attitudes (Friedrich et al., 2007a; Friedrich et al., 2007b) and tenant attitudes (Hacker, 2009) to thermal renovation, which are known to key

policymakers. Used cautiously, these provided useful information to throw light on how well these policymakers understood relevant aspects of the way their policies were being received.

However the data on materiality is both qualitative and quantitative. *Qualitative* data is essential for the natural and applied sciences, as it is data about how things happen: heat energy escapes through walls of houses *by the cascading action of molecules colliding with one another*; thermal bridges occur *where resistance to heat transfer differs from the surroundings*. This kind of qualitative data is essential for this thesis, as it goes with a thorough understanding of how the natural ‘mechanisms’ or ‘tendencies’ (Bhaskar, 1978 [1975]) of the physical, material world work. It is also a prerequisite to being able to discern which statements of expert advisors are genuine science, and which are their own values and politics. Statements of genuine science usually include a (qualitative) description of the natural mechanism at work, whereas value statements, such as ‘All homes need to be comprehensively renovated every 30 years’, tend to lack this element.

The *quantitative* side of these sciences comes in two ways. Firstly, the qualitative phenomena are given numerical values to map their relative strengths: the more freely the molecules in the wall of a house can collide, the *higher the U-value* of the wall; the higher the contrast in U-values between two adjacent surfaces, the *greater the condensation* will be at the thermal bridge. This type of data is also essential in this thesis, as the researcher has to know, for example, what thickness of Styropor⁵⁰, compared to rock-foam⁵¹, is necessary on a wall to achieve the legal standard of U-value.

A further quantitative area of socio-materiality research is statistical. The researcher needs to know, for example, how many dwellings were thermally renovated, to what standard, in what year; what a regression analysis of cost and thermal renovation

⁵⁰ Styropor is a fossil fuel based, plastic foam insulation material, similar to polystyrene, invented by BASF in 1952. See, e.g.

http://www.plasticsportal.net/wa/plasticsEU~de_DE/portal/show/content/products/foams/styropor_peri_por

⁵¹ Rock-foam is an ‘eco-friendly’ insulation material. See, e.g., the ‘Rockwool’ brand:

<http://guide.rockwool.co.uk/building-types/homes-/walls/external-walls/external-insulated-render-system.aspx>

standard show about the general relationship between these two; what proportion of what type of dwelling is being renovated more readily, compared to dwelling types being less readily renovated. This type of knowledge is essential for seeing how effective the policy is, and how well its impact and effects are understood in the policymaking community. However it has to be combined with qualitative research to find the reasons and causes for the apparent correlations.

3.3.4 Broader and background research

I have visited Germany regularly for the past 20 years, do extensive cycling tours there every summer, have stayed in over 50 different German residences in over 30 cities, towns or villages, and have spent time in many other cities and locations. I have a comprehensive familiarity with the housing stock, urban and rural, including a general familiarity with 14 of Germany's 16 states⁵². Since the spring of 2008 I have made more detailed observations of houses, taken hundreds of photographs of features I found either typical or remarkable, and have had hundreds of informal conversations with homeowners and occupiers⁵³. While these conversations are not documented, they have given me a working knowledge of many aspects of German homes and household life, and this helped form my questions in the formal interviews.

Further, as a private landlord of long standing, I have always had an interest in real estate markets. For the past 8 years I have kept actively in touch with the German residential real estate market, both through regular searches of agency websites, and through on-site visits while viewing property for sale in a number of German cities. This familiarity has been very useful in estimating the credibility of certain claims by policy actors, for example that doing thermal renovation increases the resale value of the property.

All this could be regarded as foundational research, which would give me the background knowledge, and in certain areas the tacit knowledge, necessary to make credible interpretations of the claims and assertions of my interviewees. It has also

⁵² The two exceptions are the small state of Saarland and the City State of Bremen.

⁵³ I have no difficulty getting into such conversations. When I tell German people the topic I am researching, they very frequently volunteer a great deal of information about their houses.

given the research an ethnomethodological aspect (Garfinkel, 1967), in that my deep involvement with German people in respect of their dwellings has given me detailed situational understandings of how these people feel about and act in relation to their houses and apartments, in comparison with my native New Zealand and adopted English cultures⁵⁴.

3.4 INTERVIEWS AND OTHER HERMENEUTIC RESEARCH

3.4.1 Overview

The core of my discourse-based research was in the form of interviews with policy actors. These included politicians, bureaucrats, expert contributors, and key practitioners who are applauded by, or have privileged connections to, the official policy community. The interviews were supplemented by attendance at seminars and lectures given by key policy actors, plus comprehensive research on documents produced by these people and their colleagues and underlings. This was complemented with a smaller set of interviews with, and research on documents produced by, interested parties whose actions in respect of thermal renovation can smooth or disrupt the implementation of the policy. These are such actors as landlord associations, building contractors and homeowners. I also interviewed a number of relevant private homeowners, as explained in Subsection 3.4.6 below.

The interviews took place during the three months of mid October 2009 to mid January 2010. I began organising the interview schedule three months in advance of this. My rationale as to whom to interview was as follows:

3.4.2 Federal level

Since my main concern was with Federal policy, I needed to include relevant Federal politicians, civil servants and parliamentary staff among my interviewees. I aimed to

⁵⁴ For example, Germans and New Zealanders are comparably fastidious about the appearance of their homes, while Germans like theirs warm inside and New Zealanders like theirs cold (cf. Cupples, et al., 2007); Germans like concrete blocks and are suspicious of wood for building structure, while wood is 'normal' to New Zealanders and concrete blocks are seen as somewhat makeshift.

interview one relevant Federal MP from each of the six parliamentary parties, or at least their staff energy advisors. The parties are: *Christlich Demokratische Union* (CDU - Christian Democratic Union), *Christlich Soziale Union* (CSU – Christian Social Union), *Sozialdemokratische Partei Deutschlands* (SPD – Social Democrat Party of Germany), *Bündnis 90/Die Grünen* (The Green Party), *Freie Demokratische Partei* (FDP – German Liberal Party), and *Die Linke* (The Left Party).

I also aimed to interview civil servants, from the *Bundesministerium für Verkehr, Bau und Stadtentwicklung* (BMVBS – Federal Ministry for Transport, Buildings and Urban Development); the *Deutsche Energieagentur* (DENA – German Energy Agency); the *Bundesamt für Bauwesen und Raumordnung* (BBR – Federal Bureau for the Built Environment and Planning); the *Umwelt Bundesamt* (UBA – Federal Environment Bureau) and the *Kreditanstalt für Wiederaufbau* (KfW – German Development Bank). The BMVBS is the ministry that relates to the building regulations and implements the promotion of thermal renovation. DENA researches the progress of thermal renovation throughout Germany and promotes it actively. The BBR runs urban development programmes, but, more important, decides which experts get the contracts to write the expert reports (officially solicited technical advice papers, called ‘*Gutachten*’) for the government on thermal renovation and new build thermal issues. The UBA has a less direct relationship with thermal renovation but its opinions carry some weight. The KfW supplies the financial incentives offered to homeowners who renovate to certain thermal standards.

3.4.3 State and municipal levels

I also decided to interview state and municipal policy actors, as I had observed, through document research and previous informal conversations, that their discourse on thermal renovation tends to parallel that at Federal level. These people are also closer to the implementation of the policy, as Federal power is devolved downwards in implementing building codes. Further, most states and many municipalities have their own thermal renovation promotional policies, which usually attempt to supplement the Federal policy, and therefore interesting comparisons in policy discourse might arise. I reasoned that it would be useful in any case to include

interviews with policy actors outside Berlin and Bonn, so as to check whether the discourse dominant in these two centres is similar to that found more widely.

I chose the municipality of Munich, as it has a very ambitious policy with its own subsidy system and a long-established advice centre for thermal renovation (the *Bauzentrum* – ‘building centre’).

I chose the state of North Rhine-Westphalia, as it is economically the largest state, and has a specific, long-running thermal renovation project, ‘50 *Solarsiedlungen*’ (‘50 solar housing estates’: EnergieAgenturNRW, 2009) that is frequently applauded at Federal level as an example of what is possible in thermal renovation practice.

I also chose the city-state of Hamburg, partly because it has the constitutional powers of a state, yet is a city about the size of Munich (about 2 million inhabitants) but at the other end of the country. Like Munich, Hamburg is rich, booming and politically liberal. But its state subsidy system for thermal renovation is a radical contrast to Munich’s, which functions much like an extension of the Federal system.

I also thought it would be useful to interview a key policy actor in a city very different from Munich and Hamburg. I chose Augsburg, as this is smaller (population about 250,000), politically conservative, not well-off, and does not have a strong programme promoting thermal renovation.

A further reason for including non-Federal policy actors was that this would give me experience in conducting policy actor interviews, before doing the Federal interviews in Berlin and Bonn toward the end of my fieldwork. It would more deeply familiarise me with specialist and in-house vocabulary, alert me to surprising narratives that I would not have expected to hear, and give me advance warning of what Foucauldians would call positioning (Foucault, 2002 [1973]) issues that might arise as my questioning challenged sacred cows within the policy discourse. This turned out to be very useful, as I explain in Chapter 5 in relation to the question of the ‘economic viability’ (see definition below) of thermal renovation.

3.4.4 The expert knowledge community

I needed to interview key people in the expert knowledge community, i.e. those who provide the Federal government with (supposedly) reliable information, about the physics and micro-economics of thermal renovation, which inform the written policy and could be expected to influence the policy discourse quite strongly. By collecting expert reports (*Gutachten*) and similar documents in the months leading up to the fieldwork, I was able to work out which organisations and experts appear to have the most direct input into the policymaking process through the reports they are commissioned to write. This turned out to be much simpler than I expected. There are five main institutes which, in various combinations, have a hand in most of the expert reports for thermal renovation. They are:

Institut Wohnen und Umwelt (Institute for Housing and Environment - IWU)

www.iwu.de

Passivhaus Institut (Passive Buildings Institute) www.passiv.de

Fraunhofer Institut für Bauphysik (Fraunhofer Institute for the Physics of Buildings)

www.ibp.fraunhofer.de

Institut für Energie- und Umweltforschung (Institute for Energy and Environmental Research - Ifeu) www.ifeu.de

Institut für Angewandte Ökologie (Institute for Applied Ecology)

www.oeko.de/aktuelles/dok/544.php

There are direct personal connections between the first three and the *Bauphysik* (building physics) faculties of the Technical Universities of Munich and Darmstadt. They also work in close association with LUWOGÉ (www.luwoege.de), a housing provider which is a subsidiary of BASF (www.basf.com), Germany's largest manufacturer of wall insulation, and which runs pilot projects, testing BASF products on its own extensive housing stock, which it rents out to employees. Further, the director of the Fraunhofer Institut für Bauphysik, Dr Gerd Hauser, is also Professor of Building Physics at the Munich Technical University. While at Darmstadt, Hauser supervised the doctoral studies of Wolfgang Feist, in which Feist worked out the

physics for the Passive House⁵⁵. Feist founded the Passivhaus Institut, also in Darmstadt, of which he is director and principal shareholder, though he is now also Professor of Building Physics at Innsbruck University in Austria. Feist wrote the definitive expert report for the policy developments in which the thermal standards for renovations were tightened by 30% in 2002, and co-wrote the corresponding expert report for the further 30% tightening in 2009. So I sought to have interviews with relevant persons in each of these institutions.

A point about language is necessary here. The German word *Gutachten* is ubiquitous in policy discourse on thermal renovation, as so much of what is asserted is, or purports to be, grounded in what the experts have said in their officially solicited expert reports. When people speak of *Gutachten* in this context they are referring to a specific genre of text that carries the authority of a scientific document solicited and paid for by an official body, such as Federal, state or municipal government, or a professional association, research body, firm, etc. Further, the *Gutachten* seems to have a status in popular discourse in Germany that similar reports in English speaking lands do not attain to. Hence it might be acceptable to leave this word untranslated in the text of this thesis. However, that might give the wrong impression, since the soliciting of expert reports is a world-wide phenomenon, in which official bodies seek the opinions of scientific experts and afford these opinions a privileged status of knowledge. In any language and culture, recipients of such reports are vulnerable to lapses of scientific transparency or accuracy on the part of the authors. So I will translate *Gutachten* as ‘expert report’ throughout this thesis, and I will only use the phrase ‘expert report’ to mean exactly this and nothing else.

3.4.5 Practitioners

I sought to interview the technical managers of LUWOG (above) and *Erbbauverein*, a Cologne-based housing cooperative that is prominent in the ‘50 *Solarsiedlungen*’ programme. It is applauded by the state of North Rhine-Westphalia, and more widely, for the quality and consistency of its thermal renovation of its building stock.

⁵⁵ Feist is widely regarded as the co-inventor of the passive house, along with Swede Bo Adamson.

It was also important to include practitioners who were more critical of the dominant policy discourse yet were involved to some extent in the community of policy actors. One important organisation in this regard is *Gemeinschaft Deutscher Wohnunternehmen* (GdW – German Association of Housing Providers), which represents landlords from all over Germany. I sought an interview with their chief research officer, who has done extensive research on thermal renovation issues in the rental housing sector. The state branch of this organisation in Saxony also produces documents critical of the policy, and I spoke informally with its director. The *Verband Privater Bauherren* ([National] Association of Private Builders) also criticises the policy, though time did not permit more than documentary research on its views.

3.4.6 Private Homeowners

I sought interviews with private homeowners who had undertaken thermal renovation, or who had been through a process of considering it and had decided against it. Within this group I wanted older and younger persons, males and female homeowners, conventional households and small, one-building housing co-operatives, over a good spread of geographical areas, covering free-standing homes and apartments, in both the western and the eastern parts of the now united Germany. This provided me with homeowner interviews in Augsburg; Würzburg; Lüneburg; Lübeck; Berlin; Cottbus (3 homes); Erfurt; a small village near Stuttgart; a small village in southern Bavaria; two small villages in Franconia (Franken), northern Bavaria; a city in Thüringen and a small village in Baden Württemberg. I have withheld the names of some of these towns to protect interviewees' identities.

There was no straightforward or statistically valid way to find these people. My selection method was simply to ask friends and acquaintances to ask others, etc. The data so produced therefore needs to be used very cautiously in drawing any conclusions, as I explain below. However these interviews were very useful in providing me with personal stories of difficulties and successes with thermal renovation, aspects of which I could then relate, anonymously, to policy actors, in challenging their claims and assertions. This stimulated policy actors to express their

responses to such challenges. It also formed a corpus of qualitative data on the socio-materiality of households in respect of home heating and thermal renovation⁵⁶.

3.4.7 Conference and seminar speeches and dialogues

Conferences and public seminars provided valuable supplements to interviews with policy actors. I attended the United Nations conference on energy and housing in Europe and the former Soviet Union, in Vienna on 23-25 November 2009. Two prominent German policy actors, Rolf Müller (Director of BBR) and Jochen Flasbarth (Director of UBA), and one key expert, Wolfgang Feist, were among the keynote speakers. They were also questioned extensively by participants, singly and in panel discussions, and this provided a situation akin to observing an interview. Further, a high official in the BMVBS, Hans-Dieter Hegner, gave a lecture on Federal home energy policy at the Munich Technical University Faculty of Building Physics, which I was able to attend. The one-day seminar in Augsburg, on the 2009 thermal regulations, also provided opportunities to hear practitioner discourse in respect of the policy.

3.4.8 List of interviewees, and notation

The policy actor interviewees and conference/seminar speakers are displayed in Tables 3.1, and the homeowner interviewees in Table 3.2 The notation I use for citations are listed in the tables and given in brackets in the empirical chapters. The symbols mean:

IV: It was a recorded, transcribed interview.

IVN: It was an interview that I was not permitted to record.

Schmidt: The person's surname was Schmidt, and he or she permitted or requested me to identify him or her in the text of my thesis.

⁵⁶ The transcripts of these interviews could also make a dataset for a study on personal narratives of homeowners in the context of being confronted, as all homeowners are today, with the notion that our homes are damaging the earth as they keep us warm. However this would extend beyond the scope of my research questions.

Munich_A: The interviewee was in the location of Munich, but chose to remain anonymous. Where homeowners were in very small villages I have used the name of the region rather than the village to strengthen their anonymity. All homeowners were given anonymity as a matter of course.

Braun, 2009: This was a seminar or conference speaker named Braun. These references are also given, in full, in the References section at the end of this thesis.

When quoting from interview transcripts in the empirical chapters I add a time tag in the form [44:23]. This means the section of the interview referred to or quoted comes from approximately 44 minutes and 23 seconds into the interview.

3.5 THE INTERVIEW DATA AND ITS VALIDITY

There is a range of different purposes for which we can obtain the qualitative data of interview material. My purposes in obtaining the interview data from policy actors were different from that for seeking data from homeowners.

From policy actors I needed a data set that would reveal to me the policy story-line i.e. the discourse that constructs the problem and its solution, and that drives, supports, contains, promotes and defends the written, official policy. To some extent this would be revealed to me in my role as a researcher, but it is also possible to phrase questions in such a way that one is highly likely to become positioned, by the interviewee, in other roles: sceptic, ally, dissenter, supporter, enquirer, technician, learner, etc., and thereby have a good chance of hearing the same phrases and arguments that the interviewee would use within the actual policy community, or in dialogue with outsiders. Hence I often formed my questions in ways that reflected these roles.

Further, I needed to be confident that what I was hearing, overall, covered all the essential elements of the policy discourse, and gave more or less the same weight and significance to these elements as was current within the discourse. Therefore I had to choose key or significant actors from each of the bodies involved. With regard to

government agencies, all but one of the most significant institutions within the policy community responded generously to my requests for interviews, offering personnel who played key roles in their organisations. The exception was the KfW, who said they do not give interviews, as they act simply on instructions from the relevant Ministry (BMVBS) and do not get involved in policy discussions. However, one of the two interviewees the BMVBS offered was a policy bureaucrat engaged in constructing KfW policy, so that I was still able to discuss KfW issues with a competent spokesperson.

Responses from political parties at the Federal level were more varied, with the CSU and Greens offering key MPs involved with thermal renovation policy, and the CDU offering the parliamentary energy researcher for MPs who work on thermal renovation policy. The SPD, which had just lost badly in the Federal elections and admitted to being poorly organised, offered me a Parliamentary policy researcher whose views were revealing but who declined to have the interview recorded or used in the research. He explained that the party was in some disarray after its massive election setback, and it was not yet clear who had the right to speak in its name on this issue. There was no response from the FDP or Left party. However I found no evidence that these parties had shown active interest in the policy area, so it is most likely not a significant loss.

At the municipal level I was able to interview governing Munich Green Party and SPD politicians who were actively involved in thermal renovation policy implementation at the local level. In Augsburg I interviewed a key local, governing CSU politician who is also in close touch with party policy discussions nationally.

With regard to experts, state and municipal level bureaucrats, practitioners and other interest organisation, in every case but one the person or persons I asked to interview accepted the request. The exception was Professor Wolfgang Feist, director of the Passivhaus Institut, as he now lives and teaches in Innsbruck, Austria, and was not available for interview. Instead I interviewed his colleague and assistant, Oliver Kah, who acted as his main co-writer for the more recent of the crucial government-sponsored expert reports mentioned above. However, Feist was a keynote speaker at the Vienna conference, and I heard his presentation, responses to questions, and panel

discussion contributions. The same goes for Jochen Flasbarth, director of the Federal Environment Office (UBA) and a charismatic proponent of ever-stricter regulations for thermal renovation. I was not able to interview him but he was also a speaker at this conference.

I was also able to check that the content of my data corresponded with what was being said outside the interviews, by cross-checking: comparing it with written policy promotional material and with speeches given by key policy actors in public forums, together with their answers to other people's questions from the floor. Another test of my data's correspondence with the discourse at large was to compare what was said in one interview, with what was said in others.

From private homeowners I sought quite a different kind of data. Here I was not looking for a nation-wide or regional story-line, but individual stories of individual interviewees: the story of 'me and my house in relation to thermal renovation'. My sample of homeowners was far too small to make generalisations about the progress and effectiveness of the thermal renovation policy based on these interviews. Instead, I was looking for concrete examples of thermal renovation experiences, for two main purposes.

Firstly, I wanted to be able to speak to policymakers with the voice of a homeowner. It gave me much more credibility to be able to say, 'Certain homeowners whom I have interviewed have said such-and-such,' than just to say, 'Well, what if such-and-such happens?' This, I reasoned, would make policy actors take my more sceptical questions more seriously. It would also enable me to play a role of, say, a dissenter, without getting off side my interviewee. In the event this proved a very useful strategy and seemed to make my interviewees think more carefully rather than just dismiss what could appear as frivolous objections out of hand. Two clear examples of this are given in Chapter 6.

Secondly, it provided me with extra brick-and-mortar case studies: costs, dimensions, etc. I was then able to do my own mathematical modelling of these, to test claims such as 'thermal renovation always pays back through fuel savings within X years.'

Two of these are set down in Appendices 2 and 3. These were very useful in challenging interviewees who made blanket claims, such as, ‘it *always* pays back.’

Thirdly, it provided qualitative socio-materiality data: it helped me understand the socio-technical relationships between homeowners, their fellow householders, and the house itself, in relation to thermal issues. It helped me see how people can be constrained and enabled by the human/non-human hybrid that is a household. For example, one homeowner told me he refused to put the legal minimum thickness of insulation on his cellar ceiling, because it would have made the cellar impossible to stand up straight in. Another said he refrained from installing solar water heating, as his daughters, who use most of the hot water, were soon to grow up and leave home. As I gathered these examples, I was then able to make the general point to policymakers that they were dealing with socio-technical systems, not just instances of bricks-and-mortar plus ‘homo-economicus’. In general, having interviewed homeowners gave me authority and respect in my interviews with policy actors, and this became more and more evident as the researched progressed and I accumulated more and more experiences of homeowners and their stories.

3.6 OBTAINING AND PROCESSING THE DATA

3.6.1 Practical considerations

I recorded the interviews on a hand-held Dictaphone that made digital tracks in Windows Media Audio File (WMA) format, so that it could be downloaded onto a laptop and played back via Windows Media Player (WMP). WMP has the advantage of an equaliser and a speed control, so the treble could be boosted during playback and the speed slowed, without tonal change, to make transcribing easier. I also used a plug-and-play German layout keyboard with a WMP play-pause button on the top left, so that I could type and stop-start the track without using the mouse. This was not as convenient as a foot-pad with auto-reverse, but easier to transport and, at €7.95, much cheaper.

I resolved to transcribe interviews along the way, as soon as possible after each interview, so as to keep on top of the project and to have the experience of running

each one through in my mind, slowly and in detail, shortly after conducting it. I almost kept up with this, and all but caught up again during a Christmas break in northern Bavaria, before interviewing again after Christmas.

Interviewees were generous with their time, and both they and informal contacts often introduced me to other relevant actors, with whom I had informative conversations. For example a local pastor introduced me to the Bavarian Lutheran Church's thermal renovation programme for its vicarages, supplying me with documentation of a detailed cost breakdown of a full thermal renovation on a vicarage, of which she and her architect partner gave me an in-depth tour. This cost breakdown proved a useful discussion point in some expert interviews. The UN conference in Vienna included a tour of thermal renovation projects in the city's extensive social housing, providing a degree of comparison of Austrian with German projects.

I sent policy actor interviewees a list of my likely starter questions in advance of the interviews. These are given, together with English translation, in Appendix 6. However the questions I actually asked in interviews were by no means tied to this list. They developed as my understanding of the issues developed.

My formal data analysis began after I returned to the UK. However, by transcribing the interviews during the interview phase of the research, and having informal discussions, I began to get a picture of how the policy discourse fitted together, and where it interplayed smoothly and not so smoothly with the material and socio-material realities at which the policy is aimed. It quickly became clear, for example, that there was a pivotal and ubiquitous element in the *conversational* policy discourse story-line that had been evident, but not prominent, in *written* documents: the discourse of the strict division of the costs of a thermal renovation job into 'anyway' costs and 'additional thermal' costs. The latter are the only expenses that are used in the calculation of how economic a thermal renovation job will be. This discourse was so entrenched in the policy community that it seemed actually to structure the way other discourses were allowed to work. Realising this as the interview phase progressed was helpful in formulating later interview questions, including questions that challenged it. Significantly, however, this discourse was not evident among private homeowners.

3.6.2 Thick description?

‘Thick description’ (Geertz, 1973: 5-10) refers to the phenomenon that the social and cultural context determines much of the meaning of what people say or do. A wink, for example, could indicate an attempt at alliance, a flirtation, or that a white lie is being told. If someone says, ‘You devil!’ this could be a complement or an insult, depending on the context. Hence the term ‘thick description’ is often used of research that includes the researcher’s own day by day observations and reflections upon his experience in the culture or subculture he is researching, as these observations can help the researcher catch the intended meaning of utterances and actions. It is especially useful in ethnographic research, where much of the data arrives in the form of the researcher’s response to what appear to be differences between his own culture, and that in which he is immersed. While my research was not essentially of this type, there were elements of it that intersect with it.

Firstly, while interviewing policy actors, I was, in a sense, stepping into their world: using their language and their technical terms, positioning myself or being positioned as an ally, sceptic, etc., yet also as British or New Zealander rather than German. My reflections on how it felt to be in this/these position(s) were an important part of my learning along the way, and helped inform my next and future interview questions.

In this respect, though, the biggest cultural gulf I felt was not as a British-New Zealander among German people, but as a non-believer among believers. I felt so sceptical about many of the assertions about the economic viability of thermal renovation, that I had to ease myself, as it were, into this cultural mindset in many of the interviews.

Secondly, it was winter – the coldest in some 30 years – and I was very much a beneficiary (or victim!) of the thermal qualities (or lack thereof) of German buildings. For example, going from -15°C in Berlin’s Chauseestraße into the DENA office with its passive house insulation and heat exchange ventilation system was a direct bodily experience of the subject I was researching. In every home I stayed there were direct experiences of the effects of thermal standards. One home, for example, was a large loft apartment with literally no insulation in the ceiling, while my previous stay had

been in an apartment that was so well insulated that my host saw no reason to turn the heating on.

Another telling experience was being taken by my Cottbus host to visit the vast open-cast brown coal mines nearby. Cottbus's economy is based on generating electricity with locally mined brown coal, one of the most CO₂-intensive ways of producing energy. Meanwhile, a large portion of the apartment blocks of Cottbus's workforce have been thermally renovated to reduce their CO₂ emissions, while their central heating systems run on waste heat from the power stations. This Jekyll-and-Hyde experience was a microcosm of what often seemed an unbalance in the German project of thermal renovation, where large sums are spent to squeeze the last kilowatt-hour of energy saving out of a building, while a blind eye is turned to enormous unchecked sources of CO₂ emissions that could be reduced relatively cheaply.

At first I attempted to keep a record of my daily observations and experiences, but there was simply not enough time in the day for this, as the priority needed to be to keep up with transcribing interviews. I made notes where I could, and took many photographs, some of which do carry the essence of the issues I was encountering. Generally, reflection on these experiences contributed to my being able to grasp the meaning of some of what interviewees said to me.

3.6.3 Terminology: discourse, narrative and story-line

The terms 'discourse', 'narrative' and 'story-line' are often poorly or variously defined in policy discourse literature. From the beginning of my data analysis I chose clear definitions of each, so as to aid clarity in thinking, analysis and writing.

By 'discourse' I mean all semiotic (sign-based) activities such as speech, writing, graphs, diagrams, posters, and even three-dimensional objects such as 'demonstration projects', that are employed to communicate, or induce people to believe, things about the world. Fairclough, whose vocabulary on linguistic matters is deliberately precise, uses the word 'semiosis' for this (Fairclough, 2005).

By ‘narratives’ I mean the relatively short, pithy units of discourse that are produced and reproduced within the policy community. Each of these constructs or construes some aspect of the world, i.e. it declares that something is true or false, morally right or wrong, or how valuable or advantageous it is. Each narrative can more or less stand alone, but most are usually joined up with other narratives in practice. Most narratives have the form of assertions, such as ‘It is always economically viable⁵⁷ to do thermal renovation to EnEV standards,’ or ‘The vast majority of homeowners are ignorant of the ancillary benefits of thermal renovation,’ or ‘Every home should be renovated to zero-energy standard.’

By ‘story-line’ I mean an ensemble of narratives that are strung together in a logical, quasi-logical or merely appealing manner, to produce a message and set of coherent impressions that are intended to convince certain classes of people to act in certain ways. The problem and its solution are generally constructed as a story-line. The written policy cannot do its job without a story-line, because people have to know what the policy is for, and why they should make use of it or obey it. A story-line also has the function of providing a kind of defensive wall around the written policy so that it cannot be easily undone. It can also act as a kind of vanguard, preparing the ground for a new policy, a modification of an existing policy, or a revolutionary change (Laclau, 1995: 153; Torfing, 1999: 168-186).

In a complex field such as thermal renovation policy and practice in Germany, there are of course variations within the story-line, both in space and time. But I found this to be a useful idea to begin to get a working perspective on the large amount of data I was accumulating. I will use these three terms in this way throughout the rest of this thesis.

3.6.4 Formally analysing data: precautionary issues

With the amount of data I was gathering (130,000 words of transcripts: 600 pages) it was clear that I would need to develop a coding system in order to compare similar pieces and map out connections between elements of discourse. However I was very

⁵⁷ i.e. it always pays back through fuel savings, within an acceptable time frame. The German word is *wirtschaftlich*. A fuller explanation of this word is given in Chapter 4, Section 4.2.5.

cautious not to let this become a mechanical exercise, as if one could look at conversational data from the outside and thereby grasp the meaning and significance of what was being said in a detached way. Three factors stand against this.

Firstly, the data gathering was a hermeneutic experience, in which meanings were constructed between my interviewees and myself. What they said was said to me, a specific person who was also saying things to them. It was not uttered into some kind of universal reception arena where meanings would be clear in themselves and stand on their own. Of course, much of their speech was similar or even identical to what they would say, or have said, to others who have positioned themselves in similar stances to the ones I was taking in the interviews. This was borne out to me in the similarities amongst interviews, and between interviews and documentary publications and public speeches. But even here, meanings take their form very much in relation to a real or imagined discussion partner. Hence the coding process must not mislead the researcher into treating these utterances as timeless, a-contextual entities which exist independently and hold their meaning on their own.

Secondly, the data was literary, not a set of bullet points. Literature does not necessarily proceed logically from point A via point B to point C. It weaves, twists, recaps, juxtaposes and paints pictures, as well as, in places, getting on with the action. Therefore, although I can identify certain narratives occurring and recurring in much of the data, I had to be careful not to code the data such as to imply that it necessarily connected or related to other narratives in any consistent way. Inasmuch as social structure is made up of discourse, it is not an orderly structure like the framework of a building. The narratives that comprise it are intertwined, knotted, overlapping and in various tensions with one another, while also fluctuating in relation to the audiences of the discourse. This point is especially relevant to Chapter 6, where I explore how various narratives ebb and flow within the story-line to repair, renew and revitalise it.

Thirdly, my data gathering and analysis is deeply informed by my longstanding involvement in German life, particularly in the housing sphere, over many years (see Section 3.3.4). Many of the assumptions behind terms, expressions and concerns expressed by policymakers and homeowners are already well-known to me, so that a

coding analysis designed to bring these to the surface would be no substitute for the richer understandings that already form the basis of my interpretive framework. Hence my formal coding and data analysis were done as an adjunct and supplement to the knowledge I had gained while interviewing and re-playing interviews, not as the primary means of identifying flows of meaning in the data (and see Section 3.6.6, below).

3.6.5 Where to start: research questions and their assumptions

I did the fieldwork and the data analysis with my theoretical and empirical research questions in mind. Therefore my interview questions and comments were not neutral; they were geared to find possible answers to these questions. So as the data came in I was already processing it, mentally, identifying aspects of it that threw light on these questions: the interplay of the policy with its material and social targets; the political assumptions that come into the policy domain through expert knowledge; the way the story-line reproduces and reforms itself in the face of challenges; the ways the policy fulfils or impedes the achievement of its stated aims. I am confident I have obtained a very comprehensive understanding of the policy discourse, but some aspects of it that are most often uttered have only a small role in holding the story-line together. For example, almost every policy actor brought up the subject of energy performance certificates, and what a step forward the advent of these is. The use, effects, and discourse about these certificates could make a major study in itself, but from what I could see their impact on what currently happens in thermal renovation is minimal. Within the story-line they are used in an ancillary way, i.e. as an add-on, to bolster the (problematic) claim that doing thermal renovation raises the resale value of a property (because its energy performance certificate has to be available to prospective buyers), and this 'resale value' discourse is used to help prop up the 'economic viability' discourse when it fails to stand on its own merits – a failure it suffers (as I show in Chapters 4 and 5) because of mismatches between the policy and the materiality. So, despite its frequent presence, and the obvious level of excitement some policy actors have about it, I did not put the energy performance certificates discourse anywhere near the centre of my analysis.

In short, the analysis was not done as in ‘grounded theory’ (Glaser, 1998), but with quite specific theoretical questions in mind, and always in relation to the overall evaluation question developed in Chapter 1.

3.6.6 Coding: layers of analysis

After the transcribing was complete, a first task was to listen to and read through all the transcripts once more, and make a list of what seemed to be the prominent themes relevant to my research questions. There are, of course, any number of narratives to be found in 32 interview transcripts, plus the notes from 10 unrecorded interviews, 4 speeches and a day long seminar, but I found 38 themes that had fairly direct relevance to my research questions.

With these in mind I attempted to use Nvivo 8 software to code the interview material, but it proved far too cumbersome, especially with the crowded screen display. Further, as noted in Section 3.6.4 above, coding of this type had limited use in this case, due to my own ‘ethnomethodological’ (Garfinkel, 1967) knowledge-gathering, of German housing issues and culture over a long period. This had given me a rich and firm basis of understanding, which informed both my questioning of interviewees, and my understanding of their responses. For example, the closer I got to the centres of power in Berlin, the more I heard the narrative that there was a very low uptake of thermal renovation among small, privately owned dwellings. This resonated with years of street-level observations of German housing, where one can see which buildings are being renovated and which continue in their original state⁵⁸. It also accorded with dozens, possibly hundreds, of informal conversations with homeowners and tenants throughout Germany over the last 9 years.

Nevertheless, I made use of appropriate software to enable me to find my way round my interview data efficiently, without letting this dominate my interpretation of data. I developed a relational database, properly normalised (Pratt and Adamski, 2000), and programmed a front-end using Visual Basic to run it. This enabled me to use SQL (Structured Query Language) queries to pull out any combination of cross-references

⁵⁸ Since almost all wall insulation in Germany is applied to the external wall surface, thermal renovation projects are very visible, with their scaffolding and Styrofoam blocks.

and relationships one desires. However, a disadvantage is that the formatting of the text is lost as it goes into the *memo* data-type in Access, and I wanted to keep this so as to preserve the underlining, etc, that I had done while transcribing (e.g. to indicate vocal expression). So I supplemented the database with a series of Word documents, one for each narrative or theme, each with sections for each interviewee. I dropped the relevant interview text portions into their slots in these boxes, adding cross-reference notes. This gave a well-structured set of data according to themes, while the database enabled richer sets of cross-references to be explored. However this ordering was in no way a substitute for the deeper, ethnomethodologically-based knowledge that underlay and informed my understanding of the interview data.

I could, then, identify the broad nature of the dominant story-line. It consisted of interwoven narratives that depended on or followed from each other, and functioned so as to bolster the arguments for the policy, defend its weaknesses, silence objections, and promote it. It was also clear that some of the narratives were emerging, diminishing or changing, so that there was not just one fixed version of the story-line. Even within the six months from the start of my telephone contacts with policy actors to the end of the interviews, at least one narrative had faded from the picture, its original advocates now all but denying they had ever meant what their writings clearly said (see Chapter 6, Subsection 6.4.2, on 'ESP130').

It became clear that the data could readily be interrogated in line with the theoretical research questions. To begin with, much of the story-line appeared to configure the solution to the problem in ways that did not match well with the materiality and socio-materiality, as I had come to understand it, through the natural and applied science aspects of the research. This resonated with my first research question. Further, and applicable to my second research question, a considerable amount of the mismatch seemed to be due, at least in large part, to the assumptions brought into the policy discourse in the officially solicited reports of the expert knowledge community. Finally, a great deal of the policy discourse was concerned with refuting objections, and repairing and renewing the story-line in the face of challenges and changes in the material realities to which it referred, or in actors' understandings of these. This related to my third research question.

So in a further sorting process I was able to map out how certain aspects and connectivities between and amongst the key narratives contributed to the story-line and related to the three theoretical research questions. This formed the basis of my three empirical chapters.

It was, of course, not a coincidence that this somewhat tidy relationship arose, as my interviews had been conducted with the research questions in mind. A thoroughly hermeneutic study can work this way, because we are not trying to find out what 'is', from a neutral position, in relation to some detached understanding of how the social world should be. Rather, we are bringing specific questions which are borne out of what we think is important in our world.

It also became clear that certain persons and organisations had a lot more influence than others in the content of the story-line. Certain names came up over and over again, cited as having proven certain key points about the physics or economics or sociology of thermal renovation. There were few elected politicians in this ensemble. Instead, the three biggest names were Professor Wolfgang Feist, the co-inventor of the passive house, Dr Andreas Enseling, of IWU, and DENA, with its database of so-called 'demonstration projects' (*Demonstrationsobjekte*). It was also clear that there were direct name-drop links amongst most of the experts within the institutes that write the expert reports which guide the government in developing the written policy. It seemed that the political or values influence within this policy domain came very much from the knowledge community, perhaps far more than from elected representatives and their civil service agencies. This realisation also helped shape my analysis of the interview data.

3.7 ETHICAL ISSUES

The fieldwork was carried out within the guidelines of the UEA's Research Ethics Framework. In particular, attention was given to issues of informed consent, assurances of anonymity, secure data storage, the availability of information, and covert observation. A further ethical issue was authenticity of data. There were no issues regarding interaction with vulnerable people.

3.7.1 Informed consent

I needed to make it very clear to interviewees what I was asking of them. This was straightforward with private homeowners: I wanted to hear, record and transcribe their stories (see above), so that I could interpret and report these anonymously in my research and in conversations with policymakers. I offered all interviewees the option of receiving a copy of the interview transcript, which they could then correct or change, so that the final version expressed what they wanted to say. While this met an important ethical requirement, it also led to what I would call ‘data drift, as I explain in Subsection 3.7.6, below.

Some homeowner interviewees did not want to be recorded but permitted me to report my understanding of what they had said, again anonymously.

The issue of informed consent was somewhat more complicated with policy actors. I needed to make it clear to them that I was not simply asking for technical details or their learned opinions on matters of policy development and implementation. I wanted to engage with them in dialogue to hear their responses to issues and challenges that the policy and its implementation presented.

However, I could not guarantee that my interviewees would be familiar with concepts such as ‘reproducing policy discourse’. In any case, there is no straightforward German equivalent of this expression, nor of the word ‘narrative’ as it is used in relation to discourse. So I wrote a standard email to all policy actor interviewees, in which there were two key sentences which, I believe, covered this. The letter opened with the words, *‘als Ingenieur und Sozialwissenschaftler arbeite ich momentan an einer Doktorarbeit zum Thema energetische Gebäudesanierung ...’* (‘As an engineer and social scientist I am working toward a doctorate on the theme of thermal renovation ...’). I expected this would alert them to the fact that I was interested in both social *and* technical matters. Later in the email I said, *‘... da ich überzeugt bin, dass Sie mit Ihren Gedanken und Ideen Wesentliches zum Verständnis dieses wichtigen Themas beitragen können.’* (‘...for I am convinced that you, with your thoughts and ideas, can make a significant contribution to this theme.’) I hoped this

would make it clear that their personal views and utterances were as important to me as any technical details of policy or practice they would be talking about.

3.7.2 Confidentiality and anonymity

All my private homeowner interviewees accepted my suggestion of confidentiality. Homeowners in small villages could possibly be identified by their remarks, so for these interviews I give the name of the region or the state, rather than the village, in the citations.

With policy actors I offered confidentiality both in my introductory email and again in person at the time of the interview. Several took this up, so to protect their identities I have only vaguely indicated their institutional position in the citations. Most policy actors, including all experts, said they very much wanted their names to go forward with their quotes. This aided my research because I am able to show connections between the interview discourse and the published writings and/or institutional connections of my interviewees.

3.7.3 Secure data storage

The computer on which I stored the data is password-protected. However I was using my UEA email account to send interviewees their transcripts, just at the time when the UEA server was hacked into and a large quantity of UEA emails leaked to the press. The news of this came out shortly before my interviews in Berlin, and some Federal officials expressed concern about the security of my university's email system. In response I offered to use my private email account from that time on.

3.7.4 Availability of information and authenticity of data

It is essential that people who read this thesis are confident that my data is genuine. However the data cannot be made available to the public, as it is confidential and anonymous. Therefore I developed the following system:

As I transcribed each interview I read off the elapsed time from Windows Media Player every few minutes and noted this in square brackets in the transcript, thus: [45:23]. Then, in quoting or referring to a comment from an interviewee, I include the *nearest time* to the comment, in the citation, thus: (IV_Enseling [27:54]). It is therefore possible to trace the comment to the transcript of the audio and check that the interviewer really did say this, and that it is used in context. Of course, a reader would need to know German to do this, as the transcripts are in German and I have translated into English only those portions I used in the thesis text.

However, as some of the transcripts are confidential, they may *only* be read for the purpose of checking the authenticity of my data, and *only* by a bona-fide academic under the discipline of her or his university department, and *only* upon signing an agreement to read *only* the relevant passages, for this purpose and none other. It also must be emphasised that this is not detached data that retains its significance independently of the person (myself) with whom it was produced. Its use for any other type of research would therefore be inappropriate and misleading. In any case, the interviewees gave permission for its use only for this specific research project.

There were also interviews that I was not permitted to transcribe. For these I cannot provide evidence to verify that my interpretations of these conversations are reliable. This remains a weakness, but not a significant one, as there is no aspect of the argument of this thesis that depends crucially on any of these. In particular it was disappointing that I could not record my interview with key Federal CSU MP Dr Georg Nüßlein. He permitted me to report what I could recall of our conversation, but this inevitably led to a loss of detail. However, what he said was fully consistent with the comments of his sister-party's (CDU) colleague's parliamentary energy researcher, with whom I conducted a recorded interview a few days earlier⁵⁹.

I promised all interviewees that they would receive a web link to the full thesis when it is finished, and also a 10-20-page summary in German.

⁵⁹ My interviewee, Marcus Hagel, is the parliamentary staff researcher for Dr Joachim Pfeiffer. Pfeiffer and Nüßlein together headed the research team that Hagel played a leading role in.

3.7.5 Covert Observation

I made no covert observations of any aspect of interviewees' actions or work, and all observations of homeowners' heating systems, energy bills, etc. were made under their supervision and on the understanding that they may be used in the research. Of the four leading policy actors whose speeches I observed, one was also an interviewee, and I used only interview data in this case. Further, all but one were speaking at public forums with the press overtly present, while the other spoke at a faculty seminar that was open to the public and widely advertised.

A possible issue of covert observation is the photographs I took of houses and apartments throughout Germany, some of which are used for illustrative purposes in the Picture Gallery, Appendix 7. However, these photographs were all taken from the street or public parks or access ways, so nothing is being revealed that is not already on public display.

3.7.6 Data drift

As indicated above, I offered every interviewee the option of receiving a draft transcript of their interview from me and making any additions, alterations or corrections they desired, so that the transcript expressed what they felt was true for them. Approximately one-third of my interviewees took this up. Most made modest corrections to their or my conversational grammar, and some changed matters of detail, such as homeowners who changed the number of years they expected to remain in the house where they currently live. Some made very helpful additions, such as a high Federal official, who inserted an actual figure for the percentage of residential heating CO₂ emissions he estimated were caused by small (one-to-six dwelling) residential buildings. One clarified a point about the take-up of a new thermal renovation technology that his department had investigated, and this corrected a false impression I had gained.

Mostly, however, I lost data through interviewees' self-corrections, or at least, the data 'drifted'. In particular, many colourful expressions of feeling were excised, so

that the passion some had expressed for or against certain views or practices was weakened.

More interesting, and in some ways challenging, four policy actor interviewees, who wanted their names to go with their quotes, requested that I send them not just the transcription, but also my English translation of all the passages I was quoting or referring to. This became very time-consuming, since three of these made this request after I had sent them their transcripts and waited 8 months for their response. By this stage my draft empirical chapters were well written, and it was a major exercise to pull out my quotes and allusions to their words and match them up with the originals in the transcripts (my WMP timing system helped a great deal in this). It was further challenging that I then had to wait months, in some cases, for the replies, and revise parts of my chapters to accommodate the new versions of their comments. Further, I was not able to incorporate extra quotations from these interviewees as I wrote the final amendments to the thesis, as the delays in getting my English translations of the quotations cleared with them would have been too great.

The broader question this raises concerns the integrity of utterance discourse data when it metamorphoses into written textual data. I strongly suspected that the words uttered in the interview were far closer to those used in daily discursive positionings and power struggles, than the modified, or even sanitised, written versions I finally got from these interviewees. There were no substantive changes that would alter the main issues or story-lines, but there was a loss of the sort of language that people use to influence others. Fortunately these features were not lost from the majority of my interview transcripts, since most interviewees happily accepted the transcript I sent them.

3.8 SUMMARY AND REFLECTION

The methodology arose out of the understanding of knowledge that was developed in Chapter 2. The methods chosen were consistent with this methodology, and were designed to test the theoretical framework developed in Chapter 2 as an approach to answering the theoretical research questions, by means of an empirical study of German Federal policy on thermal renovation of existing homes. This empirical study

was designed to answer the evaluation questions developed in Chapter 1. The research uses different methods for exploring the hermeneutic and the material data, but both are rooted in an understanding of knowledge as socially constructed.

Hermeneutic data was obtained through semi-structured interviews with key and representative policy actors, by listening to their speeches and audience interchanges, and by reading their documents. This was complemented with semi-structured interviews with a small number of the policy's target group (see Tables 3.1 and 3.2). This is qualitative data. Statistical, quantitative social data on relative occurrences of various viewpoints, and their correlation with each other, was only marginally appropriate in this study. The study focuses on narratives, which can be produced by an actor quite independently of other related or non-related narratives, and on issues of discursive dominance, which does not work by numbers.

Data about materiality has been obtained as in the natural and applied sciences, through reading scientific productions based on experimentation and calculation, critical reading of expert reports on the materiality of the policy area, and gathering and processing new on-site data. This data is both qualitative and quantitative: it shows how things work, plus their numeric dimensions and the numeric and statistical relationships between variables.

The interpretation of both the hermeneutic and materiality data, and their interactions, has been set against a background of wider but less systematic observations of the empirical domain over a long period of time.

Particular attention has been paid to validity of data, in terms of the choice of actors interviewed and their roles in the policy process. The interview and speech data has been processed systematically, but care has been taken to respect its hermeneutic and literary nature.

The research questions have driven the choices of topics and themes raised in the interviews, as well as the natural and applied science investigations. These questions have also played a guiding role in how the data has been formed into content for interpretation and presentation in the empirical chapters. There is no claim that my

findings represent ‘the truth’ in any complete sense. Rather, they are offered as a valid answer to the research questions in respect of this policy domain at this time.

Ethical considerations have been incorporated into the study in its design, planning, communication to interviewees, fieldwork, and data usage. My obligation to interviewees will be further fulfilled by their being given copies of the thesis and a summary of it in their native German.

Table 3.1 Policy actor interviewees and speakers

Type	Sub-type	Name (where permitted)	Notation	Organisation	Position	Notes
Politician	Federal	Hans-Josef Fell	IV_Fell	Green Party	Federal MP & Energy Spokesperson	
Politician	Federal	Dr Georg Nüßlein	IVN_Nüßlein	CSU	Federal MP & Energy co-spokesperson	Co-initiator of ESP-130 (Ch 6)
Politician staff	Federal	Marcus Hagel	IV_Hagel	CDU	Energy Researcher for MP Pfeiffer	Co-initiator of ESP-130 (Ch 6)
Bureaucrat	Federal	Thomas Kwapich	IV_Kwapich	DENA	Director, Energy Efficient Buildings Section	
Bureaucrat	Federal	Dr Alexander Renner	IV_Renner	BMVBS	Policy researcher, building energy efficiency	
Bureaucrat	Federal	Christel Willenbrock	IV_Willenbrock	BMVBS	Administrator, KfW incentives	
Bureaucrat	Federal	Hans-Dieter Hegner	Hegner, 2009	BMVBS	Director, Energy-efficient building research	Seminar speech and discussion
Bureaucrat	Federal	Dr Rolf Müller	IV_Müller	BBR	Director of BBR	Decides who gets commissions to write expert reports
Bureaucrat	Federal	Jochen Flasbarth	Flasbarth, 2009	UBA	Director of UBA	Charismatic advocate of tight thermal rules.
Bureaucrat-Engineer	State (NRW)	Anonymous	IV_Köln_A	North-Rhine-Westphalia, Cologne office	Director, NRW building renovation programme in Cologne	Active in '50 Solar-Siedlungen' programme
Bureaucrat-Engineer	State (NRW)	Anonymous	IV_Düsseldorf	North-Rhine-Westphalia	Director, NRW statewide building renovation programme	Active in '50 Solar-Siedlungen' programme

(Table 3.1 continued overleaf)

Table 3.1 continued

Bureaucrat-Engineer	State (Hamburg City-State)	Anonymous	IVN_Hamburg_A	Hamburg City-state	Administrator, Hamburg thermal renovation programme	
Bureaucrat-Engineer	State (Hamburg City-State)	Anonymous	IVN_Hamburg_B	Hamburg City-state	Administrator, Hamburg thermal renovation programme	
Politician	Municipal (Munich)	Sabine Krieger	IV_Krieger	Green Party	Energy spokesperson	
Politician	Municipal (Munich)	Nikolaus Gradl	IV_Gradl	SPD	Energy spokesperson	
Politician	Municipal (Augsburg)	Rainer Schaal	IV_Schaal	CSU	Energy spokesperson	
Politician staff	Municipal (Munich)	Sabine Gehring	IV_Gehring	Green Party	Energy researcher for Municipal Green caucus.	
Bureaucrat-Engineer	Municipal (Munich)	Adolf Tomani	IV_Tomani	Munich City	Thermal renovation costing and promotion head.	
Bureaucrat-Engineer	Municipal (Munich)	Roland Gräbel	IV_Gräbel	Munich City	City liaison officer for Bauzentrum (see below)	
Bureaucrat-Engineer	Municipal (Munich)	Anonymous	IV_Munich_A	Munich Bauzentrum (Building advice centre)	(not given, to preserve anonymity)	
Expert	University Building Physicist & eco-institute head	Professor Gerd Hauser	IV_Hauser	Munich Technical University; Fraunhofer Inst. For Building Physics Stuttgart	Head of Faculty; Director of Institute	'Father of the Energy Certificate'; Doctoral supervisor in Passive House development.
Expert	University Building Physicist & eco-institute head	Professor Wolfgang Feist	Feist, 2009	Innsbruck University; Passivhaus Institut Darmstadt	Head of Faculty; Director of Passivhaus Institute	Co-inventor of Passive House; founder, director and major shareholder of Passivhaus Institut

(Table 3.1 continued further overleaf)

Table 3.1 continued (3rd page)

Expert	Eco-institute researcher: economist	Dr Andraes Enseling	IV_Enseling	Institut Wohnen und Umwelt (IWU) Darmstadt	Researcher and writer	
Expert	Eco-institute researcher: engineer	Marc Großklos	IV_Großklos	Institut Wohnen und Umwelt (IWU) Darmstadt	Researcher and writer	
Expert	Eco-institute researcher: sociologist	Ulrike Hacker	IV_Hacker	Institut Wohnen und Umwelt (IWU) Darmstadt	Researcher and writer	
Expert	Eco-institute researcher: Bldg physicist	Oliver Kah	IV_Kah	Passivhaus Institut Darmstadt	Researcher and writer	
Expert	Eco-institute researcher: engineer	Hans Hertle	IV_Hertle	Institut für Energy und Umweltforschung (Ifeu), Heidelberg	Researcher and writer	
Practitioner	Technical manager	Dr Georg Vogelsang	IV_Vogelsang	LUWOG (housing provider for BASF), Ludwigshafen	Technical manager	Develops prototype thermal renovation models for expert reports
Practitioner	Technical manager	Uwe Neuhaus	IV_Neuhaus	Erbbauverein housing co-op, Cologne	Technical manager	Extensive thermal renovation projects are applauded by government
Researcher	National research	Ingrid Vogler	IV_Vogler	GdW (national assn of housing providers)	Chief researcher	One of the few informed critics of the regulations
Researcher	Architect	Anonymous	IVN_Bavaria_B	Technical University (name withheld)	Researcher	

(end of Table 3.1)

Table 3.2 Private homeowner interviewees: all anonymous

Location	Type of dwelling	Notation	Thermal renovation status	Social/personal factors
Augsburg	Semi-detached house	IV_Augsburg	Declined to renovate	Older single woman
Village in southern Bavaria	Semi-detached house	IV_Bavaria_A	Partially renovated	Older single man
Village in Northern Bavaria	Large free-standing house	IVN_Bavaria_C	Did full renovation	40 year old husband and father
Village in Franconia	Large free-standing house	IV_Franken_A (male); IV_Franken_B (female)	Did renovation before current strict renovations	Middle-aged married couple
Village in NW Franconia	Small free-standing house	IVN_Franken_C	Declined to renovate	50 year old father and husband
Lübeck (far north of Germany)	Very large communal house	IV_Lübeck	Full renovation planned	40 year old female member of small housing co-operative
Lüneburg (near Hannover)	Large free-standing house	IVN_Lüneburg	Planning full renovation in stages	50 year old husband and father
Cottbus (Brandenburg, east)	Small free-standing house	IV_Cottbus_A	Did partial renovation	Retired, husband and father
Cottbus	Med. sized free-standing house	IV_Cottbus_B	Declined to renovate	35 year old wife and mother; also an architect
Cottbus	Large apartment in communist-era block	IV_Cottbus_C (male) IV_Cottbus_D (female)	Whole block comprehensively renovated	Middle-aged couple; children now left home
Würzburg	Med. sized free-standing house	IV_Würzburg	Did comprehensive renovation	50 year old father; lost house in divorce settlement
Erfurt (Sth East Germany)	Small hotel with home attached	IVN_Thüringen	Did comprehensive illegal ('sub-standard') renovation	Middle-aged hotel owner living on site
Baden (near Stuttgart)	Large free-standing house	IVN_Baden	Did full renovation in excess of required standards	60 year old husband and father
Berlin	5-storey apartment block, co-operatively owned	IVN_Berlin	Partial, fairly full renovation	40 year old female representative of small housing co-operative

Chapter 4 THE POLICY AND ITS MATERIAL INTERPLAYS

4.1 INTRODUCTION

Chapters 4, 5 and 6 present the findings of my empirical research, in the context of the research questions and the theoretical framework developed in Chapter 2. Each of these three chapters relates aspects of my empirical research findings to a different theoretical research question, though there are important overlaps. The chapters also introduce different aspects of the German project of thermal renovation of existing homes in such a way that a fairly comprehensive picture is presented through the chapters.

This chapter addresses the first theoretical research question:

In an environmental policy domain:

How does policy discourse interplay with the material realities it is designed to influence?

The chapter highlights the junctions and disjunctions between the policy discourse and the material and socio-material domains at which the policy is aimed. It introduces the German policy domain of thermal renovation of existing homes and some of its chief characteristics, and explores how well the written policy and the discourse that supports and enlivens it relate to the material and socio-material objects of the policy, i.e. the (physical) dwellings, the (human) homeowners and the (socio-technical) households. Some sections of this chapter consist of rather mundane, technical outlines of the policy and the regulations that are central to it. This includes complex logic and hard numbers. Other sections include equally mundane descriptions of relevant characteristics of the German housing stock, the technologies of thermal renovation, and the thermodynamics and geometry of these technologies' effects on housing. Since this thesis concerns both discourse and materiality, an understanding of this materiality is essential if we are to grasp the significance of the policy discourse, and its junctions and disjunctions with materiality. Further, I have

not found any other description or analysis of the policy and regulations in English, to which I could refer readers, and those in German tend to be either promotional or specialist-technical, aimed at a particular branch of the building trade⁶⁰. Hence this rather mundane beginning is essential to put the empirical research in context.

The chapter proceeds as follows.

Section 4.2 presents an overview of the written policy as it has developed over the last 10 years, looking at how it relates to its material objects. In Section 4.3, key influences of the knowledge community, on discourse about the relevant materiality, are introduced and discussed. Section 4.4 shows how the government's CO₂ reduction goal has become embedded in the policy, and the effects this has on its coherence and implementation. Section 4.5 focuses on the effects of the continual tightening of thermal standards in the policy, and how these impact on the discourse-materiality axis. Section 4.6 gives an overview of the Federal subsidy system for thermal renovation, and its material and discursive characteristics and effects. In Section 4.7 I reflect upon these findings in relation to the theoretical framework.

4.2 THE WRITTEN POLICY

4.2.1 Origins of the policy

Germany first included insulation requirements in its building code in 1977 in the wake of the 1973 oil crisis. These were given in the *Wärmeschutzverordnung* (WSVO - Thermal Insulation Regulations⁶¹), and applied to both new builds, and reconstructions of old buildings. In 1989 and again in 1995 these regulations were tightened, i.e. the insulation had to be more thermally resistant so that the building used less energy for heating. The rationale for this, as noted in the regulations, was to save energy. The maximum permissible energy usage varied according to the geometry and size of the building, but on average, requirements were tightened by

⁶⁰ Descriptions of the policy and regulations, of various kinds and for a various audiences, can be found on the websites of German government ministries and agencies: www.bmvbs.de, www.dena.de, www.bmu.de, www.uba.de, and of firms and organisations related to the building trade: e.g. www.rowa-soft.de, www.gdw.de.

⁶¹ The *Wärmeschutzverordnung* was translated in various ways in English during its 26 year life: Thermal Insulation Regulations, Heat Protection Ordinance, Heat Insulation Regulation, Energy Conservation Regulations, Heat Insulation Ordinance.

16% in 1989 and a further 30% in 1995 (Hegner, 2009). As we shall see, they were tightened by further steps, of 30% in 2002 and approximately 30% in 2009. Official policy is to tighten by a further 30% in 2012.

In 1998, under the Red-Green government of Gerhard Schröder, significant changes were envisioned, resulting in the Thermal Insulation Regulations being replaced by the *Energieeinsparverordnung* (EnEV - Energy saving regulations) in 2002.

Four significant developments are seen in these 'EnEV' regulations.

Firstly, the thermal retention requirements were tightened by a further 30%, as noted above.

Secondly, concern for climate protection and the reduction of CO₂ emissions was brought into the written text of the regulations. The preamble declared: 'Due to the significant energy saving potential in the built environment, the EnEV 2002 provides a significant element of the government's climate protection programme' (Begründung der EnEV 2002, para. 1). The tightening of the regulations, it said, would provide 'a 25% reduction in CO₂ emissions from the built environment by 2005 compared to 1990 levels' (Begründung der EnEV 2002, para. 1). Federal Minister of Buildings Wolfgang Tiefensee reported in 2007 that the actual reduction achieved was 13% (Tiefensee, 2007.363). This included the massive renovation programme of former East Germany's run-down building stock immediately after reunification.

The current goal is a 20-40% reduction by 2020 and 80% by 2050 (BMU, 2007: 4-6). This is not written directly into the regulations but derives from government declarations on climate change mitigation, as set out in the Meseberg Declaration (see Chapter 1, Subsection 1.3.5).

Thirdly, the regulations as set down in EnEV 2002 would apply not only to new builds and reconstructions, but to any feature of an existing building that was having 20% or more of that feature of the building renewed or replaced. For example, if 20%

of the west wall needed to be repaired, the entire west wall had to be refitted to the new-build thermal standard.

The regulations also applied to any extension to an old building if the extension was larger than 30 cubic metres.

Fourthly, an alternative was offered for existing buildings that were being comprehensively repaired or renovated. Instead of renewing individual features of the building to the new build thermal standards, as outlined above, the builder could renovate the entire building to a thermal standard 40% less stringent than the new build standard. This means its energy consumption could be 40% more than that of a new building of exactly the same dimensions. This alternative, 'EnEV 140' as it was then called, has also been offered in subsequent EnEV regulations (EnEV 2007 and EnEV 2009), but is now called 'EnEV plus 40'.

4.2.2 Measuring heat loss

A further development in EnEV 2002 was the way heat loss from a building is calculated. EnEV 2002 anticipated the European Union's 'Energy performance of Buildings Directive' (EPBD, 2002; 2009/2003), which included the requirement that the energy consumption of a building be calculated in an 'integrated' way.

There are various ways this can be done, and two of these were brought together into a rather complex, combined package in EnEV 2002. Firstly, the regulations were set out in terms of the maximum permissible heat transfer rate (i.e. rate of heat loss, abbreviated to ' H_T ') through the building envelope, given in W/m^2K (Watts per square metre of wall area (or area of the building envelope) per degree Kelvin difference between indoor and outdoor temperature). This figure varies for various components of the building envelope, but an average value had to be worked out for the entire building.

Secondly, the regulations set out how much energy a building was permitted to consume each year to keep its indoor temperature at a specified level (usually taken to be 19-23°C in Germany). This parameter is given in kilowatt-hours per square meter

of living space per year ($\text{kWh/m}^2\text{a}$) and is known as Q_T . Further, since ‘primary’ energy⁶² is a more accurate measure of the energy used than ‘end-use’ energy⁶³, primary energy consumption was used as a basis for Q_T in EnEV 2002 rather than end-use energy, which had been used in the Thermal Insulation Regulations. The main effect of this is to significantly reduce the permissible consumption where electricity is used for heating, since each kilowatt hour of electricity consumed in the home requires around 3 kilowatt hours of energy to be generated and transmitted. Oil and gas heating do not lose large amounts of energy as their supply is much less wasteful.

In the case of repairs to *individual* features of existing buildings, EnEV 2002 required compliance with the new-build H_T values⁶⁴. However, *comprehensive* refits of an entire building required compliance with the Q_T values of EnEV 2002, but with the 40% allowance explained above.

However for new builds, both H_T and Q_T had to be complied with.

There are several reasons for the inclusion of both these parameters in EnEV 2002.

Firstly, a small or irregular shaped building, or a building with one of its three linear dimensions much smaller than the other two, has a far higher ratio of surface area to volume than a larger or more nearly cubic (or ideally spherical) building. Therefore a building of the first type needs better (i.e. lower) H_T values to retain heat, since more heat is lost through the greater surface area. Ideally this problem would be solved by requiring all buildings to have the same Q_T value, as it would cause all to consume the same amount of fuel per square metre of living space each year. However this would require smaller or more odd-shaped buildings to have extremely low H_T values and therefore excessively thick insulation. So a compromise was devised in EnEV 2002, whereby smaller (or more odd-shaped) buildings must have *somewhat* lower H_T values than larger buildings, but may have higher Q_T values, so that their H_T values

⁶² ‘Primary’ energy includes the energy required at all points in the energy production and delivery chain. With electricity, for example, it takes into account generator inefficiency, transmission line loss, transformer loss, and the inefficiencies of the components in the home.

⁶³ ‘End-use’ energy takes into account only the amount of energy consumed in the home.

⁶⁴ The heat transfer loss of individual components are usually given in ‘U-values’, which have the same dimensions as H_T values.

do not have to be *excessively* low (which means their insulation does not have to be excessively thick).

This provides a good example of where policymakers have tried hard to match the regulations to the materiality at the target end of the policy. Most people in Germany live in small buildings of one or two households⁶⁵ and it would be excessively onerous if such buildings had to match the annual energy consumption per square metre of larger buildings.

The results of the compromise outlined above are set out in ‘Tabelle 1’ (Table 1) of EnEV 2002 (English translation at Appendix 4).

Basically, the H_T values, given in column 4 of this table, are mathematically easy to design for, since a builder simply averages the H_T values (i.e. the U-values) of the component parts of the ‘building envelope’ (windows, roof, walls, floor). However there is no direct way of achieving the desired Q_T value, which is given in columns 2 and 3. The H_T values required to achieve this Q_T value need to be calculated by a trial and error process using complex mathematical formulae given in publications of the *Deutsches Institut für Normung* (DIN - German Institute of Standards, www.din.de). An economical builder will keep doing trial and error calculations until she finds the maximum H_T value that will allow a house of that particular shape and size to achieve the maximum permissible Q_T value, without going above the H_T value set down in ‘Tabelle 1’. Fortunately for builders, there is good software available to do these calculations.

A similar process is required for a builder doing a comprehensive thermal refit of an existing building. First, he finds the Q_T value, from the EnEV’s Table 1, for a new build of that geometric form and size. Then he multiplies this by 1.4 (i.e. adds 40%). Then he uses the DIN mathematics to work out what average H_T value is required to achieve that Q_T value. Then he shuffles various combinations of H_T values of available window, roof and wall options, until their average comes to or below the H_T value he got from the DIN mathematics.

⁶⁵ About 17 million of the 39 million homes in Germany are single dwelling, free-standing houses, while 75% are in buildings of 6 dwellings or fewer.

There is a second issue with the use of both these parameters. A household on the relatively warm North Sea coast will consume far less energy than an identical household in an identical house in the much colder Bavarian Alps to keep the same indoor temperature, even if the buildings' H_T values are identical. Hence it would hardly be fair to demand that the coastal house be as heat-retentive as the alpine house. However the parameters in EnEV 2002's Table 1 do not take this into account. Nevertheless, the German government has made a place for it in its fulfilment of another clause of the Energy Performance of Buildings Directive, which requires energy performance certificates to be produced for buildings. For this, Germany was divided into 39 Geographical regions, each with a 'climate factor' based on its number of heating degree-days. The Q_T performance of a building is then multiplied by this factor to get its more realistic value, which is recorded on the energy certificate. But this level of precision was found not to be good enough, so from October 2009 it has been refined, to 8,234 distinct climate zones.

4.2.3 The regulations to October 2009 and beyond

EnEV 2002 was replaced by EnEV 2007 on 1 October 2007. This brought the inclusion of non-residential buildings into the EnEV ambit, the requirement for an energy performance certificate after significant building alterations or when an existing building is getting a new owner or tenant, and the inclusion of cooling systems' consumption in a building's energy tally. However it did not change the required levels of H_T and Q_T , nor the basic methodology of calculating these.

Exactly two years later, 'EnEV 2009' came into force. This brought five main changes.

Firstly, every new building, or comprehensively refitted building, is required to produce a certain portion of its hot water or space heating by means of renewable energy produced 'on-site'⁶⁶. The proportions vary according to the energy source (solar, biomass, etc) and are set down in a new law, the *Erneuerbare-Energien-*

⁶⁶ 'On site' means attached to the same building or group of immediately connected buildings.

Wärmegesetz (EEWärmeG – ‘Renewable energy heating law’), which dovetails with EnEV 2009.

Secondly, EnEV 2009 tightened, i.e. reduced, the maximum permissible heat energy consumption by around 30% compared to EnEV 2007. The actual percentage varies with the type of building, as I explain below.

Thirdly, it tightened the conditions under which existing buildings must be comprehensively or partially thermally renovated. They must be renovated to EnEV 2009 standards if 10%, rather than 20%, of any particular feature of the building is being altered or repaired.

Fourthly, it significantly changed the way a building’s thermal requirements are calculated. The new methodology works as follows.

To begin with, a builder renewing a *single* feature of an existing building has to conform to a table of ‘U-values’. These have the same dimensions as H_T values (W/m^2K), but refer to the heat transmission of specific components: windows, roof, wall, etc. These U-values are lower (better) than those in EnEV 2007 and EnEV 2002 and they would, in theory, lead to an approximate 30% reduction in Q_T value if done over the whole building envelope.

A further change applies to new builds and comprehensive refits. The basic difference is the way H_T and Q_T values interconnect. There is now no ‘Table 1’ for whole-building H_T and Q_T values⁶⁷. Instead of having fixed, maximum permissible energy consumption (Q_T) and heat transfer (H_T) values for a building of a given shape and size, the methodology hinges more directly on maximum permissible heat transfer.

A builder designing a new house does as follows. First, she draws up a model of the house she intends to build. She gives each component (window, wall, door, roof gable, etc) a standardised ‘U-value’ for that building feature, as set down in the table of U-values (see above). She also includes the standard renewable energy figures for

⁶⁷ There is a ‘Tabelle 1’ (Table 1) in EnEV 2009, but this is the list of U-values referred to above.

the type of renewable energy generation she is planning to install. All this produces her ‘reference building’ (*Referenzgebäude*). She then feeds all the dimensional data of this building, together with its U-values, into a mathematical model based on the DIN mathematics, to find out what Q_T value (called ‘ Q_{T-ref} ’) such a building would have. Next, she draws up another model of her building, and this time puts in the *actual* U-values of the *actual* components she wants to use. This is called her ‘is-building’ (*Ist-Gebäude*). She now feeds all the data of her ‘is-building’ into the DIN model, and the Q_T value that emerges is the *actual* Q_T value (called ‘ Q_{T-ist} ’⁶⁸) for her house. If this is equal to or lower (i.e. better) than Q_{T-ref} , her building has conformed to the regulations. If not, she has to go through the second stage again, using better (lower) U-values for some of her components, or a bigger solar collector or biomass generator, etc. She repeats this process until her ‘ Q_{T-ist} ’ value is as low as or lower than ‘ Q_{T-ref} ’.

However there is one extra requirement: a further table gives maximum permissible H_T values for various types of buildings, according to the number of exposed sides they have, divided into 5 broad categories. A semi-detached house, for example, has only three exposed walls (not four), so it can have thinner insulation (and therefore a higher H_T value) yet still stay as warm as a detached house with thicker insulation (and therefore a lower H_T value). So a semi-detached dwelling is allowed to have a maximum H_T value of 0.45 W/m²K, compared to 0.40 W/m²K for a small detached house. These figures have to be adhered to even if the average of all the U-value components, as calculated above, is higher than this. This is to guard against excessive heat loss in cases, for example, when most of the wall area consists of windows⁶⁹. An English translation of this table is given in Table 4.1. Note that for H_T values, given in the far right-hand column, the lower the value, the higher the thermal standard. A_N is the liveable floor area.

A builder doing a comprehensive renovation on an existing building goes through exactly the same process, except that she multiplies Q_{T-ref} by 1.4 as she proceeds.

⁶⁸ ‘ist’ is the German word for ‘is’.

⁶⁹ The maximum permissible U-value for a window is 1.30 W/m²K, but for an outer wall it is 0.35 W/m²K.

Category	Building type		Maximum permissible heat transfer loss, H_T
1	Free standing residential building	$A_N \leq 350 \text{ m}^2$	0.40 W/m ² K
		$A_N > 350 \text{ m}^2$	0.50 W/m ² K
2	Residential building with one attached wall, as in a semi-detached house		0.45 W/m ² K
3	All other residential buildings (e.g. with two attached walls, as in a mid-terraced house)		0.65 W/m ² K
4	Extensions and enlargements of existing residential buildings		0.65 W/m ² K

Table 4.1 Maximum permissible heat transfer loss (H_T) for buildings of various wall configurations, in EnEV 2009. A_N is the liveable floor area.

In one important sense, the new method in EnEV 2009, with its $Q_{T\text{-ref}}$ and $Q_{T\text{-ist}}$ design process, represents an even more successful attempt, than that in EnEV 2002, to align the regulations with the materiality of buildings. For small houses, it enables a greater flexibility of design, in that an architect can include more features that have high heat loss – for example windows – without falling foul of the Q_T requirements (as long as he also obeys the rules in Table 4.1, above). As thermal requirements are tightened, there is a danger that designers will try to meet them by having fewer windows and more wall space, which is a far better insulator. But, conscious of this aspect of the materiality of buildings, policymakers have introduced this innovation which more effectively prevents small buildings having to have as good energy performance as large buildings. For example, for the smallest freestanding houses, H_T has been reduced by only 9%, from 0.44 W/m²K (in EnEV 2002 and 2007) to 0.40 W/m²K in EnEV 2009. However for the largest freestanding residential buildings it has been reduced by 52%, from 1.05 W/m²K to 0.50 W/m²K. In plain English, EnEV 2009 is much tougher on big buildings than on small ones.

In the case of small buildings, it is noteworthy that this indicates that possible gain through increased insulation is much less than the ‘average’ reduction of 30%. It shows there is a subtlety and flexibility within the technical details of the regulations

that, I will argue below, is not matched in the policy discourse that is driving other key developments. It also suggests that, whatever the policymakers decide, the technical staff who have to interface the policy with the materiality are limited by what the materiality can actually do.

In addition to the changes in the methods of working out what thermal retention values a building must have, a steady tightening can be seen since the first version of the Heat Insulation Regulations in 1977. Table 4.2 gives the Ministry of Buildings' estimates of average Q_T requirements, over this period and looking forward to 2012 (Hegner, 2009).

Ordinance	Date in force	Typical Q_T (kWh/m ² a)
WSVO	1977	265
	1989	220
	1995	150
EnEV	2002 & 2007	100
	2009	70
	2012	50

Table 4.2 Estimates of legal maximum primary energy consumption for space and water heating in new buildings. Source: Hegner (2009)

To illustrate the ranges of Q_T requirements for various types of buildings, including both new-builds and refits, I offered calculations of 4 cases in line with EnEV 2002/2007 regulations in Galvin (2010a: Appendix B). The results are listed here in Table 4.3, with approximate EnEV 2009 values for comparison. The EnEV 2009 values are very rough guides only, as the new methodology makes these highly dependent on the positioning and size of windows, shape of the roof, and other geometric features. The table is colour-coded so that corresponding features can be easily compared.

Clearly, larger buildings may consume less heating energy per square metre, even though, as we saw above, smaller buildings need thicker insulation to get to their required standard.

Total floor area (m ²)	Regime	New or Refit	Q _T (kWh/m ² am)
150	EnEV 2002	New	111
150	EnEV 2002	Refit	155
150	EnEV 2009	New	78
150	EnEV 2009	Refit	109
1500	EnEV 2002	New	82
1500	EnEV 2002	Refit	114
1500	EnEV 2009	New	57
1500	EnEV 2009	Refit	80

Table 4.3 QT values for two refit and two new-build cases in EnEV 2002 and 2009 regimes (Galvin, 2010a: Appendix B)

The fifth significant change in EnEV 2009 is that the notion of an inspection and enforcement regime has been introduced. Germany does not have a strong formal institution, with trained and authorised personnel, to inspect building and refit projects to ensure that the thermal regulations are being complied with. Building inspection in Germany is haphazard and piecemeal, when it happens at all. EnEV 2009 introduces this requirement for the first time, but it is still very much an idea at the pre-drawing board stage. The lack of a strong inspectorate was seen by some interviewees as a problem (e.g. IV_Vogelsang [18:11]), but by others as of little consequence because of the professionalism of German tradespeople (e.g. IV_Neuhaus [36:55]). In terms of policy discourse analysis it is an interesting issue. For Hajer (1995; 2005a; 2010), a discourse becomes ‘hegemonic’ in a policy domain when it becomes dominant in the discourse of a policy coalition *and* embedded in the relevant institutions of governance. In this case, however, there is no institution to enforce the policy that has won acceptance. There are minor and peripheral checks – such as the requirement of professionals’ signatures when subsidies are applied for – but basically the EnEV is a

law without a police force. Hence, for example, I was easily able to find and photograph a number of refit projects which clearly would not meet the regulations (e.g. because the wall insulation was too thin), without having to go looking for such projects (see Appendix 7, Picture Gallery Nos. 3, 4 and 12).

This also raises the question as to how effective a building inspectorate could be, for thermal refits, if and when Germany establishes one. In Britain, which has a relatively well developed building inspectorate, there is evidence that energy efficiency regulations in new builds are poorly enforced (Fischer and Guy, 2009). This is largely because it is far from straightforward to check and test compliance in such a complex matter. If regulations simply prescribed heat transmission values for the various components of the building envelope, this would be relatively easy to check: the inspector would simply investigate whether the U-values for walls, windows, doors, roof and ground floor complied with the regulations. But this is much more difficult when regulations prescribe whole building performance. In the German case, to begin with, the building as a whole has to achieve an overall H_T -value (see Table 4.1, above). To check this credibly, independently, an inspector would need the skills to measure all the actual sizes of building envelope surfaces (which may be different from those on the plans), reliable information as to the U-values of the components, and the mathematical ability to calculate the average H_T -value from this data.

The next phase of calculation is even more complex, as it needs to be determined whether the components lead to the overall energy consumption permitted by the $Q_{T-ist} - Q_{T-ref}$ transformation. As indicated above, there are software packages for this, but one still needs exact measurements of building envelope component size and position to utilise this. As Fischer and Guy (2009) note, it cannot be guaranteed that UK building inspectors have the mathematical skills to ensure compliance with UK regulations, and people who do have such skills are generally highly paid. Experience in Britain tends to suggest that inspection of thermal performance takes a low priority in relation to other concerns such as fire safety, which can be more readily investigated. This is further complicated by the fact that, in comprehensive thermal refits, information may not be readily available as to the U-values of existing components, such as thick masonry walls, and how much extra insulation they need to bring them up to EnEV standard.

These sorts of issues will have to be faced as Germany establishes its thermal standards building inspectorate, but there does not yet appear to be widespread awareness of or concern for such matters among policy actors.

4.2.4 The ‘economic viability’ requirement

A further feature of all the EnEV regulations, of 2002, 2007 and 2009, is the declaration, in the text, that the construction work made necessary by the thermal retention requirements is ‘economically viable’ (*wirtschaftlich* - see discussion on this word in Subsection 4.2.5, below). This means that the thermal retention measures pay for themselves over a reasonable period of time through the fuel savings they effect. The purpose of this clause in the regulations appears to be twofold. Firstly, it serves to declare that the regulations have been developed in line with a process of checking the economic viability of the construction measures that are being demanded. Before each update in the regulations, the government has commissioned an expert report to check and prove this. There are difficulties with these reports, however, and I explore this issue in detail in Chapter 5.

Secondly, the clause provides a basis for exemptions to be made, in cases where the construction measures being demanded would clearly *not* be economically viable. However the presumption of the regulations, and the discourse surrounding them, is that the measures it demands are normally and virtually always economically viable, so that permission to renovate in contravention of these regulations is very difficult to obtain. The economic viability claim was unquestioned, and affirmed vigorously and triumphantly, among all but a few of the policy actors interviewed (e.g. IV_Düsseldorf [15:30]; IV_Gehring [02:51]; IV_Gräbel [04:28]; IV_Hagel [47:00]; IV_Hauser [08:00]; IV_Kah [07:08]; IV_Köln_A [57:12]; IV_Krieger [43:07]; IV_Vogelsang [07:44]).

In the course of my research this turned out to be the most basic but least credible part of the policy, i.e. where the policy discourse and its written forms seem most out of step with the materiality of the physical world. For this reason I will explore it in

greater detail in Chapters 5 and 6, though aspects of it will also be discussed in this chapter.

As I have noted above, one of the main differences between the Heat Insulation Regulations and the EnEV regime was the EnEV requirement that existing buildings conform to its thermal standards even if only minor repairs or renewals were needed. This is a point where I found the affirmation of economic viability most questionable, because of the widely variant characteristics of the existing building stock. A decisive factor in the development of this requirement was the influence of the Green party in the late 1990s, in particular its energy spokesperson Hans-Josef Fell, who is also credited with developing the legislation for the Feed-in Tariff for renewable energy (IV_Fell [22:32]; IV_Krieger [39:01]). The relevant minister at the time was Sigmar Gabriel, of the SPD, who is seen by the Green Party as having been fully supportive of the move (IV_Krieger [39:01]).

4.2.5 What it means to be *wirtschaftlich* – the meanings of words

The German adjective *wirtschaftlich* and its related noun *Wirtschaftlichkeit* cover a spread of meaning that does not correspond to the range of meaning of any particular English word pair. ‘Economic’ and ‘economics’ are probably the closest single word equivalents, but a word-for-word translation would be misleading in many, if not most, instances. Moreover, the specific meaning of *wirtschaftlich* in the EnEV and of *Wirtschaftlichkeit* in the expert reports relating to it, and of both words in the related policy discourse, is quite specific. A fair translation would be ‘economically viable’⁷⁰ (for the adjective *wirtschaftlich*) and ‘economic viability’ (for the noun *Wirtschaftlichkeit*). A project is economically viable if the financial return it brings is equal to or greater than the amount invested in it. The economic viability of an investment is established if it can be shown that the investment will pay back within the lifetime of the technology that has been installed.

This is what *wirtschaftlich* and *Wirtschaftlichkeit* are about in EnEV policy and discourse, and whenever I use the terms ‘economically viable’ and ‘economic

⁷⁰ I am grateful to Fabiola Blum for suggesting ‘economically viable’ as a serviceable translation of *wirtschaftlich* in this policy context.

viability' in this thesis I am translating these terms as they are used in this context. In this sense three important points need to be made. Firstly, although these German words have quite specific meanings here, the concepts they embody are of universal significance. Clearly, most people would prefer to undertake projects that are economically viable, than projects that lose money. Secondly, in climate change mitigation discourse, particularly within ecological modernisation discourse (see Chapter 1, Section 1.6), the argument is frequently used that measures to reduce GHG emissions are economically viable: they pay for themselves in the long run. The Stern Report is one example that makes much of this claim. So in this sense, the prominence of these words in EnEV policy and discourse serve as a link between it and the wider discourse of ecological modernisation.

Thirdly, however, in the German sense of these terms, a project may be deemed economically viable even if it just scrapes in on the criterion of paying for itself in the long run, compared to alternatives which may be far *more* economically viable – i.e. they may bring a far greater return per euro invested. If, for example, investing €30,000 in insulating my house will pay back within the lifetime of the construction measures (say 25 years), this is deemed *wirtschaftlich* for me even if I could alternatively invest the €30,000 in a wind farm and get a full payback in 10 years. *Wirtschaftlichkeit* in EnEV policy and discourse excludes the question as to what is the most economically efficient way to reduce GHG emissions. Hence would-be renovators have to confine their field of view to the more narrow issue of whether a project will or will not pay back.

4.3 KNOWLEDGE, DISCOURSE AND MATERIALITY INTERPLAYS

4.3.1 The influence of Wolfgang Feist

In the transition period from the Heat Insulation Regulations to the first EnEV, one of Germany's leading building physicists, Dr (now Professor) Wolfgang Feist, was commissioned to write the definitive expert report on economic viability, which included recommendations for the new regulations (Feist, 1997).

Feist is a key figure in the German thermal renovation policy discourse community and also in its knowledge community. In his doctoral thesis, under Professor Gerhard Hauser, another key figure in the policy community (IV_Hauser), Feist worked out the physics for the Passive House. He also co-authored the expert report on economic viability for the most recent tightening of the thermal renovation building code (Kah, et al., 2008), which came into force on 1 October 2009 (EnEV 2009), and he is widely seen as being the brains and ideological driving force behind it. Further, he founded the Passivhaus Institut in Darmstadt as a private foundation (www.passivhaus.de) and continues as its head and one of its principal shareholders while also having a professorial position in Innsbruck, Austria. He is widely and highly respected in Germany and Austria, and indeed throughout Continental Europe, as one of the most knowledgeable and accomplished physicists of thermal retention measures in both new builds and renovations.

It is impossible to understand German thermal renovation policy without considering Feist's views and how they have been taken up by others. Three points are crucial.

Firstly, Feist claims that the proposals he put forward for existing buildings were only intended to apply to buildings which were going to be fully renovated 'anyway', for structural or maintenance reasons or to modernise them for today's market and living expectations (Feist, 2009). Ironically, in his view, the thermal regulations were not intended to be economically viable for people who want to renovate their home for the primary purpose of improving its thermal quality.

Secondly, and given this basis, Feist worked out how much *extra* it would cost to include thermal retention measures in the refit of a building which was being substantially renovated anyway⁷¹, for reasons *other* than thermal improvement. In line with contemporary practice at the time (IV_Kah [03:03]) he called these costs *die energetischen Mehrkosten* (the 'additional thermal costs') and made a sharp distinction between these 'additional thermal costs' and the 'anyway' costs. As he and his colleagues frequently argue, if you are replacing your roof anyway, it does not cost much extra to include thick insulation under the tiles; if you are renewing the

⁷¹ The two German words used for 'anyway' in this sense are 'sowieso' and 'ohnehin'.

render⁷² on your walls, you have to erect a scaffolding and apply the render anyway, so it does not cost much more to apply a layer of thick external wall insulation before you put the new render on; if you are replacing your windows, it does not cost much more to install triple-glazed passive house windows rather than standard double-glazed models.

Hence, argued Feist in his expert report, the additional thermal costs are quite low compared to the overall costs of the renovation project.

This view is also found in academic literature on thermal renovation costs, particularly from Continental authors (e.g. Jakob, 2006; Martinaitis et al., 2004; Martinaitis et al., 2007).

Thirdly, Feist argued that these additional thermal costs are the *only* expenses that may be included in a calculation of the payback time of the renovations. You do not count the cost of the scaffolding, wall render and new roof, for example, even if these are necessary to fit the insulation, as these costs have to do with the building substance and not directly with the thermal improvements.

On this basis, argued Feist, if the cost of the thermal improvements is less than the expected accumulated fuel cost savings resulting from the thermal improvements, then the project can be declared to be economically viable. This is the logic that stands behind the EnEV's statement that its requirements are economically viable.

There are of course finer details within this approach. It is argued that the savings are expected to increase year by year as the fuel price rises, while the additional thermal costs may be greater than their face value due to interest payments. Further, the period during which the fuel savings accumulate, i.e. the lifetime of the refit, is generally taken to be 25 years but is often debated. These issues are further explored in Chapter 5, which focuses on the discourse and materiality of the economic viability issue.

⁷² 'Render' is a layer of weather-resistant plaster, usually embossed, on the outside wall of a building.

An important development is that the second and third parts of Feist's basic argument are now very strongly represented among all policy actors. Every such interviewee restated these views, often with vigour and conviction. They all maintain that there is a hard and fast distinction between 'anyway' costs and 'additional thermal' costs, that you should only count the additional thermal costs when working out whether a refit will be economic, and that this makes the cost of thermal refits very low. Typical is this comment, from interviewee Georg Vogelsang, of LUWOGÉ:

Take, for example, a private homeowner whose house is due for a repaint, and who also considers adding wall insulation. That means, the render has deteriorated, the paintwork is bad. In this case, the render is repaired, the paint is applied. You need a scaffolding, building site equipment and so on. You have to pay for all this anyway, plus the render and paint. So if you add 10, 12, 14 cm of Neopor insulation, then the additional thermal costs for the insulation will pay for themselves within two winters [IV_Vogler 06:08].

For this type of renovation, as building physicist Gerd Hauser explained, 'the additional thermal costs comprise only the insulation and perhaps the preparation of the surface' (IV_Hauser [13:16]).

In more general terms, as Andreas Enseling, of IWU, explained:

You only count the energy-saving additional thermal costs in the calculation of economic viability. This is of course logical and correct, because the other costs would have to be paid by the homeowner anyway. [IV_Enseling [08:20)]

These and many other comments from interviewees indicate that this part of Feist's argument is solidly entrenched in the discourse of policy actors (e.g. IV_Hertle [08:59]; IV_Kah [04:41]; IV_Köln_A [34:13]; IV_Gehring [02:51; IV_Krieger [42:18]; IV_Kwapich [36:29]).

However, the first part of Feist's argument is no longer clearly reproduced in the discourse of the policy community. It is not clearly and universally affirmed that the EnEV regulations for thermal refits are designed only for cases where a building has

to be refitted ‘anyway’, for non-thermal reasons, even though Feist himself continues to assert this (Feist, 2009). For example, the *CO₂-Gebäudereport 2007* (CO₂-Building Report 2007), an influential expert report produced for the BMVBS, maintains repeatedly that homeowners in general *should* be doing thermal renovation, and expresses dismay that most are either not interested or have strong arguments against it, mostly on the basis of cost (Friedrich et al, 2007a: 4; Friedrich et al., 2007b: 43). Further, within the policy discourse there has arisen a general claim that the regulations are financially viable for each and every case, even where no regular building maintenance is necessary, i.e. that it is *always* economically viable to thermally renovate a building to the EnEV standards (see interview quotes in Subsection 4.5.2). This is affirmed in the *CO₂-Gebäudereport 2007*, even though it is also noted that the only costs that actually pay back are the ‘additional thermal costs’ (Friedrich et al., 2007a: 4). The logical contradiction in this does not seem to have occurred to the authors: if a house does not need to be renovated ‘anyway’, but is nevertheless thermally renovated, and only some of the costs are counted in the payback calculation, what will offset the other costs?

This type of muddle, I will argue in Chapter 5, is one of the main reasons the policy is not achieving its stated goals. Here I will simply outline the discursive and material mismatch it has led to. Before doing so, however, I switch into my role as a natural science/materiality investigator and draw attention to a fault in Feist’s own premises. This is exemplified by what I call ‘the roof and wall dilemma’.

4.3.2 The roof and wall dilemma

As I explained above, Feist claimed that if you have to refit or repair your home ‘anyway’, the additional thermal costs are always economic, i.e. they always pay back within the lifetime of the refit measures. On the surface this seems plausible if only these ‘additional thermal’ costs are being included in the calculation. However there is a particular class of cases where my own calculations show it does not hold. These cases are possibly represented in well over 50% of all residential buildings in Germany, so it is a very significant difficulty. Consider, for example, the schematic of a house shown in Figure 4.1.

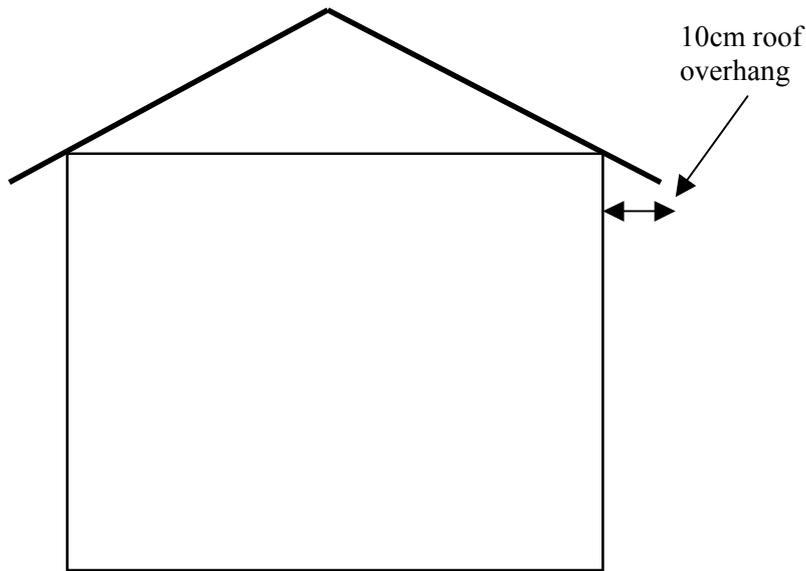


Figure 4.1 Schematic of house with 10 cm roof overhang.

Suppose the render on the east wall (right hand side) needs to be repaired. To do this legally, the builder must add a layer of insulation 16 cm thick. But suppose the roof overhang is only 10 cm wide. Clearly, a layer of insulation any more than 10 cm thick would jut out beyond the roof-line. Not only would this interfere with the guttering, it would quickly deteriorate from the top edge, due to the force of rain, hail, etc. An example of a typical, short roof overhang is shown in Appendix 7, Picture Gallery No. 10.

One (illegal) solution would therefore be to add only 8 cm of insulation. However, Figure 4.2 illustrates how adding any amount of external wall insulation would lead to a serious 'thermal bridge', which would not integrate well with loft insulation. Not only would heat be lost through this zone of zero or poor insulation, increasing the household fuel bill. More seriously, the heat loss would cool the indoor surfaces in the zone significantly in comparison to the ambient indoor temperature, leading to moisture condensation and mould formation.

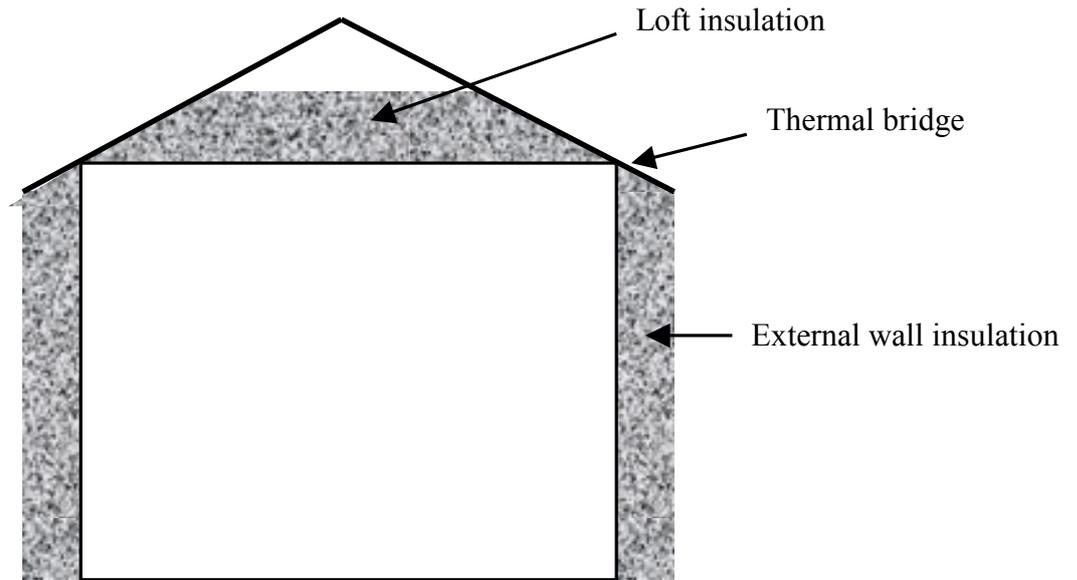


Figure 4.2 Wall and roof insulation leading to creation of thermal bridge.

As building physicists and engineers intoned in interviews, mould is a serious problem in thermal refits if thermal bridges are inadvertently created (e.g. IV_Hauser [36:27]; IV_Großklos [31:20]; IV_Kah [16:12]).

This problem would persist even if the roof overhang were extended so that the legally required 16 cm of insulation could be added to the wall.

The ‘correct’ solution, then, is that shown in Figure 4.3. Here the roof has been lifted, as well as extended, so that insulation may be wrapped round the upper corners and joined in a continuous sheath.

Unfortunately this solution is very expensive. Lifting and therefore rebuilding the roof of a modest sized free-standing house would cost in the vicinity of €60,000⁷³. Further, if the original damage was to just, say 10% of the render at the lower storey level, this could have been repaired to a *technically* adequate standard without a scaffolding for less than €1000. This was the case with a house in a village in Northern Bavaria,

⁷³ In some cases one could solve the problem merely by removing the tiles, adding an extra layer of supplementary rafters, filling the resultant gap with insulation, and replacing the tiles. This would also be expensive (€17,200 for the Würzburg house, though the thickness of the insulation did not meet current EnEV standards), and it is only possible if the intersection of the roof and the top of the wall allows for a continuous sheath of wrapped-around insulation.

where I interviewed the owners. A local farmer had driven his tractor into the wall. Fortunately this happened before EnEV 2002 came into force, so no major reconstruction was demanded. (IV_Franken_A)

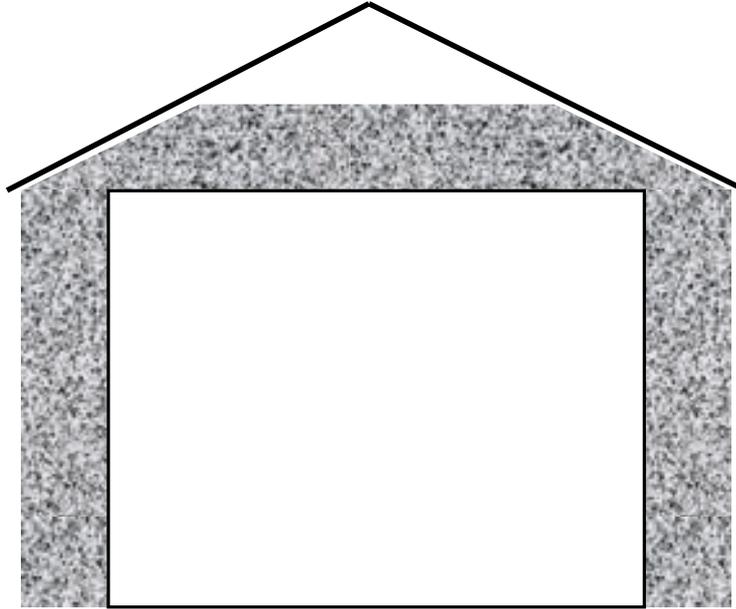


Figure 4.3 ‘Correct’ solution, with roof lifted and extended to allow space for continuous sheath of insulation.

A cheaper solution is not to replace the roof but to extend it and make a bend in the lower portion of it, reducing the angle of the roof pitch, so that a gap is made for the insulation. This solution is recommended by DENA in its promotional literature (e.g. DENA, 2006: 34) But this would still be far more expensive than merely adding a layer of insulation material before the new render is applied, and I have never seen a building in Germany where it has been attempted.

However this dilemma applies not only to cases where minor repairs are necessary. It can also apply where a major refit is due anyway, and only the additional thermal costs are counted in the economics equation. The ‘anyway’ refit might not have needed to include remodelling of the roof, but this can become necessary to accommodate the thermal requirements of the EnEV, thus increasing the cost significantly.

Nobody has ever done a comprehensive survey of the roof overhang sizes on German homes. However, observations I have made, in thousands of kilometres of cycle tours and train rides through 14 of Germany's 16 states over the past 8 years, not to mention intensive observations within many cities, lead me to believe that less than 20% of homes have sufficient roof overhang on all four sides to provide for 16 cm of wall insulation without significant roof reconstruction.

For one homeowner interviewee, who did a comprehensive thermal renovation on the 45 year old, medium sized, detached house he bought in 1997, the length of the roof overhang was a decisive factor in the choice of house he purchased. Our discussion ran (IV_Würzburg [02:50]):

Myself: What about the shape of the house? You were very lucky that, for example, the roof overhangs the wall by a sizeable length. Was that something you thought about when you bought the house?

Interviewee: Yes, when I saw the house for the first time. It's something I thought about in the first five minutes.

Our discussion continued (IV_Würzburg [03:03]):

Myself: Is this something you discussed with other people at the time?

Interviewee: No. They would have thought I was a madman.

The interviewee explained that nobody thought about this issue in the late 1990s. However, because the roof overhung the wall by around 40 cm, he was able to put 10 cm of external wall insulation on without any remodelling of the roof (see Appendix 7, Picture Gallery, Nos. 5 and 6)

If the entire roof has to be replaced due to aging and deterioration, complete with new rafters, soffit-boards, barge-boards and tiling beams, then these costs do have to be paid anyway, so it would be logical not to count them as costs of insulating the house. But if the roof has to be replaced *in order to fulfil the insulation requirements*, it does

seem logical to include the roof costs as part of the cost of insulating. These major expenses would have to be counted in the ‘additional thermal’ costs, if they were undertaken *so that* the house could take the level of insulation required by the EnEV regulations. This would apply even where the house *in general* was due for a major refit, since it is rare for the structure of a roof to need replacing. And these expenses would be less likely to pay back, through fuel savings, within the lifetime of the refit. Indeed, I have not yet found a case where they do pay back.

Despite the policy community’s lack of acknowledgement of this issue, it is a major one because it applies to so many German homes. It is especially poignant for privately owned detached and semi-detached houses, where the roof is much larger, in proportion to the building size, than in high-rise apartment blocks, and therefore a roof replacement or remodelling is a much larger proportion of the cost of a refit. Some of the homeowners I interviewed raised the issue of the raising or remodelling of the roof, either in the interview itself or during the tour of the building (IV_Augsburg; IV_Cottbus_A; IV_Würzburg). For some it was a decisive factor in their declining to insulate to the legal standards. Further, as DENA spokesperson Thomas Kwapich pointed out, 14 million of the 17 ½ million residential buildings in Germany are small, one-to-six-dwelling houses, and some 80% of the CO₂ produced through home heating comes from these (IV_Kwapich [00:50]). He also noted that this is the sector where least progress in thermal renovation is being made (IV_Kwapich [01:13]).

So Feist’s claim, that it is always economically viable to apply the EnEV regulations in cases where homes have to be repaired or refitted anyway, is problematic. Further, this is not only caused by the roof and wall dilemma. It also pertains wherever the addition of a thermal improvement clashes with the existing structure of the building. For example, external wall insulation can cause the windows to have to be repositioned so as to avoid heat bridges around the frames (IV_Großklos [30:48]). It can bulge across the boundary into the neighbour’s property, leading to legal disputes (IV_Müller [01:05:00]). It can block the light around narrow windows, causing *Schiesscharteneffekt* (‘arrow-slit effect’) (IV_Gradl; IV_Vogler [27:20]), so that the structure needs to be altered to take newer, larger windows. Further, hundreds of thousands of German apartments have very narrow balconies, which may become

unusable when thick wall insulation bulges into them (see Appendix 7, Picture Gallery No. 7). The owner of one such home told me, ‘We hardly ever use [the balcony] now. Only for pot-plants. It’s too narrow.’ (IV_Cottbus_D [18:00]). A typical solution is to cut the balcony off, and install free-standing balconies which rest upon pillars and are thermally decoupled from the building itself (see Picture Gallery No. 8 and 9). This might be economic when it is part of a major structural refit where only the actual thermal costs are counted as part of the equation. But as part of the solution to a minor repair issue it is a very expensive ‘additional thermal cost’. Other homes have low-ceilinged cellars, which become cramped and virtually unusable if the legal minimum of 16cm of insulation is applied to the ceiling, a scenario I witnessed in two of the homes whose owners I interviewed (IV_Cottbus_A; IV_Würzburg).

This bears directly on the first research question of this thesis, regarding the interplay between discourse and materiality. The assertion that it is *always* economically viable to renovate to EnEV thermal standards when doing repairs or refits on homes is unquestioned in most of the policy community, among politicians at Federal and municipal level, Federal civil servants, and the expert knowledge community. Yet the material reality of the building stock does not fit with it, since non-linearities such as the roof and wall dilemma are so common in actual buildings. There is a discourse-materiality mismatch here, which thwarts the policy aims.

A further reason for this mismatch is a peculiarity in the expert advice itself. In the expert report commissioned to show it would be economically viable to tighten the regulations by 30% in 2009, Kah et al. (2008) did not actually consider the costs of renovating old houses from their original state up to the new standards. Instead, they used the abstract idea of a house that had already been renovated to the 2002 standard, and asked how much more it would have cost to renovate this instead to the higher standard. This assumes perfect linearity. There was no thought that a house that had sufficient roof overhang, cellar height and balcony width for a 2002-standard renovation might not have it for a further 30% thickening of insulation all round. As leading building physicist Gerd Hauser commented, ‘It was a trick. They only considered the increase in costs compared to the previous regulations’ (IV_Hauser [09:07]).

Interviewees and discussion partners close to the building industry, however, tended to be more aware of this dilemma. These included the chief research officer of the *Gemeinschaft deutscher Wohnunternehmen* (GdW - the National Association of Housing Providers: www.gdw.de) (IV_Vogler); municipal civil servants associated with the Munich *Bauzentrum* (Building Advice Centre) (IV_Gradl; Munich_A); architects and engineers at an educational seminar on EnEV 2009 (REWA_Augsburg, 2009); and the technical manager of one of the most celebrated and respected housing cooperatives in the state of North Rhine-Westphalia, Uwe Neuhaus (IV_Neuhaus). As Neuhaus explained:

The politics is often distant from the practice. The EnEV 2009 is not designed by practitioners. (IV_Neuhaus [22:26])

Hence the prevailing claim that thermal renovation to EnEV standards is always economically viable represents a significant mismatch between policy discourse and the materiality which is the object of the policy.

Appendices 2 and 3 show case studies of two comprehensive thermal refits, in different cities in Bavaria, for which I was given detailed cost breakdowns. These dwellings were ideal thermal renovation cases as they had no significant non-linearities and required no restructuring to take the insulation. The appendices show that on the face of it neither project was anywhere near economically viable, and that the appearance of economic viability could only be achieved by excessive manipulation of the figures.

A further problem with the economic viability claim is that it clashes with the *socio-materiality* to which it refers, i.e. the socio-technical system of homeowner and house. This has to do with homeowners' discount rates, and I will explicate it in some detail in Chapter 5. There I will show that if this issue is taken into account – as it is in typical, everyday accountancy – then there is almost never a case where thermal renovation to EnEV standards is economically viable.

4.4 THERMAL REFITS AND THE CO₂ REDUCTION GOAL

Quite apart from the above dilemma, a further issue arises because of the interplay between the CO₂ reduction goal and the EnEV thermal standards. This would still almost certainly be a problem even if Feist's first point were still widely accepted, i.e. that the EnEV standards are only meant to apply where residential buildings have to be refitted anyway.

4.4.1 The goal and its progress

As mentioned above, the German government has stated clear goals for the percentage by which CO₂ emissions must be reduced as a consequence of thermal retention measures in buildings: a 25% reduction from buildings by 2020, and an 80% reduction by 2050 (UBA, 2007: 2; BMU, 2007: 4-6; Tiefensee, 2006). This simple, decree-like commitment has led to the widely held conclusion that the required refit rate – the annual percentage of the German housing stock which must be either thermally renovated, or replaced - lies somewhere between 3% and 5%. The new CDU-CSU-FDP government, elected on 27 September 2009, has taken up this challenge. Its coalition agreement includes the commitment to 'increase the current annual rate of thermal refits' (Koalitionsvertrag, 2009: 19 line 996). This includes the commitment to ensure that 5% of all buildings erected prior to 1978 will be thermally renovated each year (IV_ Hagel [06:47]).

As Marcus Hagel, parliamentary researcher for Federal CDU energy spokesperson Dr Joachim Pfeiffer, explained (IV_ Hagel, [06:00 – 10:00]), there are 39.6 million dwellings in Germany. If each year around 5% of these have their space heating energy requirement reduced by 50-80%, the goal of an overall reduction of 80% should be reached within 40 years. The 50-80% range is to allow for the fact that some building types are more easy to refit to higher standards, than others.

Hagel and other members of Pfeiffer's staff, together with staff of Federal CSU energy spokesperson Dr Georg Nüßlein, undertook a major study of the rate of thermal refits over the summer of 2009. Hagel explained:

Of these 39.6 million dwellings, three-quarters were erected before 1997. That's about 29.7 million, let's say 30 million. Then we asked, what has the CO₂-Building refit programme achieved? In 2006 we refitted 320,000 dwellings [sic, presumably he meant buildings - RG] - these figures come from the Ministry for Buildings. In 2007 the figure was 200,000 and in 2008 it was 289,000. And these figures include new builds that are constructed according to the 'energy-efficient' new build standards. (IV_Hagel [06:47])

However, Hagel explained that, of the portion that were refits rather than new builds, nobody knows what *proportion* of each building was refitted. Some just had windows replaced; some had one wall refitted, others were completely modernised and thermally refitted. This point was also raised by building engineer Marc Großklos, of the *Institut Wohnen und Umwelt* (IWU – Institute for Housing and Environment) (IV_Großklos), who spoke (after the recorded interview) of a new study being initiated to address this gap in knowledge. Thomas Kwapich, of the *Deutsche Energieagentur* (DENA – German Energy Agency), estimated that about 200,000 residential buildings are being refitted each year out of a total of 17 ½ million. He commented:

If we continue with this annual refit rate, it will take about 85 years to refit our entire building stock in Germany. (IV_Kwapich [03:04])

Because reliable data for actual refits is difficult, if not impossible, to obtain, there were disparate guesses and claims about the success of the programme (e.g. Flasbarth, 2009; Hegner, 2009). However, the interviewees closest to the available data claimed the annual refit rate would have to increase by between 500% and 1000% to enable the government's CO₂ target to be reached. For example, Hans Hertle, of the research institute Ifeu, commented that 'to achieve the government's CO₂ reduction goal, the annual rate of refits must increase five-fold' (IV_Hertle [18:32]). A well-informed high Federal official, who asked for anonymity at this point, said it must rise 'ten-fold'.

4.4.2 The rate of refits and the EnEV standards – a material mismatch

As my interview schedule progressed it became clear that there was a basic mismatch between the EnEV thermal regulations, and the intended CO₂ reduction goal that was supposed to be achieved *as a result of* these standards. Feist had designed the EnEV standards to be economic for homes that had to be repaired or refitted ‘anyway’. However, the policymakers who attached the 80% CO₂ reduction goal to the EnEV process greatly overestimated the percentage of homes that would have to be repaired or refitted anyway each year. It was not obvious to German homeowners that their dwellings were due for a complete, comprehensive refit at the rate of 4-5% per year.

Within the thermal renovation policy community, this has led to a strong strand of discourse maintaining that German homes are generally in need of major maintenance. Many policy actors see it as their duty to convince homeowners that their homes are substandard and urgently in need of modernisation (*Modernisierung*) or refitting (*Sanierung*). One state civil servant, who had driven forward the refitting of apartment blocks in North Rhine-Westphalia over several decades, made much of this theme and declared that every apartment block needs a major overhaul every 30 years (IV_Köln_A [12:00]). Sabine Krieger, a Munich Green Party City Councillor, maintained that:

Every 100 years there are three refit cycles. It has to be done every 30 years, approximately. (IV_Krieger [49:45])

Oliver Kah, a building physicist with the Passivhaus Institut and co-author of various expert reports with Wolfgang Feist, asked me to look out the window when this theme arose in our interview. He declared:

You only have to look, and you see many buildings that are due for a refit anyway. When you look here (laughs and points to the buildings), you see windows that are draughty, windows that are no longer well sealed. (IV_Kah [11:14])

We were looking at three multi-storey apartment blocks, which appeared to me in fair condition. There was no obvious evidence of draughty windows. To the trained eye of a building physicist, the windows were clearly substandard compared to more recent models. But how he knew that they were ‘draughty’ was problematic. Nevertheless the assertion was essential to his argument. If a homeowner replaces her windows because they are thermally inferior to the latest models, then all her costs are ‘additional thermal’ costs and have to be included in the economics equation. However if she replaces them because they are draughty, then the windows have technically ceased to function and must be replaced ‘anyway’. In this case, the standard procedure in the knowledge community is to count only 10% of the cost of the new windows in the economics equation – and not to count the cost of labour, scaffolding, etc. (IV_Ensling [11:09]).

In this way, two narratives tend to interlock: Narrative (a): It is always economically viable to refit a dwelling to EnEV standards, and Narrative (b): We will achieve the 80% CO₂ reduction goal by means of the EnEV standards because 4-5% of buildings are due for a comprehensive refit each year. The implication is that Germany will achieve the 80% goal economically viably, i.e. it will pay for itself through fuel savings.

The important point here is that the discourse is out of step with the material reality, though in a slightly different way from that outlined in Section 4.3 (above). In this case the dominant discourse clashes not so much with the physical nature of a building, but with the more complex socio-technical system that comprises a homeowner, a dwelling, and its occupants. The point in time at which a dwelling falls due for a comprehensive refit depends not just on its physical condition and characteristics, but on the overall socio-technical system of building, owner and residents. Some people are happy to live in a building which other people would feel was due for demolition. Others will want a refit but be aware that they cannot pay for it, and so make creative compromises. Some will refit a home merely because they do not like the internal layout. To the homeowners, the confident assertions of the knowledge community regarding the correct time to refit a building make little practical sense. The dominant policy discourse does not accord with the socio-technical systems that are the target of the policy. I return to this point in the next

chapter, looking at how some of these ideas come into the policymaking community via expert reports.

4.5 EnEV 2009 AND THE CONTINUAL TIGHTENING OF THE STANDARDS

As noted in Subsection 4.2.3, the thermal standards for both new builds and refits were tightened by an average of around 30% in the regulations of EnEV 2009. By this time there were hundreds of successful demonstration projects (*Demonstrationsobjekte*) throughout Germany. These are examples of actual buildings that have been refitted in line with, or even more strictly than, EnEV standards, where the additional thermal costs are said to be lower than the expected savings through reduced fuel consumption over the expected lifetime of the refit.

Three important issues are raised by this development: the status and value of the demonstration projects; the question as to whether the tightening really is economically viable; and the continued link between new build and refit standards.

4.5.1 Demonstration projects

The German Energy Agency DENA keeps a database of thermal refit projects that have successfully conformed to EnEV standards and are claimed to be economically viable. I searched this database in the summer of 2009. For most projects the energy usage before and after the refit was given, together with the measures undertaken to achieve this. However it was impossible to confirm the economics claim, as no costs were given.⁷⁴

In many cases, however, the architects of the projects were listed. I contacted a number of these, and several kindly sent me the costings. In Galvin (2010a) I display these. Two of my findings were, firstly, that the tighter the standard, the higher the cost, not only of the energy saved per square metre of living space, but of energy saved per euro invested; and secondly, that these costs were way above what could possibly be conceived as economically viable.

⁷⁴ The database was available on the DENA website, www.dena.de. However one year later it was no longer accessible online.

Nevertheless, the projects could well have been economically viable if the strict division between ‘anyway’ costs and ‘additional thermal’ costs were adhered to in the calculations. Unfortunately even the architects could not provide me with this cost breakdown.

However it might be the case that, if these buildings were due for a comprehensive refit anyway, and if only the additional thermal costs were included in DENA’s reckoning, then the projects could have been described as economically viable. Several interviewees pointed out that among these projects there were buildings renovated to EnEV 2009 standard and beyond, even before EnEV 2009 came into force. Throughout the interviews, demonstration projects were the main material basis on which the affirmation was based that EnEV 2009 is undoubtedly economically viable (e.g. IV_Gehring [52:00]; IV_Gräbel [17:02]; IV_Gradl [04:18], [12:41]; IV_Düsseldorf [51:31]; IV_Hauser [03:03]; IV_Hertle [45:12]; IV_Krieger [24:56]; IV_Köln_A [01:03:20], Flasbarth, 2009; Hegner, 2009).

However there is no information as to what aspects of the buildings were damaged or dilapidated before renovation, hence the database does *not* show that EnEV 2009 is economically viable, only that it may be so for buildings that are having a complete refit anyway. Further, it does not cover cases where no maintenance was required but a home was refitted for the sole purpose of improving its thermal quality – i.e. where all the costs are ‘additional thermal’ costs.

In Chapter 5 I will look at how the claim, that thermal renovation is always economically viable, relates to input from the knowledge community. Here I look more closely at the discourse concerning it among policy actors.

4.5.2 Discourse on the ‘economic viability’ basis of EnEV 2009

The claim that refits to EnEV 2009 standard are always economically viable is deeply entrenched in the policy community’s discourse. To cite just a few of the many assertions I heard: Andreas Enseling, economist with IWU, declared that such thermal refits ‘do not place excessive economic demands on anybody.’ (IV_Enseling [29:40]).

Leading building physicist Gerd Hauser declared that thermal refits to this standard pay for themselves ‘in 20 to 25 years’ (IV_Hauser [08:43]). Munich Green Party energy advisor Sabine Gehring referred to studies which, she said, showed that refits even to passive house standard are economically viable (IV_Gehring [48:24]).

A snippet of my interview with Marcus Hagel, researcher for Federal MP Pfeiffer (CSU), was indicative of how unquestioned this belief is:

Hagel: And I’m certain that, even if the energy price remains as it is now over the coming years, thermal refit measures will pay for themselves relatively quickly.

Myself: Have you calculated this with any case studies?

Hagel: No I haven’t. For me it’s pure assumption. (IV_Hagel [40:07])

A similar response came from Munich Green City Councillor Sabine Krieger, to whom I described case studies that did not appear to be economic:

Myself: We [myself and colleagues] find this assertion strange, that you say it’s always economically viable.

Krieger: I can’t comprehend that. I believe the EnEV is always economically viable.

Myself: Have you worked through the mathematics?

Krieger: No. But we work to stricter standards than the EnEV and we always find it to be economically viable – though I admit it’s more difficult with passive house standard.

Myself: Do you mean for new build, it’s economically viable for new build?

Krieger: Yes, but also for refits. (IV_Krieger [49:23])

Later in the conversation she remarked, ‘I can’t imagine that it wouldn’t be economically viable.’ [51:34]

However Ifeu’s housing specialist, Hans Hertle, was slightly more circumspect, affirming: ‘At the moment it’s almost always economically viable to insulate the old buildings, the ones built after the [Second World] War.’ (IV_Hertle [15:54])

Once again, however, the closer I got to the practitioners, the more doubts were expressed. Uwe Neuhaus is the technical manager of *Erbbauverein*, a *Wohngenossenschaft* (housing cooperative⁷⁵) in Cologne. This organisation is highly respected among the policy community and is often cited as an example of excellent building care. It is one of the jewels in the crown of North Rhine-Westphalia’s thermal improvement programme, ‘50 *Solarsiedlungen*’ (‘50 Solar Housing Complexes’⁷⁶), its refit projects featuring on much of their promotional literature (e.g. EnergieAgenturNRW, 2009; and see IV_Düsseldorf; IV_Köln_A). Neuhaus told me, however:

Neuhaus: We’ve reached a boundary. For me the new EnEV 2009 is absolutely fine for new builds. But with regard to existing buildings I have a big question mark. We’re coming up against boundaries. Partly technical: we have refit candidates where problems are arising to do the required insulation. Windows that can’t be opened; difficulties with balconies and window ledges. Overall critical.

Myself: You mean opening the windows when there’s so much insulation?

Neuhaus: Yes. [The space] is too small. We’re hitting the boundaries technically. And the other is the economics. We’re also coming up against economic boundaries. You have to realise that tightening the thermal standards by 30% increases the construction costs by 10-15%. That’s been proven. (IV_Neuhaus [28:30])

⁷⁵ A *Wohngenossenschaft* is a form of incorporated society whose members own a portfolio of properties, and each member rents a property, as a tenant, from the whole society. It is a very popular form of home ownership in Germany.

⁷⁶ <http://www.energieagentur.nrw.de/solarsiedlungen/page.asp?RubrikID=5526>

A rough calculation based on these figures shows that a 30% tightening of the regulations, from 100 kWh/m²a to 70 kWh/m²a, would result in additional costs of around 4.5 to around 6.5 times the expected fuel cost savings⁷⁷. It misses being economically viable by almost an order of magnitude.

Neuhaus went on to explain that he had discussed this issue widely with others in the industry and they were of the same opinion (IV_Neuhaus [29:57]).

Later I interviewed Federal Ministry of Housing section head Dr Alexander Renner, whose section deals directly with the EnEV regulations. I told him of Neuhaus's concern. At first he rejected it out of hand, saying that there are many housing societies that are irresponsible and constantly try to cut corners with substandard refits. I then explained about the high regard this particular housing society is held in by the state government of North Rhine-Westphalia, and how much its projects are seen as flagships of its '50 Solarsiedlungen' programme – a programme well known to the Federal ministry. Renner's response was:

When people tell us that EnEV 2009 is borderline, then I say that we've done it just right. Because, to be precise, we want to reach the economic boundary with our regulations. And therefore we've done it correctly and landed at exactly the right place with EnEV 2009. [45:55]

Since EnEV 2009 has to be applied to a great range of buildings of all different types, this would seem to be an admission that the boundary will not fall neatly on the economically viable side for all buildings. Despite the dominant policy discourse that EnEV 2009 is always economically viable for refits, Renner's remarks could lend credence to the comments of those in the industry who are sceptical.

Again it must be emphasised that here we are talking about full refits where the anyway costs are excluded from the calculation of whether the refit is economically

⁷⁷ For example, if a 100 m² house cost €200,000 to build under the old regulations, it would now cost €220,000 - €230,000 with a 30% tightening in the regulations, an increase of €20,000 - €30,000. If this lowered its fuel consumption from 100 kWh/m²a to 70 kWh/m²a, the cost of fuel saved over 25 years would be 30 kWh/m²a x 100 m² x 25 years x 0.06 €/kWh = €4500. Hence the ratio of cost to savings is 20,000/4500 to 30,000/4500 = 4.44 to 6.67.

viable, i.e. refits that are most likely to appear economically viable on paper. Even in this sphere, for which the EnEV refit regulations are specifically designed, there is unease between the policy discourse and the material reality.

4.5.3 New builds and refits under one umbrella

A further issue with the EnEV regime is the way thermal regulations for new builds and existing buildings are brought together within the one mathematical model set. To recap, a homeowner doing a partial renovation must conform fully to the new build thermal standards for the part of the building being renewed, while a builder doing a full refit can go 40% slacker. There are several difficulties with this coupling of new builds and renovations in the same regulation set.

Firstly, new build technology has developed rapidly over the last 30 years. A portion of the insulation can be incorporated into the masonry; windows can be positioned for maximum solar gain and minimum thermal bridging; the roof-wall intersect can be designed for a wrap-around thermal envelope; balconies can be thermally decoupled (see Appendix 7, Picture Gallery Nos. 8 and 9); building geometry can be designed for the minimum ratio of surface area to volume; the plumbing can be arranged to connect efficiently with solar collectors; heat exchange ventilation can be built into the building structure; the building can be positioned on the site such that external wall insulation does not jut out into driveways or the neighbour's property.

Most existing buildings, however, were simply not designed with strict thermal considerations in mind, and certainly not to be wrapped seamlessly in super-insulation. There are physical limits, as we have seen, to what can be added to such a building, and there are economic considerations if a building has to be comprehensively rebuilt just to take a few extra centimetres of wall insulation or to accommodate a heat exchange ventilation system. It is not at all clear why refits should follow the same 30% → 30% → 30% trajectory as new builds.

I asked every policy actor why the trajectories for new builds and refits ran parallel, and none could give a confident answer. Leading building physicist Gerd Hauser at least explored some of the technical difficulties which he finds challenging

(IV_Hauser [35:00 ff]). Most others simply referred to the DENA database of demonstration projects, or some other demonstration project they had seen.

Ironically, the clearest repudiation of the appropriateness of the link between new build and refit thermal economics came from Hans-Josef Fell, Federal Green Party MP and Energy Spokesperson. As an opposition MP, Fell sits somewhat outside of, or on the margins of, the grouping of policy actors whose policy discourse feeds into the policy formation. On the one hand Fell maintained that the 30% steps are ‘far too small’, and that zero-energy buildings were the only acceptable option (IV_Fell [00:30]). But on the other hand he was quick to point out that existing buildings would not reach even EnEV standards with thermal retention measures alone. Instead, he said, they should only be refitted sensibly and then make up the difference by generating their own renewable energy ([03:55]), so that they would then be ‘CO₂-neutral’ ([01:57]). ‘There’s no law that requires existing buildings in Germany to produce renewable energy,’ he complained, ‘though we do now have one for the new build sector’ ([02:31]).

So despite the dominant discourse affirming the correctness of coupling new build and full refits within the same regulation set, the materiality does not sit well with this, and at least one actor on the fringes of the policy community rejects it.

The second difficulty with the coupling of refits with new builds in the regulatory mathematics is the requirement that partial refits be done to full new build standard.

If, for example, I want to renew the render on my west wall only (the west wall came up frequently in interviews with homeowners, as it is the ‘weather side’ and its render deteriorates most quickly), I have to add 16 cm of external wall insulation to meet the (new build) standards of EnEV 2009. This is very expensive if my roof overhang is only 14 cm: it requires me to remodel the roof. However I can, alternatively, use the 40% rule and add only 12 cm of insulation. But then I have to bring the entire house up to ‘EnEV 2009 plus⁷⁸ 40%’ standard. This is a major undertaking, and virtually all

⁷⁸ This is called ‘plus’, as I am allowed to consume 40% *more* primary energy than for a new build.

my costs will be additional thermal costs, so it is very unlikely that the refit will be economically viable.

The requirements become even more peculiar if I want to do the refit in stages, to suit my budget. I may make a comprehensive plan for a full renovation to ‘EnEV 2009 plus 40%’ standard, and plan to do the loft this year, the cellar ceiling next year, the windows in 5 years and the walls in 10 years. But by spacing it out in this way I am disqualified from the ‘EnEV 2009 plus 40%’ provision, as I am doing a series of *partial* renovations. Therefore I have to do all of these to new build standard. For a small proportion of houses this does not make much difference in cost, as no structural discontinuities are reached (such as the narrow balcony, arrow-slit windows, or the roof and wall dilemma). But for many houses this brings troublesome technical and economic problems, as boundaries of technical feasibility are reached. This problem has the same form as that encountered by the Lower Saxony engineer, described in Subsection 4.6.3 below.

Again, then, there are mismatches with material reality caused by linking the thermal improvement trajectory for existing homes, with that for new builds. While it may be ideologically satisfying on the discursive level, it falls foul of the many-faceted, physically obdurate nature of the existing dwellings which are the policy’s target – a further mismatch between policy discourse and material reality.

These mismatches also become evident when we consider the Federal subsidy criteria for thermal refits, a topic to which I now turn.

4.6 SUBSIDIES FOR THERMAL REFITS

The Federal government offers subsidies, in the form of low interest loans and cash payments, for new build and refit projects that go *beyond* the EnEV standards. The further you go beyond the minimum standard, the greater the subsidy. For a full refit, the cut-in point is 10% better than ‘EnEV 2009 plus 40’. Higher subsidies are offered for standards 20% and 30% better. The subsidies are given by the *Kreditanstalt für Wiederaufbau* (KfW – German Development Bank)⁷⁹.

⁷⁹ <http://www.kfw-foerderbank.de/DE/Home/BauenWohnen/Privatpersonen/index.jsp>

Key issues regarding the subsidies, as they impinge on the material reality of the building stock, are as follows.

4.6.1 A subsidy philosophy

A peculiarity of this system is that the part of the refit being subsidised is the least economically efficient. In Galvin (2010a) I demonstrate that, in general, the higher the thermal standard you achieve in a refit, the more you pay per kilowatt-hour (kWh) of energy saved. Further, the *marginal* cost of energy saved is extremely high for the last few kWh of energy saved – often over 10 times the cost of the kWh saved in a modest refit, say to pre-EnEV 2002 standard. This principle was broadly agreed among the building physicists and economists I interviewed. Since the subsidy is designed to get people to move into this super-high quality zone, it could be argued that it achieves very little energy saving or CO₂ emission reduction, per euro invested.

I was curious as to why this system pertained, and I asked interviewees about it. The ringing affirmation, from every policy actor interviewed apart from those in Hamburg, was that it would be wrong to subsidise ‘what people have to do anyway’. There were expressions of moral indignation at the suggestion that people should receive state subsidies for merely insulating to the level the law requires (e.g. IV_Ensling [32:13]; IV_Großklos [36:13]; IV_Hauser [16:52]; IV_Hertle [46:13]; IV_Krieger [02:00]; IV_Schaal [18:14]; IV_Tomani [00:20]). As Renner expressed it, ‘In Germany the basic axiom applies: nothing that is required by law can be subsidised.’ (IV_Renner [11:23]).

Calling it a ‘basic axiom’ (*Grundsatz*) effectively summed up the way it is held by most policy actors: a moral truth which is self-evident and beyond question.

However in the city-state of Hamburg they do question it (IVN_Hamburg_A; IVN_Hamburg_B), and here subsidies are offered for projects that do not have to go beyond the EnEV standards. Instead, the amount of subsidy is proportional to the amount of energy saved. I mentioned this to other policy actors, and in general, those

closest to the practice were most receptive. Uwe Neuhaus, technical manager of the housing co-operative *Erbbaurein*, suggested:

Neuhaus: It would be easier if the subsidies worked differently, if the subsidies were perhaps organised so that one would say, for every saved kilowatt-hour you get such-and-such a percent monetary grant.

Myself: Have you heard this idea among others, or is it your own?

Neuhaus: It's a topic that we discuss back and forth in the industry. (IV_Neuhaus [33:42])

However the federal subsidy regime is entrenched behind a wall of protective discourse based on its unquestioned moral correctness.

4.6.2 What causes what?

One reason this style of subsidy is not questioned is the dominant discourse that the subsidies *cause* private capital to be invested in thermal refits. The official position is that the subsidies merely 'support' (*unterstützen*) this investment (Zick, 2009). But the dominant discourse instead uses the words *reizen*, meaning to provoke or set in motion (e.g. IV_Willenbrock [27:48]; IV_Hauser [16:52]; IVN_Nüßlein), and *auslösen*, meaning to trigger, activate, release, or cause (e.g. IV_Gradl [01:24]). Hence it is often said, rather loosely, that a few billion Federal euros per year trigger or provoke the investment of hundreds of billions of private capital annually in thermal improvements and lead to so-and-so million tonnes of saved CO₂. However there has never been a study as to how much private capital would be 'triggered' if the subsidies were given in Hamburg's style or some other style. This is an empirical question, and warrants investigating.

4.6.3 Subsidies and technical boundaries

A peculiar feature of the KfW subsidy system is the way it can fall foul of the uneven nature of the materiality of various building types, shapes and sizes. One interviewee,

a building engineer working in a state thermal retrofit programme, told me of the house he recently bought in a small city in Lower Saxony (IVN_Lüneburg). He had opted for retrofitting in stages, and was resigned to having to fulfil the EnEV 2009 new build standards. He was pressed to retrofit to an even higher standard so as to qualify for Federal subsidies from the KfW. He responded, however, that this would bring the retrofit over certain technical boundaries for that particular house. This would result in a step-wise increase in cost, which would make it less economic, even with the subsidies. So he had decided to aim only to reach the minimum standards.

When I told Federal Buildings Ministry official Alexander Renner this case, he responded with disapproval:

We can never see 20 years ahead, at how high the energy costs will climb or what they'll be exactly. He must be aware that the energy costs will climb. And so a person who only wants to fulfil the [minimum] regulations will certainly, in about 10 years time, look around and think: 'Oh, my roof has perhaps a bit too high energy loss.' And then he'll start over again, and add another 5 cm insulation. And these 5 cm will be extremely expensive in 10 years time, whereas today they'll cost as good as nothing. So I have to say to this engineer - I believe he hasn't thought about the subject long enough. (IV_Renner [54:11])

It was inconceivable to this high ministry official that a house could exist with material dimensions that did not respond evenly to the increased demands of KfW subsidy standards - and that a sensible, informed engineer working in thermal retrofit practice could think and behave in such a way.

Again the pattern emerges of policy discourse being out of step with the materiality at which the policy is aimed, and therefore the policy provisions and the physical world being out of step.

4.7 SUMMARY AND REFLECTIONS

The modest realist theoretical framework I have brought into policy discourse analysis has enabled some interesting answers to be offered to my first research

question, which asks how policy discourse interplays with the material realities it is designed to influence. It has enabled me to trace significant interplays between the policy discourse, and the materiality at which the policy is aimed. Rather than look at the discourse merely as a phenomenon in itself, I have also looked at the material stuff it refers to in the built environment. I have set reliable, science-based knowledge of this environment against the knowledge that is produced and reproduced in the policy discourse and in the policy itself. I have thereby been able to identify where the two domains of knowledge accord and where there are mismatches between them. In summary, these matches and mismatches are as follows.

The technical aspects of the building regulations for thermal renovation of existing homes are given in EnEV 2009, the successor to EnEV 2002 and 2007. In some senses these regulations represent a very creditable attempt by technical staff to match broad policy aspirations to the diverse materiality of existing homes. These homes were not designed with super-insulation in mind, and most designs did not take into account energy efficiency based on geometry or orientation to the sun. These buildings are also characterised by non-linearities, such as a specific length of roof overhang or width of balcony, which make them poor candidates for ever-increasing thicknesses of insulation materials. Given that the technical staff drafting details of EnEV 2009 had to work within specific parameters given them by policymakers, it is hard to see how they could have done better at matching the policy to the materiality in such a way as to be as fair as possible and to respond to the thermodynamic peculiarities of various geometric forms of dwelling. This is especially seen in the relatively small reduction in the maximum permissible heat transmission loss (H_T) in EnEV 2009 for small houses, despite persistent policy discourse that this should be a 30% reduction on that permitted in EnEV 2002.

However, considerable mismatches between policy discourse and materiality are evident in four main areas. Firstly, the claim that EnEV-standard thermal renovation is always economically viable is problematic. On the one hand, this claim is only meant to hold true if the additional thermal costs only are included in the calculation; while on the other hand, the material structure of many, if not most, old buildings prevents certain thicknesses of insulation being added without major restructuring of the building substance. In order to do what is *thermally* necessary, a homeowner has

to pay large sums for these so-called ‘anyway’ costs. Hence the economically viable claim is out of step with the way the materiality actually behaves. It is based on a paucity of observation of the built environment and its physical characteristics. It is, in effect, bad science. For example, nobody has measured the roof overhangs in a sufficiently large sample of dwellings in Germany to find out the distribution of statistical parameters in this dimension and relate it back to physical problems and costs of applying insulation of various thicknesses to types and quantities of German homes. My own observations throughout Germany indicate it is a very widespread and frequently occurring problem. Bad or non-existent science makes for fantastical discourse. Callon, et al. (2009) make the point that science can improve if the viewpoints of the people closest to the materiality in question are actively sought. The policymakers would do well to increase their communication with ordinary homeowners regarding the shapes of their houses.

Secondly, the discourse that supports the financial incentives policy has the same problem, as illustrated by the example from Lüneburg. It assumes a dwelling can be renovated to a higher standard than the legal minimum without running into further non-linearities. Better science could provide a robust challenge to both these mismatches.

It is possible, of course, that the lack of an effective building inspectorate in Germany deprives policymakers of a potential source of detailed, nationwide information and feedback on the appropriateness of aspects of the building regulations to the materiality of the actual built environment. It would be interesting to see what difference such regular feedback, from the actual practice of thermal renovation, would make.

Both of these areas are evidence of a third mismatch between policy discourse and the material environment to which it is aimed: the idea that we should pay more and more money per kWh of energy saved, to squeeze the last few kWh/m²a out of home heating consumption. In this respect, money spent equates to material realities, i.e. the amount and complexity of the work that has to be done. Here the policy discourse ignores the evidence that there are many cheaper ways to save energy and reduce GHG emissions. The stated goal of the EnEV is to reduce CO₂ emissions and help

mitigate climate change. Yet this will not be fulfilled optimally if the regulations divert money inefficiently into one form of CO₂ reduction at the expense of others. To some extent this is also bad science, in that it represents disregard of the relative costs of saving CO₂ in various ways. But it is also part of a wider, European-wide discursive phenomenon that would be worth investigating in its own right: a preoccupation with making homes CO₂-neutral. The EU's directive that all new homes be 'nearly zero energy' by 2020 is one very significant effect of this discourse (Reuters, 2010a). This preoccupation draws attention away from bigger, structural causes of GHG emissions. As I have suggested in Chapter 2, it can be seen as a form of 'environmentality', in which ordinary people lead and discipline each other to pay for the social and environmental costs of pollution while the big polluters get off free. In this case, however, the leading and disciplining is coming from the community around the policymakers, and most of the ordinary people seem to be resisting.

Fourthly, a kind of mismatch is evident in the widely distributed narrative that most homes in Germany need to be renovated 'anyway'. This is a social construction of the built environment that is produced and reproduced by policymakers, but assumes things about its materiality and socio-materiality that are not shared by a great proportion of homeowners. This social construction of the problem and its solution suits a particular community (in this case policy actors), but is at odds with that of a competing community (homeowners who are happy enough with their homes as they are). Those it suits include policy bureaucrats charged with promoting the implementation of EnEV policy, state and municipal bureaucrats and politicians committed to the success of their own programmes, experts in independent institutes who get paid to write reports that smooth the way for the policy's implementation, and others such as academics and practitioners who exchange knowledge and information with these people (see Chapter 5) and whose careers are largely built around promoting thermal renovation at ever-stricter levels.

Further, most of these things are held in place by two ubiquitous narratives that are fundamental to the policy story-line (see Chapter 6) and to general discussion among officials and even practitioners. These are: that you only count the 'additional thermal' costs when you assess whether a thermal renovation project will pay back; and that it always *does* pay back within the lifetime of the renovations. Policy actors

tend not to think *about* these things; they think *with* them. In this sense a Foucauldian, post-structural understanding of social structure throws much light on the what, why and how of policy. Policymakers cannot see the materiality clearly (e.g. all the houses with narrow roof overhangs, or the significance of this for costs of thermal renovation) because their thinking takes place within a social milieu that includes the worldview that you only count the additional thermal costs, and that it always pays back. These points do not normally come up for debate because they are part of the furniture upon which policy discourse sits. Hence it is very difficult for knowledge about materiality that would challenge these notions, to make an impact.

So there are interesting interplays between policy discourse and the materiality at which the policy is aimed. However it would not be appropriate to draw any general rules out of this, such as ‘policymakers generally misunderstand materiality because their expert advisors do not keep to pure science.’ This might happen in some policy domains and not in others. The contribution my approach makes to learning is not in terms of general principles as to how and why policies behave the way they do, but as a *methodology* for understanding what is happening between discourse and materiality in any particular policy domain. By bringing a modest realist account of the objects of scientific knowledge into policy discourse analysis, while remaining true to a social constructivist understanding of knowledge, it offers a tool that can bring to light the matches and mismatches between policy discourse and the materiality that the policy is aimed at.

There are, of course, reasons why policy discourse forms up and develops in particular ways. One of these is the influence of the experts who are commissioned to write definitive reports, for government, on the materiality that the policy is aimed at. In the next chapter I turn to consider the nature of this influence.

Chapter 5 EXPERTS, DISCOURSE AND MATERIALITY

5.1 INTRODUCTION

This chapter addresses my second theoretical research question:

In an environmental policy domain:

In what ways are the interplays between policy discourse and materiality determined by the values and politics of the scientific experts who act for policymakers as the spokespersons of materiality?

Here I explore how the knowledge that experts produce affects the interplays between policy discourse and the materiality and socio-materiality it is aimed at. As this is a very broad topic, even within the one policy domain considered here, I confine my investigation to knowledge about the economic viability of thermal renovation on existing homes. In particular I will focus on the mathematical modelling produced by key experts, within this policy field, to justify and promulgate their understanding of this economic viability.

The economic viability theme is important in this investigation for three other reasons: Firstly, as I have shown in Chapter 4, it is one of the most constant and ubiquitous of the narratives within the policy discourse story-line of thermal renovation, and probably the most vigorously defended by its advocates. Secondly, as I will argue in Chapter 6, it is an essential logical link in this story-line, which would look very different without it. Thirdly, to homeowners it appears to be the least credible part of the story-line, which seems to be one of the main reasons they are showing reluctance to thermally renovate their homes. Hence it is a theme that warrants deep and detailed consideration in any case.

This chapter proceeds as follows. Section 5.2 presents an overview of the discourse of economic viability and what counts as economically viable. This shows the kinds of

effort and discipline that go into the production and reproduction of discourse in a policy domain. It also shows how political commitments can be buried within the scientific findings of the knowledge community.

Section 5.3 explores and critiques the assumptions within the parameters of the knowledge community's dominant mathematical model for calculating whether a thermal retrofit is economically viable. This brings to light the values, or political commitments, even within and underlying the apparently neutral activity of providing a mathematical tool for policymakers. This section includes discussion of the five key parameters in these mathematical models: the expected future price of fuel; the homeowner's personal discount rate; the cost of the thermal aspects of a renovation, the expected lifetime of these measures, and the fuel savings achieved by renovating.

Section 5.4 looks more closely at the algebra of the model, showing how its creators' values drive the choices of mathematical symbolism and methodology. An alternative model is offered, based on different values, which would shift decision-making power away from experts and towards homeowners. This comparison of models illustrates how one's political orientation can affect the kind of mathematically justified claims that get into the policy realm. To make for smooth reading in this section I have put most of the algebra in Appendix 1.

In Section 5.5 I make brief comments on two further consequences of the economic viability narrative: the cost threshold homeowners must reach before they can do any legal thermal improvement at all; and the diminishing returns on climate protection investment as thermal standards are tightened. This relates to the evaluation research questions, regarding how well the policy fulfils the Federal government's aims for it, in the context of the global dimension of these aims.

Finally, in Section 5.6 I discuss the implications of the above matters for policy studies, relating these back to the theoretical framework developed in Chapter 2, and in particular to my second theoretical research question.

5.2 THE ‘ECONOMIC VIABILITY’ NARRATIVE

5.2.1 ‘The question is wrong’

‘Es ist immer wirtschaftlich:’ - ‘It is always economically viable’ (IV_Krieger [49:00]). This narrative is ubiquitous in the German policy discourse on thermal refits to EnEV standards. As I explained in Chapter 4, Subsection 4.5.2, it is so unquestioned that policy actors accept it and proclaim it without ever having performed calculations. It was instructive to observe, at the UN conference on energy and housing in Europe and the former Soviet lands, in Vienna in November 2009, how this claim was repeated and assumed by popular German keynote speakers (Wolfgang Feist, Jochen Flasbarth and to a lesser extent Rolf Müller), and was never questioned in any of the plenary sessions. I wrote in my diary at the time, ‘A discursive atmosphere prevails in which one would feel like an ignoramus to raise such a question.’

Jochen Flasbarth, Director of the UBA (German Federal Environment Office), read from his speech notes:

Sometimes people recognise the threat of global warming but ask if ambitious reduction targets are economically too challenging. However, I see that as the **wrong question**. We rather have to ask:

- How long can we afford to do business as usual in residential housing?
- How long do we want to waste huge amounts of precious energy?
- How long do we want to be dependent on finite oil and gas supplies?
- How long can we accept energy poverty and unhealthy living conditions in run down houses? (Flasbarth, 2009, p. 5, bold type in original)

Interviewee Andreas Enseling, economist with IWU, also said ‘The question is wrong’ when I raised the economic viability issue (IV_Enseling [pre-recording]). The degree of certainty in discourse around the issue of the economic viability of thermal refits at EnEV standards is so great that it is, indeed, the ‘wrong question’ to ask. I felt this very strongly during my interviews with policy actors. Before the interviews I had done calculations based on actual case studies, and found many which did not seem to

be economically viable, i.e. the cost would not pay back within the lifetime of the retrofit measures. So I raised this question in my first few interviews, but often felt humiliated by the incredulous response to my apparent lack of understanding. I then found myself wanting to avoid asking the question so as not to appear so ridiculous. However I continued to collect case studies and, even using the knowledge community's own mathematical models, found the cases came nowhere near to passing the economic viability test. But I had to press myself to keep asking the question, feeling put down for doing so. One Federal official literally laughed at me at these points in the interview, causing her speech to be so badly distorted that I had to ask my (German) partner to fix my transcription of the conversation.

This is what Hajer (1995: 65) calls 'positioning.' It is not just *what* is said by policy actors, it is *how* it is said, and what messages are given about those who think differently. These manoeuvres position dissenters and unbelievers as ignorant, morally suspect, uninitiated, and thereby strengthen the influence and hold of the dominant discourse within the community that holds power, regardless of its logical or empirical credibility. A post-structuralist view sees this as part of what produces and reproduces the social rules that constrain and enable the actions of individuals.

For the German policy community it is absolutely essential to keep the economic viability discourse intact. The rationale of the EnEV and the government's CO₂ reduction goal for thermal renovation rests upon it, since this sits within a wider discourse of ecological modernisation: we can protect the environment without compromising our lifestyle or reducing our profitability. As Hajer argues, ecological modernisation is 'the dominant way of conceptualising environmental matters in terms of policy-making' (Hajer, 1995: 100). Policymakers think *with* it rather than *about* it, and the economic viability narrative slots neatly into it.

5.2.2 Disciplining your thoughts: 'anyway' and 'additional thermal' costs.

As I explained in Chapter 4, Subsection 4.3.1, a mainstay of the economic viability claim is the strict division of costs into two parts: 'anyway' costs and 'additional thermal' costs. German policy actors count only the additional thermal costs in the calculation of economic viability. As IWU economist Andreas Enseling explained:

And therefore we distinguish between these full costs and these anyway costs. And only the additional thermal costs go into the calculation of economic viability. This is naturally logical and correct, because the homeowner would have had to pay the other costs anyway. It's the underlying basis of this axiom. And it's also completely correct and completely OK. (IV_Enselsing [08:20])

But where exactly do you draw the line between the two types of cost? For example, if you are required to insulate your entire west wall to EnEV 2009 new-build standards because a runaway tractor damaged 10% of the render, do you count the scaffolding? Do you count the 90% of the new render that replaced the portion of the old render that was not damaged? If the thickness of the new insulation around the window ledges extends over the window frames, blocking the edges of the glass⁸⁰, and therefore you have to replace the windows, do you count the new windows as 'anyway' or 'additional thermal' costs?

The knowledge community have provided clear answers. The scaffolding and all the new render, including painting it if necessary, are 'anyway' costs, because they do not directly make the house warmer. As for the windows, 90% of the cost of these, plus the entire cost of their installation, are also anyway costs. Only 10% of the cost of the windows themselves go into the economic viability calculation (IV_Enselsing [11:09]). This is standard in the discourse, and this how it *must* be used in calculations of economic viability. Leading Building physicist Gerd Hauser explained:

So when, for example, a damaged render is repaired, the homeowner must erect a scaffolding anyway, and that's a very high cost. He has to renew the render, and that's costly too. But the additional thermal costs consist only of the actual insulation costs and perhaps the preparation of the wall surface. And these costs are relatively low. (IV_Hauser [11:13])

The result is that the additional thermal costs often become a minor portion of the cost of the whole job: the cost of the insulation foam and its gluing and screwing to the

⁸⁰ German windows open inwards not outwards. Hence the additional insulation around the window frames would not prevent the windows opening.

wall, and 10% of the cost of the windows. Obviously this job has a very good chance of appearing economically viable.

To the uninitiated it requires quite a mental effort to discipline the mind so as to keep this division hard and fast, and it seldom appears to ring true to homeowners. Of all the private homeowners I interviewed, not one reproduced this discourse. From their point of view, all the costs were, quite simply, things that had to be paid for. Those who showed me the figures for the full thermal refits done on their homes made no attempt to divide them into categories – and commented that the work had not proved to be economically viable (IV_Cottbus_C [07:47 ff]; IVN_Baden; IV_Würzburg [13:19]).

5.2.3 A political claim

The German government has adopted the knowledge community's sharp division of anyway and additional thermal costs, plus the actual breakdown of what building measures may be put into which category. In interviews it became clear that policymakers see this as a technical, engineering issue, and fail to see that it is actually a set of values, or a political stance. The building physicists – Professor Feist and his co-authors, in particular - have decided what counts as anyway and what counts as additional thermal costs, and done their calculations on this basis. But this is a *political*, or *values-based* question, not a *physics* issue. It has nothing to do with thermodynamics or structural engineering. It has all to do with how people perceive their activities.

This 'anyway/additional thermal' cost division, with its fine details of categorisation, is vigorously promoted by the economists, engineers, sociologists and building physicists in the small network of ecologically oriented research institutions which win the contracts for most of the expert reports for various aspects of the government's EnEV and KfW programme. These institutions⁸¹ are:

⁸¹ Apart from the *Passivhaus Institut* these institutions are not well-known outside Germany, so I will not give use English name equivalents for them in the text of the thesis. Further, translating 'Passivhaus Institut' as 'Passive House Institute' is misleading because *Haus* in German means 'building', not 'house'. So I will leave it in its German original.

Institut Wohnen und Umwelt (IWU) <http://www.iwu.de>

Passivhaus Institut <http://www.passiv.de>

Fraunhofer Institut für Bauphysik <http://www.ibp.fraunhofer.de/>

Institut für Energie- und Umweltforschung (Ifeu) <http://www.ifeu.de>

Institut für Angewandte Ökologie <http://www.ifaoe.de/>

There are direct personal connections between the first three and the Building Physics (*Bauphysik*) faculties of the Technical Universities of Munich and Darmstadt. They also work in close association with LUWOGÉ, a housing provider which is a subsidiary of BASF, Germany's largest manufacturer of wall insulation, and which runs pilot projects, testing BASF products on its own housing stock, which it rents out to employees. Further, all the decisions as to who gets the commissions to write the expert reports are made by a particular section of a Federal agency in Bonn, the *Bundesamt für Bauwesen und Raumordnung* (BBR - Federal Office for the Built Environment and Planning). The head of this section, interviewee Rolf Müller, assured me that proper, transparent criteria are employed in selecting the successful tenders for the expert report commissions. However I did express to him my concern that the experts involved all know each other and tend to recycle the same underlying political views. I interviewed actors in all but one of these institutions and noted how closely they interacted and shared their views.

5.3 CALCULATING ECONOMIC VIABILITY: PARAMETER ASSUMPTIONS

Calculating the economic viability of thermal refits is no simple matter, since there is an open set of possible benefits that can be conceived as accruing from a thermal upgrade. These include energy savings, increased comfort and health, improvements to the building structure, better weatherproofing, enhanced (or spoiled) appearance, possible higher resale or rental value, and the social benefits of reduced CO₂ emissions and employment (Martinaitis et al., 2007). However, most established methods of working out refit economics include only the direct gain through energy savings in their models, as this is seen as a direct and quantifiable monetary payback from the investment.

These established methods fall under one of four headings: simple payback time; net present value; internal rate of return; and cost of conserved energy (Martinaitis et al., 2004). The model underlying the German regulations is based on the cost of conserved energy. It compares the cost of the renovations with the cost the homeowner would have paid for the fuel he or she has now saved, over the lifetime of the renovations.

The knowledge community has produced a standardised form of this model for calculating economic viability, with a few minor variations. The model is structured such that a project is deemed to be economically viable if the expected value of each kilowatt-hour (kWh) of the fuel savings which accrue from the renovation over the lifetime of the renovations is equal to or higher than the cost of each kWh of saved energy, counting additional thermal costs only (Kah and Feist, 2005: 9; Enseling and Hinz, 2006: 22)⁸².

So if the additional thermal costs per kWh were €0.07 and the expected value of the fuel savings was €0.08 per kWh, the project would be declared economically viable.

This model was used for the economic viability calculations presented in the expert report in preparation for the 30% tightenings in the thermal standards for EnEV 2002 (Feist, 1998) and EnEV 2009 (Kah et al., 2008). It is also used in case studies to confirm that the EnEV standards are economically viable in practice (e.g. Enseling and Hinz, 2006) and in a number of related commissioned studies undertaken by the Passivhaus Institut (e.g. Kah and Feist, 2005; Feist, 1997). Homeowners are not encouraged to use it for themselves⁸³, presumably because the model is regarded as already having proven that EnEV standards are economically viable.

⁸² The actual wordings are:

‘Die Maßnahme ist wirtschaftlich, wenn die eingesparten Energiekosten höher sind als die Kosten der Energiesparmaßnahme’ (Kah and Feist, 2005: 9); and

‘Eine Energiesparmaßnahme ist dann als wirtschaftlich anzusehen, wenn die annuitätischen Energiekosteneinsparungen größer sind als die annuitätischen Kosten.’ (Enseling and Hinz, 2006: 22)

⁸³ In all my searching of the German government’s promotional literature on thermal renovation I have never seen this model presented.

I look here at the parameter assumptions of the model, then at assumptions inherent in the mathematical method. I will argue that these are politically based, yet that they enter the policy discourse under the guise of science-based mathematical reckoning.

There are five basic parameters in the calculations: the expected lifetime of the renovations, the cost of the job, the future price of heating energy, the homeowner's discount rate, and the amount of energy saved.

5.3.1 Expected lifetime of renovations

The first parameter is the expected lifetime of the renovations. One school of thought, represented by the Institut Wohnen und Umwelt (IWU), takes this to be 25 years (e.g. Enseling and Hinz, 2006). Another, represented by the Passivhaus Institut, assumes a 20-year lifetime with a residual value (e.g. Kah and Feist, 2005; Kah et al., 2008). Here the renovations are assumed to remain as good as new for 20 years, and then fall to a lower standard, which lasts and continues to diminish for a further 30 years. So the latter method demands a 50-year planning horizon compared to 25 for the former, though the cost and benefit balances turn out to be comparable. In both cases, the mathematical modelling depends crucially on this time-frame assumption.

From a policy discourse standpoint, this sets up the discussion, at the outset, with a 'life-of-the-renovations' time-frame in mind: when deliberating on whether to do thermal renovation you have to think in terms of a block of time of 25 years or more. This is unquestioned in the policy community.

However, not one of my private homeowner interviewees shared it. It was especially meaningless to interviewees over 60 years old. Some envisaged that they would move to smaller dwellings within a decade or so. Typical was the comment: 'I discussed this with the energy advisor and I see myself living here another 10 or 15 years.' (IV_Augsburg [02:07]). This homeowner explained that she was working out her economic viability calculation on a 15-year basis, as that was the maximum she could conceive of staying in her house:

500 euro times 10 [years] is 5,000, and then again, shall we say 10,000 euros [if fuel prices rise]. That's what I could save in 15 years for energy, for gas, if I kept the place that warm. Then I'd have saved 15,000 euros. (IV_Augsburg [06:32]).

However, because the job would cost over €30,000, she had decided it was not economically viable. Any savings after 15 years were meaningless to her.

Another homeowner, in his late 60s, had renovated only the essential parts of his house. He explained why a major refit with 25-year payback timeframe did not appeal to him:

For me it's actually really good to be able to live without a mortgage, because I don't like being in debt. And I think, when someone's as old as me, at 67, he shouldn't get himself into any more big debts. (IV_Bavaria_A [23:08])

A further challenge to the 25-year framework arises out of the recent increase in mobility of German households, a theme mentioned, ironically, by a number of policy actor interviewees. Generally there is large-scale internal migration from the east of Germany to the west, and from the north to the south (Hegner, 2009). The possibility of having to sell up and move house to follow employment opportunities does not engender the commitment to a house that is required, to invest in a project that takes up to 25 years to pay back.

So the 25-year framework is a mathematical device whose political overtones do not resonate well with the time frames of many private homeowners.

Some housing providers, however, do think in decades, making long term plans based on expected life cycles of aspects of the building. They see themselves as investing money now, some of which will take decades to pay back (e.g. IV_Neuhaus [12:09]).

Within the knowledge community there is now a move toward longer time-frames. The more sophisticated model, promoted by Feist and his colleagues in the Passivhaus Institut, is now becoming standard. This uses a 'residual' value of the renovations, which stretches to 50 years, and was used in Kah et al.'s (2008) expert report to pave

the way for the 30% tightening of standards in EnEV 2009⁸⁴. Ingrid Vogler, chief researcher for GdW, the national association of housing providers, commented:

You then get results for economic viability that look very, very good on paper, but in practice, for a business-minded housing provider, simply don't add up. No business trusts its assets to a payback time of more than 20 years. (IV_Vogler [19:30])

Further, there is contradictory empirical evidence as to whether 25-50 years is the correct time frame for construction measures such as 16 cm of polystyrene external wall insulation encased in a thin covering of plaster. Nobody knows how long these fixtures last. They are highly vulnerable to weather (e.g. IV_Bavaria_A), physical impacts (e.g. IV_Franken_A [18:11]), and even woodpeckers, who eat insects clinging within their stucco folds, and in the process mark out their territories by digging arrays of deep holes in the soft polystyrene – which squirrels and birds often come to nest in (Handwork, 2008; ; and reported personally in IVN_Berlin). In Appendix 7, the Picture Gallery, Nos. 1 and 2 show a photograph of a woodpecker damaging a school's wall insulation, and a cartoon suggesting how this phenomenon is popularly perceived.

When I asked my (anonymous) informant at the Munich Building Centre how long these wall coverings last, he laughed, threw up his hands in a shrugging gesture and said:

It all depends. When it's good, 25, 40 years. But when it's not, after a few years it's stuffed⁸⁵. (IVN_Munich_A)

The political advantage of a long time-frame in calculating economic viability is very clear: it trains people to accept a very long wait for returns on big investments made now, and therefore contributes to motivating them to do thermal renovation for economic reasons. In Subsection 5.4.2, below, I will present an alternative economic

⁸⁴ While Kah was the co-ordinator of the authorship panel for this Gutachten and Feist was one of the authors, a number of policy actors claim the ideas and approach are Feist's. Kah himself, when interviewed, did not challenge this view.

⁸⁵ There is no polite English equivalent of the German word *kaput*.

viability calculation model, which unhooks the issue from this contrived time framework and provokes homeowners to relate their costs and benefits to their own perceptions of acceptable payback time.

5.3.2 The cost of the job

As I have argued above, the cost of the job is also a political decision, as it requires homeowners to accept the knowledge community's assumptions about the division between anyway and additional thermal costs. The additional thermal costs are usually far lower than the total costs, for thermal upgrades. As I showed in Chapter 4, the total cost may be very high depending on the size of roof overhang, width of balcony, type of window settings, proximity of property boundary and driveway, etc. Ifeu researcher Hans Hertle estimates that the typical cost of a complete thermal upgrade is €500-€1000 per square meter of living area, while typical additional thermal costs account for around €200-€300 of this (IV_Hertle). This accorded with my own calculations. Using the Nuremberg dataset from Galvin (2010a: Table 4), Table 5.1 is produced.

	floor area (m²)	cost (€)	cost (€/m²)
	200	154,000.00 €	770.00 €
	117	90,000.00 €	769.23 €
	161	76,000.00 €	472.05 €
	695	215,000.00 €	309.35 €
	130	186,000.00 €	1,430.77 €
	155	70,000.00 €	451.61 €
	170	120,000.00 €	705.88 €
	160	250,000.00 €	1,562.50 €
	575	64,000.00 €	111.30 €
	467	370,000.00 €	792.29 €
Average			737.50 €
Minimum			111.30 €
Maximum			1,562.50 €

Table 5.1 Refit costs per square metre, Nuremberg dataset (source: Galvin, 2010a)

This shows an average refit cost of €737.50 per m² of floor area, with a range of €111.30/m² to €1562.50/m². It was not possible to find out how much, if any, of these costs were for remodelling rather than refitting, nor how much was anyway costs. However, more precise figures were available for comprehensive refits in a town in Bavaria (see Appendix 3) and in Würzburg (see Appendix 2). These are given in Table 5.2.

	floor area (m ²)	total cost of refit (€)	additional thermal costs (€)	cost (€/m ²)	additional thermal cost (€/m ²)
Bavaria	120	144,950.00 €	78,450.00 €	1,207.92 €	653.75 €
Würzburg	104	57,400.00 €	43,400.00 €	551.92 €	417.31 €

Table 5.2 Refit costs per square metre, houses in Würzburg and Bavaria

Here the total refit costs are €1207.92 and €551.92 per m² of floor space, with the additional thermal costs €653.75/m² and €417.31/m².

The mathematical model counts only the additional thermal costs. However to do the thermal upgrade the total costs, which the homeowner has to pay, can be very much higher, as in the Bavaria house, or only modestly higher, as in the Würzburg house.

5.3.3 The future price of heating energy

The parameter that most animated my interviewees was the future price of heating energy. All my policy actor interviewees but one predicted a high future price and scarce availability of heating fuel. Munich Green Party researcher Sabine Gehring said:

I personally think, quite simply, we've long gone beyond peak-oil. (IV_Gehring [45:57])

Other policy actors commented:

My argument is this: in a few years time oil will be very, very expensive, ... and then there'll be a big jolt, a break-point. (IV_Gräbel [10:56])

I really think the price of energy will double, perhaps triple. In my view it's clear: as crude oil gets scarcer, the price naturally rises exponentially. (IV_Gradl [24:58])

Oil is a big part of the equation. The amount of available oil could reach a tipping point. We're getting this peak. And that will have dramatic effects on the oil price. (IV_Köln_A [18:00])

I've followed this theme for the last 12 years. I love this theme; it's *my* theme. I'm absolutely convinced that my son – not so much myself, but my son – will have to pay a very high price for energy. And even if he's very rich, he'll never be sure whether he's going to get any. (IV_Neuhaus [49:20])

It's clear to me that, long-term, the tendency is upwards, constantly upwards. Sure, the curve will go like this (indicates a bumpy curve). And when it's on an upswing, everybody will think about thermal renovation. (IV_Schaal [35:28])

The only exception was IWU building engineer Marc Großklos, who said:

I regret that the energy price will rise much slower than we're always predicting ... and therefore people won't be so highly motivated to do thermal renovation. (IV_Großklos [22:01]).

I asked all homeowner interviewees a set of specially phrased questions to estimate what sort of annual percentage increase in fuel prices they were envisioning. The range was 5% to 10% per year, with most settling around 6% to 7%.

In the expert report the assumed annual increase is 5% to 6%. This, of course, is also a political choice, but one that probably reflects social expectations fairly, if even conservatively.

5.3.4 Homeowners' personal discount rates

The fourth parameter in the economic viability calculation is the homeowners' personal discount rate. This is an estimate of the annual cost, to the homeowner, of investing a sum of money in a home improvement project. It is a somewhat abstract reality, as it involves not just measurable elements, like the annual interest rate paid on a loan, but also 'opportunity costs' and 'risk factors' (Boardman et al., 1986; HM Treasury, 2010: 79-99).

'Opportunity costs' are the costs of lost opportunities for alternative investment due to investing a sum of money in one fixed project. If I invest €100,000 in a thermal refit, I cannot invest that money in, say, shares in a wind power company, which may bring a higher annual return. To some extent these losses can be calculated. However there are other losses that defy quantification. For example, the older homeowners I interviewed wanted to keep a large sum of money aside for the possibility of needing to go into a rest home, or of needing to move home so as not to have to negotiate stairs, or of having to do general repairs on the house and car (IV_Augsburg; IV_Bavaria_A). Younger homeowners wanted to keep money aside for their children's tertiary education (IV_Cottbus_B; IV_Bavaria_B). It is difficult to put a value on these 'lost opportunities.' The important issue is that they are not acknowledged by the EnEV policymaking community and do not figure in the economic viability calculations.

The second part of one's personal discount rate is risk factors. Whenever we invest in some project, there is a risk that it will turn out badly. We might die before we reap the financial benefits. A marriage break-up might force the sale of the house on a falling market, leading to substantial losses, as happened with a homeowner interviewee who had done a full thermal renovation (IV_Würzburg). The refit might not last the expected 25 years (e.g. IV_Franken_A). The fuel price might not rise as expected, rendering our investment less profitable. Woodpeckers might bore holes in our polystyrene wall coverings, or, as happened in Augsburg in the street near where I was interviewing, martens might invade the roof and literally eat their way through the roof insulation. More commonly, a home that previously had no mould and condensation problems might develop these after a thermal refit, if the job is not done

to the very exacting standards necessary at EnEV 2009 level. As thermal renovation engineer Marc Großklos explained:

If you don't insulate the window ledges properly – and that's often difficult, because there's very little room in there – then the physics of the building makes it inevitable that mould will appear. And that's because condensation will form.
(IV_ Großklos [30:48].

Generally, the tighter your thermal standards – and therefore the bigger the difference between indoor and outdoor temperatures – the more careful you have to be, to avoid the thermal bridges that lead to condensation and mould. The risk of mould formation was a very great concern of a homeowner who is also an architect, who brought up the subject seven times within half an hour of conversation (IV_Cottbus_B [e.g. 03:28]).

An even more serious risk, raised by the same homeowner and others (e.g. IVN_Franken_C), is that the income earner could lose his or her job and no longer keep up the mortgage payments on the loan taken out to do the renovations (which may be on top of an existing loan drawn when buying the house). In this case the house could be repossessed.

Again, these issues were very real to homeowners, but most policy actors dismissed them. A typical response was to criticise German homeowners for spending all their money on new bathrooms and kitchens (e.g. IV_Renner [01:00:12]).

However Rolf Müller, an economist and director of BBR, took the general issue of risk quite seriously, while pointing out that it was very difficult to quantify (IV_Müller [01:05:00]). But, as Müller affirmed, these risk factors are not included in the discount rate in the standard economic viability calculation model.

A rough idea of homeowner discount rates can be calculated from the length of time homeowners would want a renovation job to pay back through fuel savings. A survey by the social research institute TNS-Emnid (<http://www.emnid.de/>) revealed that only 3% of German homeowners would do thermal renovation if it took 12 years or more

to pay back: a discount rate of approximately 8% or lower. A further 18% would require the job to pay back in 8-11 years, a discount rate of approximately 9-12%, while 47% would require a 5-7 year payback time, giving a discount rate of approximately 13-20%. A further 25% of homeowners would not do thermal renovation under any circumstances, and 7% gave no answer (Friedrich, et al., 2007b: 35). Hence, of those who would do thermal renovation, by far the majority, 69%, have a discount rate of 13-20%.

The economic viability calculations in the expert reports use discount rates of around 3% to 5%, basing this only on cost of living increases and the very low interest rates offered by the KfW to those who qualify for a loan. This is a political choice, not a mathematical necessity. The expert knowledge community has chosen the lowest possible discount rate. It is out of step with the socio-materiality of the built environment, as the TNS-Emnid survey results indicate. It has the effect of making thermal refits look more economically viable than they would be for an actual homeowner; of making them appear to pay back earlier rather than later. And the government has accepted this move as if it is reliable, science-based knowledge. This is interesting, since the TNS-Emnid survey was reported in an expert report to the BMVBS in 2007 (i.e. as Friedrich et al, 2007a and 2007b), the same government department that receives the expert reports on the economic viability of the EnEV regulations. However in the expert report that reported the TNS-Emnid survey, the authors (who included Germany's leading building physicist, Professor Gerd Hauser), interpreted the survey results as indicating that homeowners were uninformed of the true benefits of thermal renovation. It declared, in response to the survey results, that 'the heating cost savings achieved through thermal renovation outweigh the costs of modernisation in the middle- to long-term.' However it added that this is the case because only the additional thermal costs should be counted in the calculation⁸⁶ (Freidrich, et al., 2007a: 4), and did not show any actual case studies.

⁸⁶ The words in the report are: 'Denn die Heizkostensparnis überwiegt mittel- bis langfristig die Modernisierungskosten, also die Kosten, die über eine ohnehin fällige Instandsetzung hinausgehen.'

5.3.5 Annual heating fuel savings

The annual heating fuel consumption of a dwelling before and after renovation is one of the most critical parameters in the economic viability calculation. The knowledge community take pains to get real life examples from many cases, so that their sample calculations represent the real world. Calculations based on the BASF housing estates run by LUWOGGE are particularly useful, as are those of the *Erbbaufverein* in Cologne, as these housing providers use arrays of sensors to measure actual temperature, fuel consumption, solar energy, etc. (Enseling and Hinz, 2006; IV_Vogelsang; IV_Neuhaus). Case studies such as these are used to confirm the real world effects of the physics theory that goes into working out insulation thickness, etc., for the EnEV regulations.

However, insulating to EnEV 2009 standards will not necessarily give a particular homeowner the theoretical fuel consumption. Studies show there is a wide range of actual fuel consumption figures, depending on the heating habits of the occupants (Schuler et al., 2000; Entrop et al., 2010). One of the householder couples I interviewed own and live in a comprehensively thermally renovated apartment which, on official reckoning, should be consuming less than 60 kWh/m²a. We examined the fuel bills together, and found the figure for their apartment was 197 kWh/m²a (IV_Cottbus_C and D), while the average for the block was 47 kWh/m²a. The thermal renovation costs on the couple's apartment would therefore take at least three times as long to pay back, as the official reckoning.

There is less uncertainty about fuel use before renovating, as homeowners can work this out from their past fuel bills. The issue for them is, though, that their fuel usage after renovation will depend on their indoor lifestyle. This is a large factor in determining the economic viability of their renovations. However the fuel usage that goes into the official model is that derived solely from theoretical calculations based on the physics of the building.

5.4 THE POLITICS OF MATHEMATICS: MODELS FOR CALCULATING ECONOMIC VIABILITY

5.4.1 The standard model of the German knowledge community

The standard model for calculating the economic viability of a thermal renovation project is outlined, for example, in Enseling and Hinz (2006: 12ff). This takes the expected lifetime of the renovations to be 25 years. The more sophisticated variation, using a 20-year lifetime followed by a residual of diminishing worth, is outlined, for example, in Kah and Feist (2005: 9ff) and in Kah et al. (2008: 18ff). Since the outcomes are similar and the first variation is less complex, I will explain the model using the simpler version.

The principle of the model is to compare the *cost of saving each kilowatt-hour (kWh) of fuel* with the *value of each kWh of the fuel you are expected to save*. These amounts are averaged over the 25-year lifespan and compared. If the value of each kWh of fuel saved is greater than the cost of saving it, your project is deemed to be economically viable.

Firstly⁸⁷, you take your total additional thermal costs, together with the current interest rate plus annual cost of living increase, and work out what your annual repayments would be on a table mortgage of this amount and this interest rate over 25 years. To do this you use the standard table mortgage formula:

$$P = A \times I/100 \times (1 + I/100)^{25} / ((1 + I/100)^{25} - 1)$$

where I is your percentage interest rate plus cost of living increase,

A is the ‘additional thermal’ costs of the project,

and P is the equivalent annual payment of additional thermal costs.

You then work out the cost of each kWh of energy saved, using the formula:

⁸⁷ Enseling and Hinz do the steps in a different order, which I find unnecessarily contorted and untransparent. The order I am using is mathematically identical but, I believe, clearer to grasp.

$$C = P / (L \times R)$$

where L is the living area, in m^2 ,

R is the reduction in energy use, in kWh per m^2 , due to the renovations.

P is the equivalent annual payment of additional thermal costs (see above)

and C is the cost of each kWh of energy saved, in €/kWh.

You now take the current price per kilowatt-hour of heating fuel, 'H'. You take the expected percentage annual increase in the price of fuel, 'E', and work out each year's fuel price by multiplying H by $(1 + E/100)$ raised to the power of 0, then 1, then 2, etc, up to 24. On a graph this would give an exponential curve.

Next, you work out the average of these 25 values. This gives you 'F', the average price of fuel over the 25-year lifetime of the renovations, again in € per kWh.

If F is greater than C, the project is deemed to be economically viable: the value of each kilowatt-hour of fuel saved is greater than the additional thermal cost of saving one kilowatt-hour of fuel.

The advantage of this method is that it results in your being able to make a simple comparison: the *cost* of each kilowatt-hour of fuel saved, compared with the *value* of each kilowatt-hour of fuel saved (a cost-benefit comparison). You can also compare it directly with the cost of energy generated by alternative means, such as wind power.

The figures can, however, be quite abstract for a homeowner wishing to make ends meet. They refer to a hypothetical average of the value of each kWh over 25 years, not to values of actual amounts saved in actual years.

There is also a mathematical quirk in the model, which can confuse people into thinking their project will pay back earlier than it actually does. When you average an exponential sequence, you get a value that the sequence does not reach until somewhat after its halfway point – in this case around 15 years out of the total of 25. But your cost 'curve' is flat. Figure 5.1 shows this on a graph. There are two flat horizontal lines, very close together, on this graph. The higher of the two is the

average fuel cost saving over 25 years, i.e. the average of the exponential curve, while the exponential curve is the actual saving. The flat line does not draw level with the curve until the 15th year. The lower flat line is the annualised cost of fuel savings. This case is deemed to be economically viable because the cost of saved fuel is lower than the average price of the fuel savings. But the fuel savings do not reach their averaged value until some 2 ½ years after the halfway point. This tends to mask the fact that, while you are paying your average annual costs every year from day one, your fuel cost savings will not reach this level until well in to the future. This is not a problem for a professional housing supplier who thinks long into the future. But it is for a householder who may easily be misled by the apparently high value of ‘average’ fuel savings.

In this sense the choice of a particular algebraic form becomes political, or values-based. The time at which the average value is reached is the solution, for t , to the equation:

$$[a(1+E/100)^0 + a(1+E/100)^1 + a(1+E/100)^2 + \dots + a(1+E/100)^{24}] / 25 = a(1+E/100)^{t+1}$$

where a is the initial fuel price and E the annual percentage increase in fuel price.

The equation is a political, values-based choice in that it gives a solution that is of significance to the homeowner but is hidden behind the parameters the model produces, namely cost and average price per kWh over the 25 year lifespan. This is of course not to suggest that algebra itself has political intentions or agency. However it influences outcomes in specific ways, and the modellers are responsible for choosing it as a medium within their model, and not making its effects explicit.

The graph in Figure 5.1 also shows that for the first 15 years you are losing money, compared to if you had not renovated. From a purely economic point of view it would have made more sense to wait 15 years and then renovate. You would then be making profits from the day the renovations were completed.

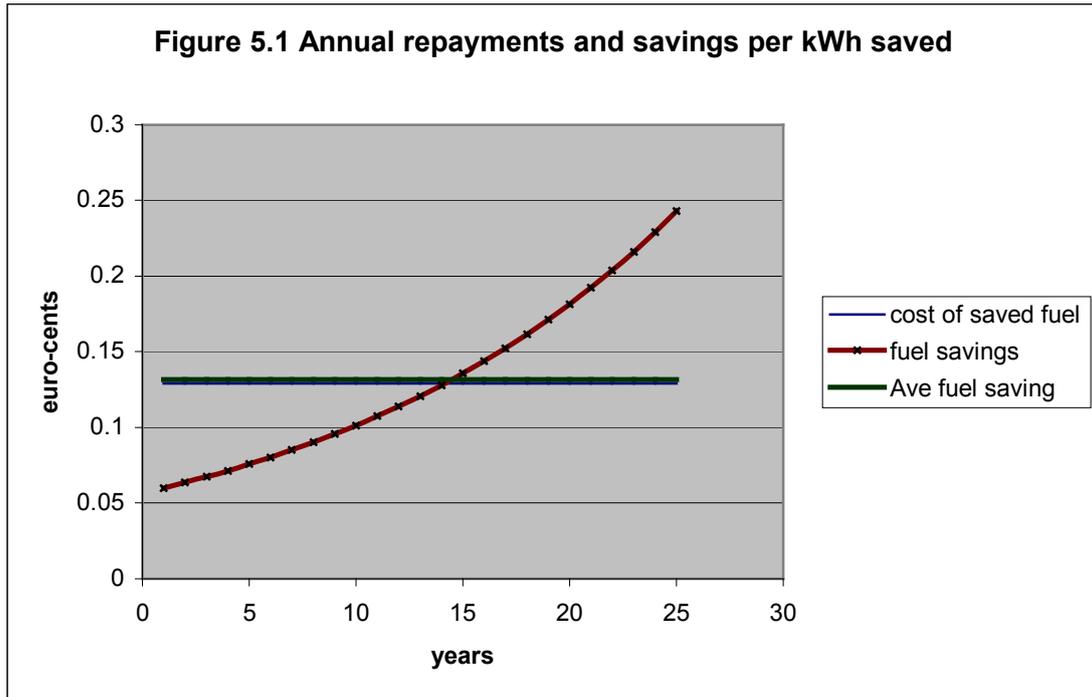


Figure 5.1 Annual repayments and savings per kWh saved

I raised this issue in an interview with an (anonymous) building physics faculty member who produces economic viability sums for the expert report which his line manager writes for government and other bodies (IVN_Bavaria_B). However he saw no reason to attempt to make its effects clear to the average homeowner. Instead he applauded the advantage it brings, in hiding a problematic aspect of economic viability from potential home renovators.

Later in my interview schedule this issue was raised by Ingrid Vogler, chief researcher for GdW. Fuel savings go up exponentially, she said, not reaching their average values until into the latter half of the 25-year payback time. But, she pointed out, if landlords are to use the standard model and increase the rent according to the average fuel price saving, then:

That means today's tenants will pay for future tenants' savings. Tenancies are not as long in rented accommodation as in owner-occupied homes... A tenant moves out in, say, 3 years, or in 5 years. We have a 10% annual turnover in Germany. (IV_Vogler [05:24])

So, averaging the exponential curve creates an impression of immediate gain that will not actually be enjoyed for some 15 years. The model is no more than that – a model – but the choice of result mechanism has discursive effects which coincide with the interests of elements in the political system who want to persuade people to invest money. The choice of which mathematical symbolism to use is not politically neutral.

Hence there are six quite distinct ways in which the values, or political commitments, of the modellers are driving the model:

1. The choice of the type of model used ('cost of conserved energy').
2. The choice of parameters used to construct the model.
3. The figures chosen for each parameter, including the rationale for choosing these figures.
4. The criterion chosen to decide whether a retrofit is economically viable: it must pay back within the 25-year time frame (or 20 years plus residual).
5. The quirk of averaging an exponential sequence, in which the average value is not reached until after the halfway point.
6. The way the model's results are presented, so that it is not made clear that the homeowner is running at a loss in all the years up until the annual benefits reach the level of the annual costs.

5.4.2 An alternative economic viability calculation model

Here I present a model that requires the homeowner to make more of their own value decisions as to what numbers to use for each parameter. It uses four parameters rather than five: it makes no prior assumptions about payback time, but instead *calculates* the payback time for a given project. Further, it avoids the exponential-flat curve problem by refraining from constructing a hypothetical average value of fuel price savings (it can do this because it is not working to a set timeframe). This model works as follows:

First, the homeowner decides how much of the cost of her project she will count as ‘additional thermal’ costs. This has to be her own decision because only she knows what features of her house she would have repaired ‘anyway’⁸⁸. This is ‘A’.

Second, she works out how much money she expects to save, in fuel costs, per year, by doing the refit. This will depend on her household’s habits as much as on the characteristics of the building. In the official methods, this figure is given by experts, on the basis of the thermodynamic characteristics of the dwelling. But it also depends, in the real world, on a household’s lifestyle and heating habits. This figure is ‘S’.

Thirdly, the homeowner makes an educated guess as to the annual percentage increase in the price of heating fuel. 6.5% is a safe bet because that is the historic increase since 1987⁸⁹, but it is the homeowner herself who has to live with the consequences of her choice. This figure is ‘E’ (a percentage).

Fourthly, she works out her personal discount rate. This can be taken as the likely long term interest rate, plus the annual cost of living increase, plus a portion for risk and a portion for lost opportunities - bearing in mind that this is not the kind of investment one can pull one’s money out of, if life’s circumstances change. This figure is ‘D’ (a percentage).

The homeowner now has to do two sums, using a calculator or spreadsheet. Firstly she works out a factor, ‘F’, that combines the effect of her estimated fuel price increase and her discount rate. This is:

$$F = (1 + E/100) / (1 + D/100)$$

Then she works out ‘N’, which is the number of years it will take her project to pay back, using the formula:

⁸⁸ Martinaitis et al (2007) propose a two-factor method for appraising the economics of a thermal renovation, in which the ‘anyway’ costs are included, but weighted differently from the ‘thermal improvement’ costs. This might appeal to homeowners who have good, but not urgent, reason to renovate ‘anyway’.

⁸⁹ The Brent spot price of crude oil in 1987 was \$US20. In 2010 it was around \$US80.

$$N = \log [(A/S) \times (F-1) + 1] / \log F$$

A further advantage of this model is that, if ‘E’, her figure for the percentage annual fuel price rise, is the same as ‘D’, her discount rate, the formula becomes simply:

$$N = A/S$$

In Appendix 1 I show how these formulae are derived, and give some examples relating to an actual home in Germany. I also show that there are some cases – in which the discount rate is somewhat higher than the annual fuel price increase - that will never pay back, even if the thermal refit measures last forever⁹⁰. Appendix 3 shows the model applied to a comprehensive thermal refit that was carried out on a Lutheran vicarage in Bavaria⁹¹ that led to annual fuel savings of €1,512. This incurred actual costs of €144,950, and these would be reduced to €78,450 if only the bare minimum ‘additional thermal’ costs were taken into account (i.e. if it is assumed the house needed a comprehensive refit ‘anyway’). Even here, however, the job would take 53 years to pay back if the discount rate is 8%, and 36 years using the policy experts’ discount rate of 5%. Further modelling in this Appendix is displayed in graphs, which show how the payback time varies with the discount rate. If the cost of the job is taken to be €78,450, it will *never* pay back if the discount rate goes above 9%. Even if the job had only cost €40,000 and still achieved an annual fuel saving of €1,512, it would *never* pay back if the discount rate went above 11%. The TS-Emnid survey cited in Chapter 4 shows that most homeowners have discount rates of around 12% or more (Friedrich, et al., 2007b: 35). Hence, if the actual socio-materiality of the residential built environment is taken into account, *there is hardly ever a case where thermal renovation to EnEV standards is anywhere near economically viable, even when only additional thermal costs are counted.*

⁹⁰ These cases will crash a calculator or spreadsheet (as you cannot have a log of a negative number or of zero) so another way of dealing with them is given in the appendix.

⁹¹ I was given a detailed tour of the house and its refit measures, and a copy of the cost breakdown for the job. However I offered anonymity to the resident, a pastor, so I cannot reveal the city and suburb in which the vicarage is located. The Lutheran Church in Bavaria is currently refitting all its vicarages to this standard (Kirchliches Amtsblatt, 2009).

5.4.3 Further comparisons between the models

There are three main differences between the model I put forward, and the official model. Firstly, it gives the result in terms of years to payback, rather than a comparison of costs and benefits per kWh of energy over a fixed period. My experience of interviewing homeowners indicates that they find this the more meaningful measure. Secondly, it puts the onus on the homeowner to make choices as to what to include in the additional thermal costs of the job, how much energy is likely to be saved in his or her particular case, what to include in the discount rate, and what the cost of energy is likely to do over time. These decisions are taken out of the hands of officials and given back to the homeowner. Thirdly, it avoids the peculiarities of averaging exponentials, noted above.

Martinaitis et al. (2007: 193) point out that simple payback time models – of which this is one – suffer the disadvantage that they cannot distinguish between the economic efficiencies of refits that have different lifetimes. If the payback time of two measures is the same but their lifetimes are different, the two measures will not be equally economically efficient. This is true in theory, and it would matter if we were comparing, say, loft insulation, which has a very long lifetime, with external wall insulation, which is fragile and exposed to the elements. In this case, a homeowner would need to do two separate sums and decide whether the payback time for each feature made sense in terms of its possible longevity.

Further, the model has the advantage that, the earlier the payback time, the more economically efficient a refit measure is, regardless of its possible (and unknowable) lifetime. This is because an early payback time means it will move into profit soon, and so bring bigger long-term gains.

However the model has the disadvantage that it does not reveal how economically efficient a refit is in terms of the kWh it saves per euro invested. The fact that a refit pays back early does not necessarily indicate that it is a better investment than alternatives on offer, a point I explore in more detail elsewhere (Galvin, 2010a).

5.4.4 Wider socio-technical questions

A further, more general point needs to be made, to emphasise the *socio-technical* intent of the above alternative model. The standard model is couched in the assumption that scientists and engineers produce energy-efficiency technology that homeowners will adopt if they are informed and sensible. Guy and Shove (2000) investigated the understandings of housing energy efficiency among policy actors in Finland, Sweden, France, the UK and the USA, and found that ‘building scientists and their funders subscribed to a remarkably uniform, remarkably linear’ understanding of research, development, demonstration and dissemination (*ibid*: 129). Once the technology has been invented, developed and demonstrated, its dissemination should follow on naturally, and if it does not, this is because of ‘barriers’ (*ibid*: 131) due to ignorance, inappropriate regulatory frameworks, glitches in supply, etc. The standard mathematical model deconstructed in this chapter can be seen as an attempt to smooth out these barriers – particularly in its heavily prescriptive accounts of what costs may be counted, what the payback time and discount rate should be, and how you calculate the annual fuel savings.

This represents ‘an unwarranted conceptual separation of the social and the technical’ (*ibid*: 131). The technical is conceived like an arrow aiming at the social, or like a medicine being applied from outside the social, to fix it.

A better understanding would recognise that technical solutions are, from the start, socially generated. For example, the claim that 16cm of external wall insulation is appropriate for (almost) all houses may well have provenance, at least in part, in the dominance of BASF as an insulation manufacturer and the momentum of building firms and infrastructure that use its products. In their investigations of housing energy efficiency activities in various countries, Guy and Shove (2000: 130) found that ‘the material stuff of energy conservation’ depends just as much upon commercial factors as upon regulatory systems or climatic conditions. What is seen to be correct and appropriate tends to adjust to suit what is available off the shelf.

The alternative model can be seen as a first attempt to re-root thermal renovation in a more appropriate social setting, i.e. that of houses and homeowners, rather than the

academic-industrial complex that tends to produce and market products that suit its own needs. Using this model, homeowners would produce a different set of requirements, which industry would then have to respond to.

5.5 FURTHER ECONOMIC ISSUES

There are two further problems with the way economic viability is discursively constructed in the German thermal renovation knowledge community. One is what I call cost threshold. The other is the broader issue of the cost of saving CO₂. I discussed these more fully in Galvin (2010a), and will outline them only briefly here.

5.5.1 Cost threshold

Because of the strict thermal standards demanded in the EnEV, a homeowner must reach these standards if he wants to do any significant thermal improvements at all. He cannot just put 6 cm of insulation material on his (external) wall next time he renews the render, even if this dovetails nicely with his 9 cm roof overhang. This is against the law. There is, of course, an *Ausnahme* (exception) clause in EnEV 2009: Section 25 declares that a renovator can apply to the local municipality to be excused from an aspect of the regulations in situations of *besonderer Umstand* (special circumstance), *unangemessener Aufwand* (disproportionate expense) or *unbillige Härte* (inequitable hardship). But getting an *Ausnahme* is a difficult bureaucratic process. One interviewee, a builder and hotelier, explained how he simply did not have the energy and patience to persevere with it. Instead, he did an illegal, comprehensive thermal refit on his small hotel in Thüringen, in former East Germany, to a standard he regarded as sensible (IVN_ Thüringen). A photograph of the result is given in Appendix 7, the Picture Gallery, No. 3.

The costs of achieving the EnEV standards are in many cases so high that people either renovate according to their own rules – technically illegally - or do nothing. Another eastern German homeowner, who had legally renovated the walls, windows and heating system of his house but not the roof, explained his problem. The upper story of the house was in the loft. To insulate the roof legally would require 25 cm of

insulation. This would bring the (sloping) ceiling so low that much of the living space would be lost. The alternative was to raise the roof – a full reconstruction job. ‘You’d have to put a lot of money into it,’ he said. ‘It would really hurt,’ (IV_Cottbus_A [14:55]).

A similar example is shown in the Picture Gallery, Nos. 11 and 12, showing a house before and after thermal renovation done to the owner’s own standards rather than the more stringent EnEV standards.

Even if a renovation job may be technically economically viable, the high cost threshold puts people off. Each step-wise tightening of the standards not only increases the proportion of homes that encounter problems such as the roof and wall dilemma. It also seems to increase the proportion of people who shy away from outlaying such a large capital sum. Ulrike Hacke, a sociologist at IWU who has researched landlord-tenant relationships, writes:

Because lawmakers have continually raised the legal minimum standards for energy efficiency of dwellings in recent years, housing investors have spoken increasingly of the economic viability problems this brings. This could lead to a negative effect on investment. (Hacker, 2009: 1, my translation)

This phenomenon was a key reason for the proposal, ‘*Energie-Spar-Prämie-130*’ (‘Energy saving premium 130’ – ESP130) floated by leading MPs from the CDU-CSU Federal caucus in the run-up to the general election in September 2009 (Pfeiffer and Nüßlein, 2009). Here it was suggested that a limit of 130 kWh/m²a be put on the regulations, and the subsidy system be adjusted to incentivise more widespread renovating, but to a lesser standard. The somewhat chaotic life of this discursive manoeuvre makes for an informative case study in itself, and I will look at it in more detail in Chapter 6.

So, ironically, tightening the regulations tends to thwart the CO₂ reduction goal that it is designed to achieve. Although Hacke, cited above, is institutionally a part of the

knowledge community⁹² whose expert reports are given a privileged status in the knowledge they put forward about thermal renovation, the point she espouses does not penetrate the dominant discourse. Instead, this point gets elbowed out by the overwhelming push to reproduce the economic viability narrative. This gives weight to the view that the physicists, micro-economists and engineers who have the ear of the policymakers select out which aspects of knowledge of materiality are important, and that they do this on the basis of their values, or politics, rather than on scientific grounds.

5.5.2 Saving CO₂ economically

The economic viability model of the expert community has the advantage that it produces a figure for the cost of saved energy, in euros per kilowatt-hour (€/kWh). This figure can easily be used for comparison with other ways of saving energy or generating renewable energy. Further, since it is directly related to the tonnage of CO₂ emissions reduced (you multiply by a factor depending on the energy source), it can also be a very useful means of comparing the costs of reducing one tonne of CO₂ emissions from various sources, such as through electric cars, modernisation of industry, carbon capture and storage, etc.

Its disadvantage, though, is that it masks the fact that the cost of the 'last' kWh of energy saved is an order of magnitude higher than the cost of the 'first'. For example if you have a house that consumes 240 kWh/m²a, you may be able to renovate it to the standard of 150 kWh/m²a for a cost of, say, 2 eurocents per kWh. But if, instead, you renovate to 100 kWh/m²a, the cost might rise to 4 eurocents per kWh, and 8 cents if you renovate to 70 kWh/m²a. This is largely due to the stepwise problems you encounter when trying to add thicker insulation or get rid of thermal bridges, but also due to stepwise increases in the complexity of the thermal retention measures.

This would make the *marginal* cost of saving the last 30 kWh/m²a (i.e. of getting to 70 kWh/m²a rather than 100) the far larger figure of 27 cents per kWh⁹³. These

⁹² She is a researcher with Institut Wohnen und Umwelt (see above).

⁹³ 240 – 100 = 140 kWh. At 4c/kWh this is 560 cents. 240 – 70 = 170 kWh. At 8c/kWh this is 1360 cents. The difference, i.e. the cost of getting from 100 to 70, is 1360 – 560 = 800. A cost of 800 cents to save 30 kWh gives 800/30 = 27c/kWh.

figures are comparable to, though lower than, those of Jakob's (2006) calculations of marginal costs of thermal renovation to various standards in Switzerland.

So it costs over 13 times as much, per kWh saved, to go the last 30 kWh/m²a, as it does to go the first 140 kWh/m²a.

This is a very expensive way to save CO₂, when you can generate wind power for around 8 eurocents per kWh, insulate loft floors for less than 1 cent per kWh, or put foam plastic sealing strips on draughty windows for a few euros per window.

Although this is disarmingly simple to calculate, it appears never to be discussed in the policy community, and my attempts to raise it were met with blank looks. Instead the standard mathematical model eclipses it. This gives a single value for the entire ensemble of saved kWh, masking the extremely high cost of the last 10%, 20% or 30%. Once again, the choices that have gone into the way the model is constructed strongly influence people's conceptions of what the project of thermal renovation is achieving. Again, mathematics can be a highly political activity, and scientific experts can be very choosy as to which aspects of its truth to focus on.

5.6 SUMMARY AND REFLECTIONS

In this chapter I have deconstructed the mathematical model which is used in expert reports to prove the economic viability of thermal renovation to various standards. This deconstruction consisted of bringing to light the values and assumptions – effectively the politics, or values - of the scientific experts, that underlie the choices of various mathematical processes for making these experts' case.

However, this exercise in deconstruction differed from what is normally understood by the term, in an important way. I did not assume that *all* the sources of inspiration for the model are the values, assumptions and politics of the modellers. Instead, the modest realist framework I am using enabled me to distinguish those which are genuine scientific knowledge, from those which are not. The modellers are correct, for example, in asserting that adding insulation of such-and-such a U-Value to the walls of such-and-such a type of house will result in a saving of such-and-such a

number of kWh/m²a, all other things being equal. Their basic physics is sound. Further, the micro-economics they draw on accords well with the costs of undertaking various kinds of thermal renovation in the German situation. Also, the mathematical functions they use – such as the compound interest formula – are consonant with sound scientific knowledge and practice. My argument with the mathematics of their average of an exponential sequence, for example, is not that the mathematics itself is value-laden, but that they have failed to make its quirks transparent to readers, and in this it subtly supports their values and politics.

The main problem with the knowledge the experts provide is that it is a mixture of genuine science and the experts' own politics. These experts also display too narrow a view of the scope of the materiality they are dealing with, namely the residential built environment throughout Germany. They show little understanding of the extent to which German houses suffer non-linearities (e.g. the wall and roof dilemma, narrow balconies, low-ceilinged basements, and low loft roofs) with respect to thermal renovation. It is a *scientific* question as to how prevalent these features are, and how difficult and expensive they make thermal renovation. These experts' reports should take these real material factors into account, if the experts are, indeed, offering their services as scientists.

The modest realist framework I am using has enabled me to distinguish quite effectively between what is genuine science, what is politics, and where there is a need for more science, deep within the technicalities of an expert report. This represents a contribution to learning, which policy discourse analysts could be interested in incorporating into their own theoretical and methodological frameworks. Its strength is that it offers a *methodology* that would enable specific characteristics of the influence of expert knowledge, on policy discourse, to be brought to light in each unique policy situation.

Here it has provided at least a partial answer to my second research question, in that it shows some of the key ways the interplays between policy discourse and materiality are determined by the values and politics of the scientific experts who act for policymakers as the spokespersons of materiality.

The interplays between materiality and discourse are strongly influenced, at least in this case, by those who write expert reports for government. On the one hand these experts provide the government with good knowledge of the materiality, based on genuine science. But on the other hand, they mix this up with their own values and politics, so that policymakers get a skewed understanding of what the materiality is like. The experts also leave out aspects of scientific-type knowledge which they do not seem to be aware of, or to take seriously. All this leads to unrealistic demands being set in the regulations.

In terms of what the German government is trying to achieve, it needs to ask why this particular group of experts is allowed to dominate the field of official knowledge supply. These people are not only paid to write expert reports for the Federal government which are taken as the truth about the physics and micro-economics of thermal renovation, such that these views continually drive up the thermal standards in the building regulations. They are also paid to write similar reports for state and municipal governments, for other agencies and for private firms, the effect of which is to further promulgate and entrench the economic viability narrative⁹⁴. Thirdly, they are employees or major shareholders in institutions that survive and thrive, financially and otherwise, on the writing of such reports, or, in the case of the technical universities involved, on the development of ever more sophisticated devices, methods and strategies for bringing buildings closer and closer to zero-energy standard. Fourthly, they are closely connected to each other personally, in a professional-social sense. Fifthly, they have professional connections to practitioners, such as LUWOG, the daughter firm of BASF, Germany's largest manufacturer of building insulation, who have their own interests in driving up the standards. One would not question the integrity of these experts in seeking to offer what they see as reliable knowledge to policymakers. But a strong case could be made for the Federal government to cast its net more widely, among other professional and practitioner groups, and even among ordinary homeowners, in gathering the knowledge it needs for the development of sound and successful thermal renovation policy.

⁹⁴ The websites of these institutions list many of the publications they have produced for such bodies, and offer a selection for free download.

We saw in Chapter 4 how the policy and its material objects are in places out of step with each other, and in this chapter we have explored the influence of the providers of expert knowledge, in contributing to these mismatches. We now need to ask, what happens to the policy discourse and its story-line if and when these mismatches become evident to policymakers. This theme is explored in the following chapter.

Chapter 6 NARRATIVE ACCOUNTS, DEFENCES AND MANOEUVRES

6.1 INTRODUCTION

This chapter deals with the third theoretical research question:

In an environmental policy domain:

How does policy discourse maintain, reproduce and reform itself in the face of changing understandings of materiality and of the policy's influence on it?

In this chapter the focus is on the life of the policy discourse itself, and the dynamic interplays that are constantly occurring within it.

In the empirical investigation it became evident that there is a constant attempt among policy actors to maintain, repair and regenerate a credible and powerful story-line that not only constructs the problem and its solution, but also acts as a vehicle for the written policy to travel in and achieve its aims. But this story-line has many weaknesses, so a great deal of effort goes into making it sound strong and serviceable. These weaknesses arise from the poor fit that much of the story-line has with the material-social world, and this is fed, in part, by the values and politics brought into the policy discourse by the knowledge community. But not all of this is static. While many of the narratives within the story-line seem to be fairly stable, some are coming and going. Some come into being as a response to awareness, by various actors, that the policy is not working properly. Others come from shifts in personnel, such as when a popular, influential figure gets a high government appointment. The provenance of others is more difficult to trace.

In a complex field such as thermal renovation policy and practice in Germany, there are variations within the story-line. Different narratives tend to be affirmed to different degrees among different groups in different ways, depending on the aims of

the group. For example, the director of the *Bundesamt für Bauwesen und Raumordnung* (BBR - Federal Office for Building and Planning) talks more about the need to develop pleasant districts, than to thermally renovate all houses, while the director of the *Umweltbundesamt* (UBA - Federal Environment Office) talks in extreme terms about the latter need. In some cases, the narratives have diverged so much that one could say a new, or alternative, story-line is emerging. For example, the Munich municipal Green Party caucus proclaim that it is always economically viable to renovate to EnEV standards and beyond, but the Federal Green Party caucus seems to have dropped this narrative. This could be because the Greens are not in government at the Federal level, whereas they are in Munich City Council, which is trying to get people to thermally renovate their homes. Whatever the reasons for variation, my somewhat abbreviated description, here, of ‘the’ dominant story-line is not intended to claim that all is perfectly uniform or static.

The chapter proceeds as follows. In Section 6.2 I outline the plot of what appears to be the dominant story-line, and how its narrative parts are made to fit together. In Section 6.3 examine what appears to be the beginning of a shift in the configuration of the story-line, as one of its main defences begins to lose credibility. This defence is a sub-set of narratives about landlords and tenants. I show how, in circles with a good overview of the materiality at which the policy is aimed, this narrative’s function in the story-line is now being replaced with another narrative set, this one to do with small, privately owned houses. In Section 6.4 I look at two relatively new narratives, and contrast their trajectories in relation to the dominant story-line. One, coming from more radical sections of the policy community, seems to be offering itself as a possible alternative to the very dominant economic viability narrative. The other, from more conservative circles, appears to have lived for a short while, failed to take hold in the story-line, and faded away. In Section 6.5 I look at the fortunes of a long-running narrative, to do with the ever-tightening trajectory of the thermal renovation regulations in respect of insulation alone. In this case, the narrative seems to be petering out in some sections of the policy community.

Reflecting on these findings, in Section 6.6, I explore the more general question as to why and how it takes focused, hard work to hold a story-line together in this particular

policy community. I also reflect on these findings in light of the theoretical framework and the findings of Chapters 4 and 5.

6.2 THE STORY-LINE AND ITS CONSTITUENT NARRATIVES

Several narratives from different provenances come together to form the story-line that supports, promotes, explains and defends the written and other official aspects of the German project of thermal renovation of existing homes. There is not a natural fit between and among all these narratives, but they are pressed, as it were, together to keep the story-line intact. Because of this unnatural fit, and the mismatches between some of the narratives and the material and socio-material world they refer to, a great deal of effort and manoeuvring is required to keep them together, to keep reproducing the story-line, to bolster it and protect it from attack and from its own internal tendency to disintegrate. The key narratives in this story-line are as follows.

6.2.1 Reducing CO₂ emissions at negative cost

This narrative asserts that *by doing a thermal refit we save more money than we pay*. The cost of the refit is outweighed by the money gained through fuel savings within the lifetime of the refit, quite apart from ancillary benefits, such as increased comfort and reduced GHG emissions. In the words of Jochen Flasbarth, Director of the Federal Environment Agency:

Good insulation, modern heating systems and thermal windows are worthwhile also in **monetary terms**. If energy related investments are coupled to other renovation activities – which is usually possible – emission abatement investments lead to net cost savings under current market conditions. (Flasbarth, 2009: 4, bold type in original)

This amounts to a re-affirmation of the economic viability of thermal refits, explored at length in Chapters 4 and 5. This narrative is widespread in official publications on climate change (e.g. IPCC, 2007; IEA; 2008; 2008b). One of the most oft-repeated forms of it is the graph, produced by McKinsey and Company (2007) and reproduced by EURIMA (see Chapter 1, Figure 1.2), of comparative costs of reducing one tonne

of CO₂ emissions through various measures. This graph shows that thermal refits bring a negative cost of around 160 euros for each tonne of CO₂ saved, and sets them alongside other CO₂-saving measures, most of which incur positive costs. As I have argued in Chapters 4 and 5, in the real world this claim only holds true for certain degrees of thermal renovation and only on homes with certain physical characteristics.

But this narrative is a basic pillar of the story-line. Many of its protagonists recognise that it is true only in limited ways, but nevertheless, as I showed in Chapters 4 and 5, it is reproduced regularly, often without qualification, as a cornerstone of the edifice of the German thermal renovation story-line.

6.2.2 Low energy possibilities for all buildings

This narrative says that *it is technically possible for (almost) every existing building to be insulated to 'low' (or in some versions 'passive' or 'zero') energy standard*. This refers to the buildings' structure and thermodynamic potential, rather than the financial costs of renovating them. This narrative appears to owe much of its provenance to the work of building physicists such as Professor Wolfgang Feist, director of the Passivhaus Institut, and his doctoral supervisor Professor Gerd Hauser, director of the Fraunhofer Institut für Bauphysik. It is reproduced not only verbally but also through the physical presence of hundreds of 'demonstration objects' of thermally renovated homes scattered throughout Germany. These homes can be seen as discursive statements whose purpose is to make the point that any home can be so renovated (e.g. IV_Enseling [30:03]; Flasbarth, 2009: 7; IV_Gehring [52:00]; IV_Gradl [04:18], [04:48]; IV_Düsseldorf_A [51:31]; IV_Hauser [03:03]; Hegner, 2009; IV_Hertle [45:12]; IV_Krieger [05:00]; IV_Köln_A [46:48]). In the real world the claim of this narrative holds true for a large proportion of buildings, though, as I have pointed out earlier, many others have the wrong physical characteristics to take super-insulation without losing their form and purpose.

6.2.3 Low energy zero cost refits

The above two narratives are making quite different assertions: the first about cost, the second about physics. However they have become fused into the composite

narrative: *almost any existing building can be thermally renovated to low (or passive or zero) energy standard, at negative or zero cost.*

I explored the ‘economic viability’ narrative in Chapters 4 and 5. The German words *wirtschaftlich* (economically viable) and *Wirtschaftlichkeit* (economic viability) are ubiquitous in the policy discourse, in particular with reference to renovation to EnEV standards. However the discourse often takes this further. For example this was vigorously asserted – though in a somewhat confused way - by the Munich municipal Greens. As Gehring expressed it:

The current state of technology is such that you can do a building renovation economically viably to the highest thermal standard, in fact even to passive house standard⁹⁵. (IV_Gehring [42:13])

Building physicist Hauser and DENA representative Kwapich spoke of ‘problem-free’ economic refits ‘to Factor-10’, i.e. in which the energy consumption is reduced by 90% (IV_Hauser [21:18]; IV_Kwapich [35:41]).

While it may be the case that we can thermally renovate almost any building in such a way that we get our money back through fuel savings, and that almost any building can be thermally renovated to EnEV standard or higher, the fusion of these two ideas results in a narrative that has little or no fit with material reality.

6.2.4 The triangle of market, technology and regulation

This fusion of economics and physics in the above narratives lends justification to the continual tightening of the EnEV thermal standards for refits, with confidence expressed by many that a further 30% tightening in 2012 will be economically viable. However this is usually interwoven with a further narrative, concerning technology, the market and the legal regulations. This is that *tightening the regulations stimulates technological development, and influences the market to drive down the price of the*

⁹⁵ Readers will recognise that this statement is somewhat enigmatic, as the passive house standard is *not* the highest thermal standard. A passive house consumes 15 kWh/m²a of end-use energy (about 45 kWh/m²a of primary energy) per year, compared to a ‘zero-energy house’, which consumes no net energy, and a ‘plus-energy house’, which produces more energy than it consumes.

technological innovations. Oliver Kah, a building physicist with the Passivhaus Institut and Feist's co-author on a number of key expert reports, commented:

What's interesting is that it's also the case that the EnEV influences the market. There's an interconnectivity. Back in 2000, in the expert report from 1997 that Mr Feist produced, there was a recommendation about super thermal windows, with inert gas between the panes and a special coating on the glass. Before that the norm was plain double-glazed windows ... And the U-value of the windows was improved from 2 or 2.5 or 2.7, to 1.5 or even 1.1. Feist recommended that we should require these new windows in refits and new builds. Back then the difference in price was relatively large. But now the new windows are a standard product, and you can't buy the plain ones any more. And the cost has fallen dramatically. (IV_Kah [35:19])

Georg Vogelsang, technical manager of LUWOGGE, the housing subsidiary of BASF, makes the same point with regard to insulation material. BASF's standard product, *Styropor* is now being surpassed by their new product, *Neopor*, which has better U-values and a lower price per kWh of energy saved (IV_Vogelsang [12:18]). Building physicist Gerd Hauser showed me a new 'lateral thinking' development in heat exchange ventilation piping which could bring down the price of installing a ventilation system in an old home dramatically⁹⁶ (IV_Hauser [27:17]). Adolf Tomani, an engineer in Munich's energy conservation grant programme for thermal renovation, makes a related point with regard to domestic boilers. The city subsidises only condensing boilers, which are more expensive than conventional boilers, and this has driven up demand 'as the citizens ask for those boilers instead of regular ones as they want to obtain the subsidy' (IV_Tomani [22:48] and later correspondence).

These are specific technical developments that have indeed reduced the cost of renovating to tighter thermal standards. However there would need to be caution in extrapolating this to a more general principal, partly because of natural limitations of

⁹⁶ Channels are drilled across the inside of the Styropor insulating blocks which are affixed to the external walls, such that the channels join up into one continuous channel around the outside of the house. A hole is then drilled through the wall in each room to connect with the channel. This becomes the air input duct. A second channel and hole act as the air output duct. The channels lead to a small heat exchange ventilator unit installed, say, in a cupboard in the bathroom.

materials, and partly because the bulk of costs in thermal renovation are for the skilled labour involved, not the technology.

6.2.5 Supporting narratives

The above narratives are supported by others. Firstly, it is regularly asserted that *every building has to be comprehensively renovated anyway every few decades* (see Chapter 4, Subsection 4.4.2). This serves to connect together two strands of thought, in the policy, that arose separately. One is the original rationale for insulation regulations, namely to save fuel. This arose in the mid-1970s in the wake of the oil crisis. The other strand is the formation of specific CO₂ emission reduction goals. This arose in the 1990s. Asserting that all buildings have to be renovated ‘anyway’ every few decades, and extending the scope of the regulations to include buildings getting even minor repairs, joined up the CO₂ goal with the existing regulatory system. If every homeowner accedes to the imperative to do a full refit every 30-40 years, and does this to EnEV standards, then the CO₂ goal will be reached.

This dovetails with the ubiquitous narrative, explored in Chapters 4 and 5, that *you only count the additional thermal costs when working out whether a refit will be economic*. This produces the claim that the 20-40 year refit cycle will lead to the CO₂ goal being achieved economically, i.e. for zero or negative cost.

This, of course, fits in with the standard mathematical model, critiqued in Chapter 5, which sets the calculation of economic viability in a time-frame of 25-50 years.

In brief, then, the dominant story line runs: Almost any existing building can be thermally renovated to low (EnEV or passive or zero) energy standard, at negative or zero cost. The standards can be pushed higher as time progresses, as tightening the regulations stimulates technological development and influences the market to drive down the price of the technological innovations. The CO₂ goal will be reached through this, because every building has to be comprehensively renovated anyway every few decades, and this renovation will be economically viable because only the additional thermal costs may be counted in the calculations, the correct mathematical model for which is that developed by the knowledge community.

Outlined like this it looks tidy and, perhaps, convincing. However it is under siege at several crucial points. This is because many people are recognising that it is not having the effect it is supposed to have. I now turn to explore the shifts in narrative that are being triggered by this mismatch.

6.3 NARRATIVE SHIFTS

6.3.1 Landlords and tenants

As I explained in Chapter 4, the annual rate of thermal refits is far too low to bring about the CO₂ saving envisaged by policymakers through the EnEV regulations. Recognition of this has led to the rise of a further narrative, namely that *the 'landlord-tenant dilemma is the most significant brake on the annual rate of thermal refits'*. In Germany there are strict rules as to how much a landlord can increase the rent if she improves her properties, and these increases, relative to the cost of living, have to be tapered down to zero after 9 years – i.e. she can add 11% of the cost of the improvements to the rent in the first year, but this is reduced to around 10% the next year, and so on, down to zero. Therefore, it is now widely recognised, the landlord pays for the energy saving but the tenant gets the benefit through lower fuel bills. Landlords have made it abundantly clear that this makes it far too expensive for them to renovate to the strict standards of the EnEV (IV_Vogler).

This problem has been thoroughly discussed in many forums, and all the major parties are now committed to solving it. It would make a major research topic in itself, as it straddles the gulf between the socialist concern to keep rents affordable and the environmentalist concern to incentivise landlords to renovate.

The important point here is the way the issue is positioned in the story-line. It functions as a key explanation for the low annual rate of thermal refits. It thereby serves to defend the policy and its dominant storyline from criticism: the policy is perfectly all right, it is just being subverted by the landlord-tenant dilemma.

In this respect, landlords are often configured negatively in the wider policy community. The strongest expression of this sort came from a high official in the state civil service of North Rhine-Westphalia:

There are locusts, pure investment operators, who want nothing other than profits. They couldn't care less. They milk the built environment, strip it of its assets. It's only about collecting rent. The environment is completely ignored. Profit takes centre-stage, end of story. (IV_Düsseldorf[18:05]).

The negative image of landlords in this policy field in Germany is another area of discourse that would be interesting to explore. Immediately after my interview with Ingrid Vogler, chief researcher with GdW, the national association of housing providers, she asked me to start the recorder again, as something very important had occurred to her. She said:

The political sphere configures the housing sector almost as pure problem material, as an energy problem. But it's not a problem. It's the basis of the home life of every person here in this country. It has a very important function for the social solidarity of the community. It has an important function for integration. It's in the multi-story apartments, provided by landlords, that migrants live. It's there that you find the social outcasts. This sector also has an important function in socio-economic development. We have a nation with huge social differences, where the middle is being lost, where there's a growing divide between rich and poor. And it's right there that the landlord has huge responsibilities that he must keep on top of. Energy is one part of that. But the rental sector is not the country's energy problem and nothing more. I need to say it over again: what an important social function rental housing has. And the politicians just don't appreciate that. (IV_Vogler [annex, 00:00])

Vogler's organisation, GdW, got involved relatively recently in the political process surrounding the EnEV. However their research has revealed that the rented, multi-story apartments of the big landlords actually contribute a proportionally small amount of the CO₂ emissions from home heating (Vogler, 2009: 45-54). Although

such buildings make up around a quarter or a third of German dwellings, they appear to be producing only around one-fifth of the CO₂ home heating emissions.

This realisation has now begun to spread. Thomas Kwapich, of DENA, explained to me that his agency has identified the sector which responds least to the call to do thermal refits: privately owned ‘one-to-six-dwelling houses’ (IV_Kwapich [00:30 ff]). Further, in a large number of these houses, one or more of the dwellings is let to a tenant. This is why it is wrong to assume that the large number of tenanted dwellings in Germany indicates that most of German rented living space is in multi-story apartment blocks. Kwapich also pointed out that one-to-six-dwelling houses produce by far the greatest proportion of the CO₂ emissions from home space heating and water heating in Germany. He estimates this at about 80% of the total. My own rough calculations accorded with this estimate⁹⁷.

And these are the homes, said Kwapich, which have the lowest rate of thermal renovation⁹⁸.

So the landlord-tenant dilemma can no longer credibly be used as a defence against accusations that the EnEV framework is not appropriate to produce the annual rate of thermal refits that would be needed to achieve the CO₂ goals. And there appears to be a shift happening, within the story-line, where this defence is falling away. While most policy actors interviewed throughout the country still appeared to hold to it, it seems to be losing sway in Berlin. This was especially evident in my interview with Thomas Kwapich, director of the Energy Efficiency of Buildings section of DENA, the German Energy Agency, and with Marcus Hagel, Researcher for the Federal CDU/CSU Parliamentary Energy spokespersons. Kwapich recognised that most CO₂ emissions came from small, privately owned homes [IV_Kwapich [0:13]]. Hagel spoke confidently of the negotiations between all the main political parties to solve the landlord-tenant dilemma, but felt that this in itself would not massively increase the annual rate of thermal refits (IV_Hagel [44:06]) Significantly for this thesis, as

⁹⁷ These houses are the majority of buildings; they have greater living area than apartments; and they have larger surface to volume ratios and are therefore less thermally efficient.

⁹⁸ This has also been confirmed, in a non-systematic way, by my own extensive travels in Germany over the last 8 years. While it is common to see larger buildings being renovated, it is extremely rare to see the smaller, one-to-six-dwelling houses with the scaffolding and materials that indicate thermal renovation.

reliable knowledge about the materiality enters the policy community, changes do begin to occur in the story-line.

6.3.2 The problem of small, privately owned homes

Since small, privately owned homes produce the most CO₂ and are responding least to the EnEV policy framework, this could be seen as a threat to the dominant policy story-line, which maintains that it is always economic to do thermal renovation. If thermal renovation to EnEV standards pays for itself and at the same time makes the house more comfortable and saleable, a naive response would be, ‘Then why isn’t everybody rushing to do it?’ Clearly everybody is not. In order to hold together, the story-line needs an explanation for this which does not threaten its own integrity. There are two explanations being put forward by DENA.

Firstly, it is maintained that *the complexity of organising and managing a thermal refit is too great for most private small home owners* (IV_Kwapich [07:45 ff]). These people have to deal with ‘a complete assortment of actors’ – architect, engineer, skilled labourers; they must relate to firms dealing with different areas – heating, roofing, insulation, plumbing, windows; they have to make decisions about different features – solar heating or biomass, gas or oil, double or triple glazed windows, how thick to make the external wall insulation [08:47 ff]. ‘What it amounts to,’ said Kwapich, ‘is that as lay people they have to suddenly become experts. They have to do all the research themselves. It’s not a process that runs by itself. It’s *very* complicated.’ [09:54]

Further, Kwapich maintained:

To achieve ‘Factor 10’, to get from 300 kWh/m²a to 30 kWh/m²a, which is by all means possible, ... technically not a problem at all, they have to work according to a carefully chosen programme. (IV_Kwapich [10:38])

They have to do it ‘technically correctly’. And all this, says Kwapich, deters people from even getting started.

This idea had not come through in my interviews with homeowners. Those who had decided not to renovate did so for financial reasons; none mentioned the difficulties of being a good technical refit manager. They had investigated the issue, either with an energy advisor or with local professionals in the building industry, or, in the case of the community projects in Lübeck and Berlin, using their own investigative skills (IV_Lübeck [21:29]; IVN_Berlin). My Würzburg interviewee, who works in a social sphere, not a technical sphere, had acted as his own technical manager, discussing issues frequently with his contractors to ensure they co-ordinated the various elements of the job. He commented, ‘You don’t have to be a technician to do that’ (IV_Würzburg [22:24]). My Thüringen, Baden, and Lüneburg interviewees, who also did comprehensive renovations, all worked in areas related to the building trade, so for them the co-ordination of the project was not too difficult. Nevertheless, although DENA showed me no empirical studies to support their claim, it did seem reasonable to suppose it was a factor inhibiting the uptake of thermal renovation.

The second major factor is claimed to be *the shortage of appropriately skilled labour*. Kwapich explained:

You have to appreciate that energy-efficient building and renovating require a very high level of supplementary qualification among all the actors, and by that I mean architects, engineers and skilled labourers. You can’t just go ahead as in conventional building. Rather, in renovating existing buildings there are many things to watch out for, so that the result is cost-effective, energy-efficient and, above all, doesn’t damage the building. It’s especially important to renovate without creating thermal bridges. You have to enclose the building envelope in a complete, seamless layer of insulation that’s free of thermal bridges and therefore doesn’t suffer from condensation and mould, or other such effects. And this [level of skill] is simply not there. (IV_Kwapich [17:15])

This theme was consistently expressed by policy actors throughout Germany: politicians, civil servants, building physicists, engineers and researchers all echoed it. Energy advisors, too, are seen as under-qualified and in short supply (IV_Gräbel [19:00]; IV_Großklos [33:49]). One of my interviewees, Hans Hertle, of Ifeu, is

currently developing a national certification framework for this profession in conjunction with the Federal Ministry of the Economy (IV_Hertle [37:20]).

Large, wealthy cities such as Munich and Hamburg provide high quality, well organised, subsidised energy advice to homeowners, and this is probably one reason why no policy actors there expressed any of the DENA reasons for the low uptake of thermal renovation among small home owners.

6.3.3 The budgets of small home owners

The two narratives outlined above provide a useful defence of the dominant story-line, in which the economic viability of thermal renovation to EnEV standards is a key narrative, and they do appear to have a basis in the material and socio-material reality of the built environment. But this did not touch on the issue mentioned most consistently and energetically by my homeowner interviewees, namely cost. In any case, as I have shown, few comprehensive thermal renovation jobs to EnEV standard are economically viable, so homeowners would find this out when they start planning their renovations. So in cases where the two defence narratives do not apply, there is still the economic viability problem. I questioned my Berlin policy actor interviewees further on this issue, but found they continued to affirm the economic viability narrative consistently. This occurred even when its logic completely broke down. For example, for over 20 minutes [21:25 – 33:08] of my interview with an influential Federal official and policy actor (IV_Federal)⁹⁹ I tried to lead her to consider the case of a medium sized family home that did not need to be renovated for structural or cyclical maintenance reasons, but the homeowners simply wanted to save CO₂ and keep warmer for less cost. I asked how this could be economically viable, since all the costs would be additional thermal costs. Again and again she deflected the question. Her moves were interesting because they were very similar to those of other policy actors. I expound them here in some detail, partly because they exemplify discourse that was produced in a number of policy actor interviews, and partly because they show how the dominant discourse of the story-line defends itself against a stiff challenge.

⁹⁹ I do not have this actor's permission to identify her with this part of our discussion.

First, the official reintroduced the topic of *anyway costs*, declaring that any older house would be due for a refit anyway [22:32], and that when you take these anyway costs out of the equation, the additional thermal costs would pay back within the lifetime of the refit [23:00]. Then she noted that, since homeowners spend big money on bathroom renovations, which do not pay back, they should be prepared to spend on other non-thermal costs [23:14]. This ‘new bathroom’ theme (sometimes modified to ‘new kitchen’ theme) occurred in other interviews with policy actors (e.g. IV_Renner [59:47]). It functions as a kind of sub-narrative, used to strengthen the argument that homeowners can afford to do thermal refits: if they can afford to renovate the bathroom, they can afford a thermal renovation¹⁰⁰.

Her next move was to speak of the *ancillary benefits* of thermal renovation: if the economic viability calculation does not come out positive at first, the homeowner should add to it the value of the increased comfort of a warm home, and an increased home resale value [25:07]. This ‘ancillary benefit’ argument was almost ubiquitous in interviews (e.g. IV_Düsseldorf [08:37]; IV_Großklos [40:30]; IV_Hagel [42:52]; IV_Hauser [29:48]; IV_Krieger [26:56]; IV_Köln_A [19:36]; IV_Kwapich [23:33]; IV_Renner [01:06:19]; IV_Schaal [17:01]; IV_Vogelsang [07:00]). This was the case even though the EnEV text excludes such factors from the economic viability calculation, as do Feist and colleagues’ expert reports.

One could argue, further, that increased comfort only occurs when the user ‘takes back’ some of the thermal gain by increasing the home’s average temperature, a form of the ‘rebound effect’ (Haas and Biermayr, 2000; Holm and Englund, 2009; Sorrell and Dimitropoulos, 2008), which actually erodes the economic gains made by renovating and reduces the economic viability. Further, the assertion that a thermal refit brings anything near to a one-to-one gain in the resale value of the home in the German real estate context is also problematic. I have not found a single study which supports this claim. The German real estate market is subject to fluctuations related to demographic and economic changes. Also, from their understanding of their local real

¹⁰⁰ The German preoccupation with bathrooms in real estate advertisements would make an interesting study. In photo-galleries of properties for sale, there are almost always 2 or more pictures of the bathroom(s), even if no other pictures of the inside of the property are shown. This can be seen, for example, in Germany’s biggest real estate database, www.immobilienscout-24.de. The quality of the bathroom seems to directly influence a property’s resale value, so, contrary to the assertions of many of my interviewees, it may well be economically viable to renovate the bathroom.

estate markets, none of my homeowner interviewees expected their investment in thermal renovation to be reflected in the value of their properties. Of the three who had done comprehensive thermal renovation on their homes, two found that, a few years later, the value of the property had fallen dramatically (IV_Cottbus_C [26:05]; IV_Würzburg) and the other avoided the question but declared emphatically that one does not do thermal renovation to save money (IVN_Baden).

Nevertheless, these sub-narratives are typically introduced to bolster the economic viability claim when it gets challenged.

The official then talked at length about the tendency of homeowners to spend money on pointless changes to their homes, such as adding brick veneer cladding, which would then have to be removed if external wall insulation was to be applied [28:06]. When I reiterated, once again, the case I was asking her about, she suggested that such people could do just one aspect of a refit: new windows, or loft insulation, or external wall insulation, if they found the overall cost too daunting [36:57]. She then suggested lifestyle changes, such as heating fewer rooms. But there was stiff resistance to the idea that small homeowners might be deterred from doing thermal renovation because it was not economically viable. As in almost all my policy actor interviews, this part of the storyline was impervious to critique. I had, with me, the detailed, itemised costs of complete thermal refits, for example of a Lutheran vicarage in Bavaria and a home in Würzburg. All the costs tallied, more or less, with costings my interviewees had mentioned for typical refits. Yet no matter whose mathematical model I used, the projects were in no way economically viable¹⁰¹, even when only the additional thermal costs were included. It would take around twice the lifetime of the renovations to pay back. But no interviewee who was committed to the economic viability narrative regarded these, or any other such cases, as a challenge to this narrative. This part of the story-line was stronger than any materiality to which it purported to refer.

¹⁰¹ The Lutheran Church in Bavaria is thermally renovating its vicarages for ethical reasons, to reduce their environmental impact, and so is not concerned that this project is not economically viable.

6.4 THE EXCEPTIONS: TWO NEW NARRATIVES

Despite the centrality of the economic viability narrative within the dominant policy story-line of thermal renovation, there are two counter-narratives which have arisen within the policy community, largely as a response to recognition, by some actors, that the economic viability approach is not working. One of these exists on the radical fringes of the policy community but seems to be gaining ground. The other came in to the public sphere quite suddenly in summer 2009, from within the more politically conservative wing of the policy community, but has been thoroughly stifled by the reproducers of the dominant story-line, and has already metamorphosed into a pale reflection of its original, somewhat bold, self. Here I consider each of these in turn.

6.4.1 Renewables to the rescue

Hans-Josef Fell is the Federal Green Party's energy spokesperson. As I noted in Chapter 4, he is credited with conceiving the principles of the *Erneuerbare Energiengesetz* (EEG – Renewable Energy Law), which introduced the Feed-in Tariff for producers of renewable electrical energy through photovoltaics (PV), wind power, geothermal energy, biomass, and hydroelectricity. When I interviewed him I was surprised to notice that he did not maintain that thermal renovation was always economically viable. Although he talked of the costs of insulation technology coming down in the future (IV_Fell [22:00]), he did not expect this to make all renovation cases pay for themselves. Instead, he readily admitted, thermal renovation can be troublesome:

In thermal renovation we of course have bigger problems [than with new builds], much bigger. You can think of renovation and new builds together. Sometimes it's more optimal to do a good thermal renovation, in order to lower the energy consumption, but sometimes it's very difficult. (IV_Fell [01:30])

When I suggested to him that many small home owners in Germany cannot afford to renovate to EnEV standards, he responded:

Yes, you're right. Those are precisely the people who don't have much money, who don't earn much, who are afraid of falling into poverty. Of course they can't shoulder the investment demands [of thermal renovation]. (IV_Fell [05:28])

Fell suggested two solutions for this set of problems. First, these people need to be subsidised 'up to almost 100%' [08:45] for thermally renovating their homes. This would bring the annual rate of refits closer to the desired rate. But secondly, because so many old homes cannot be renovated economically or practically to EnEV standards, the difference should be made up with renewable energy:

So then it becomes sensible to bring in renewable energy - with combined heat and power, for example, where you generate electricity from biogas and use the waste heat for home space heating. (IV_Fell [01:00])

For Fell, the aim is to make the entire built environment 'CO₂-neutral' within 30 or 40 years [25:43]. For this, he said, Germany needs a new law, which phases in a renewable energy requirement for renovations. The *Erneuerbare-Energien-Wärmegesetz* (EEWärmeG – 'Renewable energy heating law'), he noted, now does this for new builds, but should be extended to renovations [02:31]. In summary:

We need a law that moves in this direction, so that these houses simply produce no more emissions. They would be fossil fuel and CO₂ neutral. And the renewables and insulation would be coupled together, as it were, so as to find the optimum solution for each building. Reduction of energy consumption *and* the use of renewable energy. Both. (IV_Fell [01:57])

Fell also spoke at some length of his preferred economic model for this¹⁰². The important point here is that it represents a considerable departure from the dominant story-line of thermal renovation policy, in two ways. Firstly, the emphasis has shifted from the *consumer benefit* of economic viability, to the *moral benefit* of a CO₂-neutral built environment. Secondly, the claim that it is *technically* possible to refit all homes

¹⁰² I have offered a critique of Fell's economic model for renewable energy production in my study of Freiburg's climate protection policies: Galvin (2008).

to a high thermal standard has been replaced with a call for on-site renewable energy generation to offset CO₂ emissions.

There is some evidence that this rearrangement of the story-line is gaining ground. The EnEV 2009 already includes a requirement for a portion of a new home's heating energy to be generated, on site, by renewables. At least one high-ranking Federal official, Jochen Flasbarth, director of the Federal Environment Agency, publicly proclaims the need for zero energy renovations, with renewables making up for any shortfall (Flasbarth, 2009: 4). Flasbarth is a well-known environmentalist in Germany who was previously in leadership positions in NGOs, then took state and federal committee positions, and was appointed head of the Federal Environment Agency in August 2009¹⁰³. It will be interesting to see if, in his now influential position, his commitment to renewable energy in the built environment influences the strength of this narrative in the policy community.

A peculiarity of this strand of thought, very much evident in the EEWärmeG, is the requirement that the renewable energy corresponding to each building be generated 'on-site', meaning, according to the legislation, attached directly to the building or set of buildings in question¹⁰⁴. This is almost always the least economically efficient way to generate renewable energy, as is well understood in the policy community. In other words, it is a narrative that is out of step with the way the material world works. So it would be worth investigating which other narratives hold it in place.

It will also be interesting to see whether, long term, the narrative of renewable energy gains such a hold in the EnEV policy community as to lead to a loosening of the hold of the economic viability narrative within the dominant story-line. However, for every degree of loosening of the economic viability narrative, the narrative of the need for zero-energy homes with on-site renewable energy generation seems correspondingly stronger. Both have an underlying assumption: that it is wrong for homes to consume energy or induce any GHG emissions at all. There do not seem to be parallel narratives of such dominance for other great GHG emission areas such as industry, transport and food production.

¹⁰³ Flasbarth's CV is on line at https://umweltbundesamt.de/uba-info/lebenslauf_jochen_flasbarth.pdf.

¹⁰⁴ The buildings must 'auf einem Grundstück oder in räumlichem Zusammenhang im Quartier stehen'.

6.4.2 Reducing the thermal standards

As I noted in Chapter 5, on 2 September 2009 the CDU-CSU federal caucus released a press statement announcing their new policy for thermal renovation (Pfeiffer and Nüßlein, 2009). The statement was entitled 'Energy Efficiency Policy: Thermal Renovation Simple, Transparent and Efficient'. It began by declaring that, in order to fulfil the EU goals for CO₂ reduction, 'we need a thermal renovation offensive in the 17th session of Parliament (i.e. the Parliamentary term of the government that would be elected on 27 September 2009). This would introduce an 'Energy saving premium' (called 'ESP130') for all renovations, and a 'contracting' system to solve the landlord-tenant dilemma.

The 'energy saving premium' proposed that a subsidy be given for every thermal renovation project of any building over 30 years old in which the standard of 130 kWh/m²a was reached. This subsidy would be set in such a way as not to overburden the Federal budget, and a straightforward, easy to follow, transparent application system would be established to make it easy for homeowners to make use of. It would be available to both landlords and private homeowners.

The 'contracting' system is a means by which a landlord's thermal renovation costs could be added to the rent, so that the tenant would effectively share or shoulder the cost of the thermal improvements in line with the energy savings they brought. I will not explore this matter here, except to say that it is a long-running idea that all the main political parties are committed to introducing in some form or other.

The 'energy saving premium', however, took many by surprise. The new EnEV 2009 was about to come into force, on 1 October 2009, tightening the thermal standard for renovations from an average of 150 kWh/m²a to around 100 kWh/m²a. So it looked as though the CDU-CSU, which was predicted to win the election in coalition with the FDP, was planning to modify the EnEV and loosen the standards for renovations.

As Marcus Hagel, Pfeiffer's energy researcher, told me later, the motivation for the 'energy saving premium' came from his and his colleagues' discovery, in research

done for Federal MPs Pfeiffer and Nüblein, that the EnEV regime was not leading to a sufficiently high annual rate of thermal refits.

In the days following the release, a number of organisations released press statements in support. These included GdW (the national association of housing providers) (Freitag, 2009), the *Verband Sächsische Wohnungsgenossenschaften* (Saxony Association of Housing Co-operatives) (Lange, 2009), *Handwerk* ('Tradespersons') *Magazine* (Handwerk, 01.09.2009), and *Zentraler Immobilien Ausschuss* (Central Real Estate Board) (ZIA, 2009). Munich's leading daily newspaper, the *Süddeutsche Zeitung*, reported that the *Bundesverband der Verbraucherzentralen* (Federal Association of Consumers) also welcomed the move (SZ 01.09.2009). However the move was criticised by the Green Party for setting a cap on Federal subsidies (Energiepolitik, 2009), while the NGO *Klimaretter* (Climate savers) criticised the standard of 130 kWh/m²a as too lax (Götze, 2009).

I asked every policy actor interviewee about 'Energy Saving Premium 130' (ESP130). Most had heard of it, and criticised the choice of 130 kWh/m²a as too lax a thermal standard. Some pointed out that a single standard was inappropriate, as the EnEV allowed for a range of standards depending on the geometry and size of the building. However Rainer Schaal, CSU city councillor and energy spokesperson in Augsburg, had anticipated my question and consulted with colleagues within the wider party. He spoke of an ongoing debate within the party as to the most appropriate thermal standards. The question being debated was:

Is the EnEV standard 2009 already too high? And is that hindering thermal renovation to any decent standard at all? That's the theme of ESP130. And there are these two philosophies: shall we go broader, or shall we go deeper?
(IV_Schaal [25:42])

He continued:

In the commercial rental sector I can imagine that significantly more thermal renovation would be done if the standards were lower. (IV_Schaal [27:42])

However, every other interviewee who knew of ESP130 sharply criticised the 130 kWh/m²a standard as too lax. But by the time I did my interviews in Berlin, in mid-December 2009, the narrative had changed. To begin with, GdW, one of ESP130's strongest initial supporters, was no longer interested in the 130 kWh/m²a standard. Vogler, GdW's chief researcher, commented:

You really do have to think through what thermal level to demand. A primary energy consumption of 130 kWh/m²a is on the far side of the EnEV. You could afford to be a bit more demanding. (IV_Vogler [13:29])

Hagel, the energy researcher for Federal MP Pfeiffer, was one of the chief designers of ESP130. He stood by the idea of setting a standard that would provoke at least some meaningful renovation rather than just trivial projects:

This 130 kWh/m²a is clearly not in conformity with EnEV or similar to it, though it could still achieve a fair bit. So from the thesis, this basic thesis, I find it acceptable to work in such a way that you have the greatest effect. It doesn't achieve anything if you demand people improve their home's thermal standard from 102 to 100 kWh/m²a. If someone renovates from 150 to 115 it has a greater effect. (IV_Hagel [21:35])

But Hagel no longer stood by the figure of 130 kWh/m²a. ESP130, he said, was really just a 'discussion forum' intended to bring out 'grievances' and to highlight the potential for energy savings in the built environment [12:55].

He continued:

The idea of 130 [kWh/m²a] was actually just to make a suggestion as to how things could function differently. Yes, and above all to address these older buildings, because that's where the big potential savings are. But of course we've got to keep to the EnEV standards. I have to say it was really just an initial, visionary suggestion. (IV_Hagel [21:58])

And later in the interview:

This 130, that was just a number that we took from somewhere. We could have written 70, or even 60, or even zero (laughs). (IV_Hagel [54:00])

I then interviewed Federal MP Dr Georg Nüßlein, the CSU energy spokesperson who had promoted ESP130 together with Pfeiffer (IVN_Nüßlein). He, too, said the figure of 130 was just an arbitrary choice. However he felt that the effects of tightening the thermal refit standards in EnEV 2009 are not completely clear. He said there is a tendency for some homeowners to be less likely to do refits as the standards are tightened, because of the extra expenses. He thought that policymakers are now in a phase of discussion and reflection on what the best way forward might be.

So the '130' part of ESP130 never found its way into the story-line. After less than two and a half months of life, it had died away, with even its chief protagonists declaring they never even meant it in the first place.

Ironically, if it is seen as an average level of primary energy consumption, 130 kWh/m²a makes very good sense in terms of material and social reality. As I argued in Chapter 5 and in Galvin (2010a), for many buildings, renovation to a modest thermal standard can be economically very efficient and technologically straightforward.

But the sheer weight of the dominant story-line pushed it out of the arena.

This gives us a picture of the story-line and how it has responded to two quite significant issues that connect quite directly to it. But there are further issues that seem likely to make their impact upon it in the near future. I turn now to look at these.

6.5 LOOKING TOWARDS 2012: THE LIMITS OF EnEV VIABILITY?

The SPD-Green government of Gerhard Schröder was replaced in November 2005 by the CDU-CSU-SPD 'grand coalition' government of Angela Merkel. The policy of continually tightening the thermal standards in the EnEV continued uninterrupted, with Wolfgang Tiefensee (SPD) becoming Federal Minister of Transport, Buildings

and Urban Development (*Bundesminister für Verkehr, Bau und Stadtentwicklung*). The plan was to tighten the thermal requirements for both new builds and refits by 30% in 2009 and again by a further 30% in 2012. There was a long-running narrative, expressed both in official publications and informally, that 'EnEV 2012' would follow EnEV 2009 with a further 30% tightening and that this would be both technically and economically viable.

My first interview took place on 14 October, 2009, just 13 days after EnEV 2009 came into force. This was also 17 days after the general election that brought major losses for the SPD and resulted in a new centre-right coalition government of the CDU, CSU and FDP. Now, with neither the Greens nor the SPD in government, none of the parties that had set the EnEV trajectory in motion were in power. However, none of my interviewees expressed any concern that the new government would be the cause of any stalling or back-tracking on the EnEV trajectory.

Instead, the discourse about the intended 30% tightening in 2012 was complicated by other factors. These were: the desire to press on towards a zero or nearly zero energy standard for all buildings; a growing awareness of technical difficulties in refitting old buildings to ever-tightening standards; and the renewable energy narrative, outlined above. These narratives were expressed in rather haphazard ways, often in contradiction to each other, and often by actors who also affirmed the basic narrative of EnEV 2012 tightening. The picture was made even more colourful by the announcement, on 18 November 2009, that representatives of the EU Parliament had reached agreement with the EU Council on changes to the Energy Performance of Buildings Directive. This would require all EU member states to regulate so that all new buildings will be 'nearly zero energy' as of 2020, and to draw up plans to increase the number of existing buildings refitted to nearly zero energy standard (Piebalgs, 2009).

6.5.1 Pressing on toward zero energy homes for all

For some in the policy community, EnEV 2012 is seen as a necessary stepping-stone on the way toward the target of the entire building stock being renovated or replaced to zero or nearly zero energy standard. In Flasbarth's words (in his own English¹⁰⁵):

The long life cycle of buildings means for Europe that 75 per cent of today's building stock will still be there in 2050. Therefore we do not only need energy efficient new buildings but even more **ambitious retrofits** of existing buildings that cut emissions drastically. What we need are **strict minimum efficiency standards** not only for new buildings but also for retrofits. In 2020 we must discuss if a zero energy house instead of the passive house can become the standard for renovations. (Flasbarth, 2009: 8; bold type in original)

To understand the significance of this quote we have to know that (a) the passive house standard is stricter than the new-build standard envisaged for EnEV 2012; (b) a passive house consumes 15 kWh/m²a of electrical energy for heating, though this equates to around 45 kWh/m²a of energy at the source of generation; and (c) the zero energy house consumes no net energy for heating. Hence Flasbarth is advocating extremely strict thermal standards for future refits.

Others advocated a similar approach but to not quite as strict standards. Typical of these was the response:

Energy consumers in existing buildings in Germany today use between 150 and 250 kWh/m²a. We must demand of them that they reduce this to 50 kWh/m²a. Or better. We have to set our hopes on this. (IV_Köln_A [01:01:07])

I frequently raised with policy actors the question, why renovate old buildings to such strict standards, when this results in such a high cost per kilowatt-hour of energy saved. Why not renovate more buildings, but to a lower standard, for the same money,

¹⁰⁵ Flasbarth misuses the English words 'instead of' in this quote, making it sound as if the passive house standard is already the refit standard for 2020.

thereby saving more energy per euro invested? Großklos's response was fairly representative:

And what happens when I do this kind of renovation? Sure, I save energy, but what happens in 15 years time when the energy price is high? (IV_ Großklos [24:17])

Instead, he said, do the job now to the highest possible standards, so that 'in 15 years time the building is still in the forefront of thermal technology.' [15:31]

The interviewee was oblivious to the contradictory nature of this statement: that a building renovated today, to even the highest current standard, could be 'in the forefront' of thermal technology in 15 years time.

As Gräbel put it: 'Every sub-standard renovation today is a refit case for tomorrow.' (IV_ Gräbel [18:00]) Enseling maintained that it is better to renovate to the passive house standard of 15 kWh/m²a, 'because then, that house won't have to be refitted again.' (IV_ Enseling [20:23]) For Tomani, today's refits must be done to a 'future-capable'¹⁰⁶ standard' (IV_ Tomani [15:34]).

So the prevailing view was that every building will have to serve its purpose in a future with extremely high energy prices and strict CO₂ rules, so we should renovate all buildings now to the highest possible standards, rather than do what seems economical now and then have to re-do the job, to a higher standard, later on. But none could point me to any calculations to prove that it was not cheaper to do the job twice: once now, to a modest standard that easily pays back within a few years, and then again to a higher standard when fuel prices get very high and thermal renovation technology is even more advanced than today's. Instead, the view was strongly and almost universally expressed that all today's renovations must be to the highest possible standard, so that they fit well with a low energy future.

¹⁰⁶ The German here for 'future-capable' is *Zukunftsfähig*. An alternative translation would be 'futuristic'.

6.5.2 Technical difficulties with EnEV 2012

Some policy actors close to the practice of thermal renovation are beginning to say that there might be severe technical difficulties in attempting to renovate most old buildings to standards 30% better than EnEV 2009. At the time of my interviews this new narrative was beginning to sit uneasily alongside the dominant story-line. I first heard it from Uwe Neuhaus, the widely respected technical manager of the housing co-operative '*Erbbauverein*', in Cologne. As I noted in Chapter 5, Neuhaus and his colleagues found the refit standards in EnEV 2009 'on the boundary' of feasibility, both technically and economically (IV_Neuhaus [28:30]). Neuhaus went on to say, of the proposed tightening in EnEV 2012:

And the further 30% tightening that's been announced, I don't know how we'll be able to implement it... I see a danger that people will do less renovation.
(IV_Neuhaus [29:57])

Among high-level Federal civil servants, recognition of this view came from Hans-Dieter Hegner, director of building issues in the BMVBS. He said that it is unlikely that technology will be able to further improve the heat transmission losses, (H_T values) of wall and roof insulation, etc., and therefore any tightening of thermal standards in EnEV 2012 cannot come from better insulation. Although we could in theory just keep on increasing the thickness of the insulation, this would create problems of space and geometry. Instead, he said, the emphasis will be on better heat exchange ventilation and the use of renewable energy (Hegner, 2009).

This statement was made to an audience of building physics students and staff at Munich Technical University, in a lecture chaired by leading building physicist Professor Gerd Hauser. Nobody in the audience questioned it. This, together with Hegner's position as a high official in the BMVBS, the ministry that advises parliamentarians on the EnEV legislation, gives cause to believe that the views he expressed have a good chance of prevailing. It may well be that the trajectory of ever thicker insulation for old homes has reached its zenith¹⁰⁷. The narrative of the value of

¹⁰⁷ Under EnEV 2009, wall insulation has to be around 16cm thick. To improve this by 30% would require making it about 22 cm thick.

ever-tightening standards for insulation is clearly at odds with the realities of the material world.

6.5.3 Complexity and speed of change in the building regulations

A closely related issue is the technical difficulties caused by increasing complexity and speed of change in the building regulations. Ingrid Vogler, of the housing providers association GdW commented, when I asked her what she thought of EnEV 2012:

The tightening of the standards for refits – it's going too fast. Building practice is not keeping up with it. At the moment all the relevant laws are being altered at once – there's the heating and hot water bill (*Heizkostenverordnung*), the renewable energy heating bill (*EEWärmeGesetz*), the changes in the EnEV. Every year there's a new situation to get to grips with¹⁰⁸. And building practice in Germany can't keep up with it, doesn't even know what's current and what's been surpassed. If you make changes you've got to bring the people along with you... I really think they should take a few years out to think over what's the best thing we can do with existing buildings. It's really counter-productive when you've just brought a regulation into force and then you tell us there's another 30% just around the corner. (IV_Vogler [40:17])

Vogler's concern, about both the tightening of standards and the pace of change, was echoed by Marcus Hagel, researcher for Federal MP Joachim Pfeiffer, one of the authors of ESP130:

We've got to watch out that we don't bend the bow so hard that it breaks¹⁰⁹. Our aims for the EnEV have always been ambitious. Now, with EnEV 2009, we've almost gone over the top. And now the new EU buildings directive has come. And then comes the next EnEV. We've got to be careful that with all these constant changes we don't get the situation where people just do nothing, because they

¹⁰⁸ Literally: 'Every year a new cow is led through the village.'

¹⁰⁹ It is difficult to find an English colloquial equivalent of 'den Bogen nicht überspannen'. 'Break the camel's back' almost does it but lacks the sense of tension.

don't know what's going on... We should take a moment to catch our breath....
Otherwise we'll just leave the people behind. (IV_Hagel [00:38]).

Among the research institutes, Hans Hertle, of Ifeu, was the only policy actor who shared this view:

A further 30% [reduction in] primary energy is very ambitious. I'd rather sit and wait a little bit, and see how EnEV 2009 works out in practice, including for non-residential buildings. And then next year, or perhaps the year after, we can review it and see what we think. (IV_Hertle [49:00])

The growing complexity of building regulations is a theme that goes beyond Germany. Fischer and Guy (2009) found that in Britain, many architects report this is a problem for them. Concern about GHG emissions, say these authors, 'has sparked an enhanced regulatory offensive' within building codes. In Britain this goes together with upgrades in health and safety and accessibility rules, all of which are making regulations more complex. For many architects this is manifested as 'an increasing, though often unco-ordinated, regulatory grip on building design' (*ibid*: 2578).

While none of my German practitioner interviewees mentioned the interplaying complexities of building rules for energy efficiency, health and safety, and accessibility, the theme of increasing complexity in energy efficiency often came up in both interviews and informal conversations.

6.5.4 Saved by renewable energy

As I explained in Section 4.1 above, a relatively new narrative linking renewable energy to thermal refits is emerging among more radical elements in the policy community. This narrative comes with an acceptance that insulation measures alone will not achieve the high standards of energy efficiency required to meet Germany's CO₂ emission reduction targets. Hegner seems to be embracing a form of this narrative, and, as I argued above, it accords with the introduction of renewable energy requirements alongside insulation measures in EnEV 2009. In terms of logic and

appeal, this narrative could conceivably displace the narrative that insists it is always economically viable to do thermal refits to high standards.

However, as I also indicated above, it has a weak point with respect to materiality, in that locally generated renewable energy is far less economically efficient than investment in larger projects such as wind farms. It would be interesting to investigate the discourse that affords high moral value to decentralised, locally generated renewable energy compared to that generated in large, centralised projects. This discussion was not evident among those I interviewed, presumably because the renewable energy narrative is young in this sphere.

6.6 SUMMARY AND REFLECTIONS

The story-line that goes with the German government's policy on thermal renovation of existing homes has an unstable and precarious existence. It is an ensemble of narratives that are held together with links and reasoning that, in places, do not dovetail well with each other. In other places it is out of synch with the material and socio-material world, and some narratives within it are slipping away as others push their way in. Further, it is by no means static. In the three and a half months from 1 September to late December 2009, the ESP130 narrative came and went. Around the time of the coming into force of EnEV 2009, and probably for some time leading up to this, the narrative of too fast a pace of change and too sudden tightening of thermal standards arose and gained in strength. The renewable energy narrative, which has probably been current in some circles at least since Hans-Josef Fell and others first began promoting renewables legislatively in the 1990s, is now finding fertile ground in the EnEV policy community as it becomes clear that insulation alone will not suffice.

As Hajer (1995; 2005) points out, discursive domains are argumentative, bristling with conflict and contestation. One thing that impressed me as I did my interviews was the amount of work and effort that went into maintaining a story-line that would act as an effective vehicle for the policy. The interviews were not genteel tea-party discussions. My interviewees were often working very hard to convince me of their

viewpoint, to demolish the counter arguments I was reporting to them, and to rid the discourse of intrusive assertions that ran counter to the dominant story-line.

As well as its function as the hegemonic construction of the problem and its solution, the dominant story-line has an important social function. It holds a very disparate community together on a difficult task, namely, seeking to engage its target audience (homeowners) in an expensive and risky project that could, quite literally, lead them to bankruptcy. In this sense it is a microcosm of human society. As Harré so eloquently explains (Harré, 1993), we must not underestimate the amount of work and effort it takes to hold our social bonds together. The way we dress, the language register we use, the way we ‘position’ ourselves in relation to those with whom and about whom we are conversing, all have to be carefully selected and skilfully executed to have the desired effect.

Latour (2005: 69-70) contrasts human society with a troupe of baboons, who need to work constantly, grooming and watching each other, to keep their social bonds intact. At first sight, he suggests, we humans are not condemned to such behaviour, because we have a huge legacy of artefacts (houses, streets, marriage beds, phones, vehicles, books, school houses, office blocks, kitchens, etc) to act as channels and knots that connect us together. However he later notes (*ibid*: 196-199) that this view would be only partly right, since human life is far more complex than that of baboons, and the things ‘interfering’ with it are more numerous and tricky. As Harré puts it, people are constantly having to ‘give accounts’ – to explain what they are doing and why, what they want and why, and to persuade others to do what they want them to. This constant work and effort is ‘social being’ (Harré, 1993), the ‘stuff’ of human society. Further, our demands and justifications are not allowed to be too innovative. They have to fit with the story-lines that are ‘structured’ in our social group. My suggestions to interviewees that thermal renovation might not be economically viable were akin to a kind of social misbehaviour, and from their standpoint their incredulous responses were appropriate.

The sense of agreement is what holds the story-line together in the thermal renovation policy community. Without a story-line there would be no such community, no ‘discourse coalition’ (Hajer, 1995: 58-68). Further, even if the written laws had

somehow got there without discursive support, there would still need to be an appealing story-line, promoted by determined advocates, to get people to do what the laws were requiring.

One of the reasons for the instability of the story-line is the mismatches between it and the materiality and socio-materiality at which it is aimed, mismatches which are in large part due to the values, or politics, in which the knowledge productions of the scientific experts are couched. The modest realist theoretical framework I presented, and used in the research, brought this to light effectively. It enabled the story-line to be seen in relation to its matches and mismatches with the materiality. These matches and mismatches could be identified because modest realism provides a methodology for judging which statements about the world are truer to the way the world is, than which others.

Hence the contribution to learning, made by this approach, does not consist of being able to prove general laws about how story-lines function in policy domains. Rather, it provides a *methodology* for judging the goodness of fit of statements within the story-line about materiality, with the materiality itself. This enables certain aspects of what drives a story-line to be clearly brought to light, namely how reliable knowledge of the materiality keeps forming and interposing itself on the policy discourse.

My third research question asked how policy discourse maintains, reproduces and reforms itself in the face of changing understandings of materiality and of the policy's influence on it. This chapter has indicated that the uneasy relationship between policy discourse and materiality contributes to the instability of the story-line. This is because the actual nature of the materiality keeps reasserting itself, through knowledge formed about it among a range of both formal and informal actors. It is somewhat like the Biblical quotation, 'If my disciples keep silent the stones will shout aloud' (Luke 19: 40). Stones, like houses, have specific shapes and physical properties. No matter what we say about them in our story-lines, we inevitably stub our toes on them if we produce and reproduce unreliable knowledge about them. They shout back at us, as it were, and make our stories about them unstable.

To some extent it is the case, as Fischer (2003a), Hajer (1995; 2005) and others argue (see Chapter 2, Section 2.6.1), that the appealing form of a story-line keeps it together and gives it traction in achieving policy dominance and hegemony. However, the factors discussed in this chapter lead to the suggestion that this literary quality of the story-line is not enough. It also needs to be in a coherent, stable relationship with the material realities to which it refers.

Hence I would challenge the emphasis in policy discourse literature on the purely literary value of the story-line (Fischer, 2003a: 162, 181; Hajer, 1995, 62ff; 2005a, 302ff; 2010; Herrick, 2004: 430; Roe, 1989: 263), where it is claimed that elegance and narrative coherence are the overriding factors in stabilising the story-lines that become dominant in policy domains. Where policy actors are confronted with reliable knowledge of the material world that contradicts their story-lines, they often do start to change their stories.

Further, there are clear connections between the insights provided by all three of my theoretical research questions: the policy discourse is out of step with key aspects of materiality and socio-materiality; this is largely due to misrepresentation, or and least biased representation, of this materiality to the policy community by the experts; one effect of this is that the policy story-line is unstable and needs constantly to defend itself against evident failure.

In this chapter and the previous two I have offered the findings of my empirical investigation, in the light of the research questions and the modest realist version of policy discourse analysis I developed in Chapter 2. In the next and final chapter I will summarise and reflect on these findings, and draw conclusions on my evaluation of German thermal renovation policy. I will also reflect critically on this research project and the contribution it has made to learning.

Chapter 7 DISCUSSION AND CONCLUSIONS

7.1 INTRODUCTION

In this chapter I discuss the implications of this thesis. I begin, in Section 7.2, by summarising the findings of the empirical part of the research. In Section 7.3 I reflect on the policy evaluation question that was formed in Chapter 1, namely how well German Federal policy on thermal renovation contributes to the achievement of Federal and international climate change policy, and in Section 7.4 I make specific recommendations for German policymakers in this field. In Section 7.5 I look at two further issues that arise from the empirical research: the question of what a home is for, in relation to growing discourse about advocating the ‘zero-energy home’; and the implications of growing discourse advocating on-site micro-generation for all homes. Section 7.6 discusses the limitations of the research, and suggests directions for further study. Section 7.7 reflects more directly on the contribution to learning¹¹⁰ that this thesis has made.

7.2 SUMMARY OF EMPIRICAL FINDINGS

7.2.1 Findings in Chapter 4

Chapter 4 set out to explore the first research question:

In an environmental policy domain:

How does policy discourse interplay with the material realities it is designed to influence?

In this chapter the policy discourse/modest realist approach enabled me to explore the interplays between policy and its accompanying discourse on the one hand, and the materiality and socio-materiality towards which the policy is aimed on the other. It

¹¹⁰ I use the phrase ‘contribution to learning’ here, rather than the more usual ‘contribution to knowledge’, because the word ‘knowledge’ is used in a specialised way in this thesis, which is quite different from the sense that it is used in statements referring to the worth of a PhD thesis.

showed that certain aspects of the EnEV regulations fit well with the thermodynamic properties of various dimensional forms of building, and that the technical staff designing the 2009 regulations had not given in to some policymakers' unrealisable aspirations, particularly with respect to small, freestanding dwellings. However it also showed up gross mismatches between the policy discourse and aspects of the regulations on the one hand, and the materiality of the actual built environment on the other. This was seen in the EnEV's claim that what it demands is always economically viable, and its lack of provision for non-linearities, such as those that occur with the roof and wall dilemma, narrow balconies, small loft living space and low basement ceilings. A further mismatch was seen between the Federal government's climate change goal in respect of thermal renovation under the EnEV regime, and its tightening the regulations and directing the subsidies so as to squeeze the last few kWh of energy consumption out of home heating. By doing this it makes GHG abatement, per tonne of CO₂ saved, far more expensive than it needs to be.

There was also a major mismatch between policy discourse and socio-materiality, in the claim that most dwellings need to be extensively renovated anyway, whereas in practice this reality is formed by a complex interplay between homeowner, occupants and building substance, and is subject to wide variation.

These features of the policy discourse are interesting, not just because of what they are in relation to other possible or actual policy discourses, but because of what the materiality and socio-materiality show them up to be: misguided in terms of the Federal government's aims for the policy, and in terms of global aspirations for climate change mitigation.

Further, the economic viability narrative and the anyway/additional thermal costs narrative appear to be so deeply and tenaciously set in the policy discourse that they can be regarded as part of the furniture of the social milieu: unquestioned, unquestionable, forming habits of thought that are continually reproduced in conversation and practice. This habituation contributed to the difficulty that many policy actor interviewees had in appreciating some of the mismatches between the EnEV demands and the materiality that the EnEV is aimed at.

Nevertheless we can see a challenge to this discourse emerging, not from argumentative rhetoric, but from the materiality of the actual built environment. The materiality is not ‘co-operating’ (to use an ANT term, purely metaphorically) with the discourse. Here materiality itself can challenge entrenched discourse habits, far more persistently than ideology-based argumentative discourse can. It mounts this challenge by way of homeowners who bypass the regulations and ignore the policy rhetoric about the need to insulate to EnEV standards, by way of architects who have developed skills of getting around the regulations, and by a growing awareness of what the materiality of old homes actually is.

7.2.2 Findings in Chapter 5

Chapter 5 set out to explore the second research question:

In what ways are the interplays between discourse and materiality determined by the values and politics of the scientific experts who act for policymakers as the spokespersons of materiality?

In Chapter 5 I used the policy discourse/modest realist approach to critically examine how the expert community represents the materiality of thermal renovation to policymakers. I focused particularly on the claim that thermal renovation to EnEV standards is always economically viable.

The expert reports come from a social context in which the economic viability and anyway/additional thermal costs narratives are solidly entrenched, and the discourse of the experts serves to reproduce and deepen these narratives. This takes place through a set of practices these experts use in constructing a certain type of mathematical model designed, in their view, to calculate whether thermal renovation to various standards is economically viable.

The analysis I offered, of the themes that drive these mathematical models, covered both the discourse in these models, and the reliable scientific knowledge we have about how houses of various types respond to thermal retention technology. This dual focus was methodologically coherent, since the modest realism I have developed has

a consistent epistemology, namely of the social construction of knowledge, which applies both to scientific utterances in the narrow sense, and to the more general discourse of the policy sphere. For example the notion of the wall and roof dilemma is a piece of discourse, but one that, I would contend, conveys knowledge of the world that is reliable for everyone everywhere. However, while the division of costs into anyway and additional thermal categories is also a discursive production, I would contend that it does *not* convey knowledge of the world that is reliable for everyone. Being able to distinguish between these types of claims in a methodologically consistent way is, I contend, an indication of the contribution to learning that my theoretical framework has made.

With regard to policymaking procedures, the fact that these experts are so closely interconnected ideologically and institutionally, and that they gain so much from promulgating the type of conclusions they draw, is a cause for concern. This concern is deepened by the fact that all officially commissioned expert reports in this field are contracted out by one Federal agency, the BBR, in which one person, the BBR's director, has the final say as to who gets the contracts. Despite the obviously high integrity of such persons, this still entails the risk that one set of ideological views get recycled through the expert report system.

I argued that these experts' input has the further effect of focusing attention on homeowner-financed thermal renovation as a realisable option for significant GHG abatement, thus deflecting attention from the more systemic GHG emitters such as transport, industry, energy and food production.

Nevertheless, I noted that despite the strength, persistence, official acceptability and resourcefulness of the purveyors of these narratives, the narratives are being widely resisted quite successfully by the vast majority of homeowners. The rate of uptake of thermal renovation is only around one-tenth to one-fifth of what would be needed to fulfil the Federal government's goals for it, and my interviews with homeowners revealed that very few concur with the experts' assertions regarding economic viability, anyway/thermal improvement costs, the 25-plus year payback time, and the need for all or most houses to be renovated anyway.

7.2.3 Findings in Chapter 6

Chapter 6 addressed the research question:

In an environmental policy domain:

How does policy discourse maintain, reproduce and reform itself in the face of changing understandings of materiality and of the policy's influence on it?

In this chapter I drew together the dominant features of the story-line that constructs the problem of energy-inefficient homes and its solution, and examined how this story-line renews, repairs and re-shapes itself in the light of events that challenge it. I argued that the story-line is constantly under threat because so much of it is out of step with the materiality to which it refers, and that one reason this is so is because the experts who represent the materiality and socio-materiality to policymakers do so in a value-laden way that actually *misrepresents* salient features of it. Their own values, or politics, are brought into their reports and these get lodged in the story-line, making it clash with its object at many points.

I found that despite the heavy influence of expert discourse, aspects of the materiality that do not fit with the expert reports are constantly becoming known to policymakers and nudging at the fringes of the story-line: the low rate of thermal renovation; the technical difficulties of ever-increasing thickness of insulation; the realisation that many older homes cannot economically be renovated to EnEV standard. However, policymakers do not explain the low rate of thermal renovation in terms of a failure of the EnEV to correctly predict economic viability, because the economic viability narrative is so solidly entrenched in the story-line, together with its supporting narrative of the anyway/additional thermal costs division narrative. Instead, policy actors explain the low rate of renovation in other terms, such as the landlord-tenant dilemma, the complexities of organising a refit job, the shortage of skilled labour, and homeowners' ignorance of the economic viability of thermal renovation to EnEV standards.

Further, the issue of the technical difficulties of ever-increasing thickness of insulation is feeding into the newer, emerging narrative that on-site micro-generation

of renewable energy should offset the energy and CO₂ emissions of older homes. This has implications for the issues of zero-energy homes and the economic efficiency of GHG abatement measures, both discussed below.

Increasing awareness of the difficulties of super-insulating older homes, however, is beginning to challenge the economic viability narrative among fringe policy actors. Again, though, this is leading to a further emphasis on on-site micro-generation rather than a questioning of the policy's basic assumptions about what homes are for and what people should be allowed to do in them.

An interesting feature of the policy story-line is the difficulty the 'ESP130' narrative had in becoming established in it, even though it came from Federal energy spokespersons in the coalition that was predicted to win, and did win, the election within weeks of its release. It was further interesting that even GdW, the national association of housing providers, perhaps the best organised critic of the ENV regime, which supported ESP130 at first, had weakened its critique considerably within 3 months. Presumably this narrative did not find its place in the story-line because of the dominance of expert input that consistently reproduces the key narratives of economic viability, anyway/thermal improvement costs, and the need for (almost) all homes to be comprehensively renovated anyway.

Again, the modest realist theoretical framework enabled this analysis to proceed effectively, since I have been able to set the policy story-line over and against the material realities that its narratives are referring to.

The policy analysis explicated in Chapters 4, 5 and 6 was designed to answer the broader policy evaluation question: how well is German Federal policy on thermal renovation of existing homes meeting its stated objective, of reducing CO₂ emissions and thereby contributing to climate change mitigation, and this was set in the wider context of what the global policy community takes climate change mitigation to be. I now turn to address this issue.

7.3 THE POLICY EVALUATION QUESTION

The thesis has brought the following issues to light in regard to the policy evaluation question.

7.3.1 Is money being spent wisely?

In Chapter 1 I asked what is needed for global GHG abatement goals to be effectively pursued. I argued that deep emission reductions are necessary sooner rather than later, so as to bring about an early peak in annual emissions followed by a rapid decline. I maintained that this requires us to look for affordable ways of reducing GHG emissions across a wide bandwidth of emission sources, and attempt to optimise the tonnage of GHG emissions reduced per euro invested.

To some extent the German project of thermal renovation is contributing to global GHG reduction goals, in the sense in which this project is understood by the international community. One investigation suggests CO₂ emissions from building use (residential and non-residential) are being reduced by one million tonnes per year through replacement of old buildings with new builds and refurbishment of other buildings, associated with the subsidies granted by the KfW bank (Friedrich et al., 2007a: 11ff). This raises the important issue of how much CO₂ emission reduction is being achieved through the EnEV regime.

To begin with, the estimate offered by Freiderich, et al. (2007a) is derived from figures for subsidies paid out by the KfW for both new builds, and thermal renovations of existing properties. There are no available records giving separate figures for these two types of project – a point confirmed by parliamentary energy researcher Marcus Hagel (IV_Hagel). One cannot simply argue that new-builds reduce GHG home heating emissions in any direct way, unless the new build is actually replacing an existing home. Even then, one must still take account of the ‘embedded carbon’ and the energy consumed in demolition and disposal of the old building. ‘Embedded carbon’ refers to the large pulses of GHG emissions caused by

new builds, which could be well over 3 million tonnes for every 100,000 new dwellings, not to mention non-residential new builds¹¹¹.

Secondly, there is no record of which particular aspects of what sort of dwellings have been thermally refitted, from and to what standards. Consider, for example, a dwelling consuming 200 kWh/m²a, and of size and shape that would be required to be refitted to 100 kWh/m²a under EnEV 2009. If such a dwelling is refitted to reduce energy consumption to 90 kWh/m²a, this will earn a subsidy, for going beyond the legal requirement by 10%. However a similar dwelling, refitted to 70 kWh/m²a, will earn around three times that subsidy because it has bettered the regulations by 30%. However it represents only a 15% improvement, compared the first dwelling, on overall reduction of energy consumption (since the first case reduces energy consumption by 110 kWh/m²a and the second by 130 kWh/m²a). Hence there is no linear relationship between the amount of subsidy given, and the amount of energy saved or GHG reduction.

Thirdly, not all refurbishments get KfW subsidies, so there could be further reductions of hundreds of thousands of tonnes of CO₂ per year not counted in these figures.

Fourthly, none of this takes account of changes in consumer heating habits after thermal refits (see Sections 6.3.3 and 7.6.4).

The kind of study that would have to be undertaken to obtain a reliable estimate of actual current annual reductions in GHG emissions from home heating has not yet been undertaken. However, interviewee Oliver Kah (IV_Kah), of the Passivhaus Institut, informed me that his organisation is currently preparing a research design for such a study.

My own very rough calculations show that annual reductions of some 4 million tonnes would be required for the next forty years, to achieve the goal of an 80%

¹¹¹ This assumes a pulse of CO₂ of 30 tonnes for each new dwelling built, compared to the Empty Homes Agency estimate of 50 tonnes (EHA 2008).

reduction by 2050¹¹². Further, my discussions with some Federal officials, who wished to remain anonymous, indicated that the CO₂ emission reductions are actually lower than the million tonnes publicly claimed – since, as outlined above, they are calculated from the amounts of subsidy granted, rather than from actual measured energy use reduction. The lowest estimate, which came from the source most likely to be best informed, was that the reductions are about one-tenth what would be required, to achieve the 80% goal.

However, even if there is a significant net reduction of CO₂ through the EnEV regime, this thesis has argued that this is an unbalanced project. Squeezing the last 70 or so kWh/m²a from a building's annual heating energy consumption is extremely expensive per kWh of energy saved and per tonne of CO₂ emissions reduced, and becomes exponentially more expensive as the target consumption approaches zero. This simply means that public and private funds available for thermal renovation are being used increasingly inefficiently. It also means that the expense of having to conform to such stringent standards deters would-be renovators, so that CO₂ reduction from heating energy efficiency in buildings is only around one-tenth to one-fifth of the goal set to reach the target. This makes Germany's contribution to global GHG reduction in the built environment far less than it could be. There is therefore a strong case for more flexible standards so that more dwellings get renovated economically efficiently, though to a less stringent standard.

The counter argument amongst policymakers is: 'A partially renovated house today is a refit case for tomorrow.' However, this deprives homeowners of the possibility of doing affordable renovations that bring some increased comfort and fuel savings right now. If these pay back within a few years, nothing is lost if then a further refit is undertaken in later years. The dream of a golden age in which all homes have been renovated to low or zero energy standard is unrealistic, and insisting on it is more likely to impede the achievement of GHG reduction goals than achieve it.

¹¹² Assuming that total annual CO₂ emissions from heating in all German buildings amount to around 200 million tonnes, reducing this by 80% over 40 years would require annual reductions of $0.8 \times 200 / 40 = 4$ (cf. Friedrich et al., 2007b: 15).

7.3.2 Focusing on buildings

The focus on buildings, and the great sums of money expected to be spent making them very low consumers of energy, detract from other sectors where cheap GHG emission reductions are possible. For example there is no speed limit on German motorways. Significant reductions in GHG emissions would be made simply by lowering speeds (EE, 2006)¹¹³.

EU goals for reducing energy consumption in all sectors are being developed through a call for widespread consultation in mid-2010, against a policy background outlined in the paper, *Stock taking document: Towards a new Energy Strategy for Europe 2011-2020* (EU Commission, 2010b; see also EU Commission, 2010a). The paper's conclusions include the words:

The key components of such a strategy are the exploitation of the full potential of energy savings, the promotion of low carbon innovation, a fully functioning internal energy market, secure and sustainable energy networks and greater cooperation and solidarity within the EU as well as achieving a more coherent and effective approach to the EU external energy relations. (EU Commission, 2010b)

This approach calls for a balance of strategies, and it needs to be worked out in ways that are balanced across sectors, and that do not put impossible burdens on private individuals in one section, as the EnEV does to homeowners.

7.3.3 Governmentality

I have argued that the pressure on individuals to refit their homes to extreme thermal standards is a form of what Foucault (1991) called 'governmentality', and Dryzek and Dunleavy (2009: 292) call 'environmentality'. The responsibility to reduce global GHG emissions is devolved to ordinary people, who inadvertently fulfil the goals of

¹¹³ In theory, the power required for a vehicle to overcome air resistance increases with the cube of the speed, and energy and fuel consumption for a given distance increases roughly with the square of the speed. Hence a car travelling at 110 km/hr would use approximately twice the fuel of a car travelling at 80 km/h to go the same distance, while a car travelling at 200 km/h would use six times the fuel. There are complicating factors that tend to reduce these differences, but they are nevertheless significant.

powerful interests and individuals at their own cost. It detracts from pressure to challenge the systemic causes of GHG emission: the way our civilisation is organised today, with vast consumption of energy inherent in manufacturing, extraction of natural resources, food production, transport and energy conversion, as well as the construction and use of buildings. These things are not likely to be changed significantly by individuals doing their bit, but possibly only by radical changes to the way our systems of provision function. This is the opposite of what is happening with the EnEV, because the onus falls on individuals to make personal sacrifices that can bankrupt them, and the costs are spread unevenly throughout the community (depending, for example, on the length of your house's roof overhang). A governmentality approach will not achieve international climate protection goals because it is far too difficult for individuals to make large enough CO₂ savings within a system that runs on the consumption of CO₂-emitting fuels. Hence there need to be more modest goals for CO₂ reduction from dwellings, and more emphasis on top-down changes in other sectors.

7.4 RECOMMENDATIONS TO GERMAN POLICYMAKERS

My recommendations to German Federal policymakers fall under two headings: recommendations concerning the EnEV, and recommendations for Federal policy procedures.

7.4.1 Recommendations concerning the Energieeinsparverordnung (EnEV)

1. If the thermal requirements for new builds are tightened in 2012, as planned, there should be no parallel tightening of thermal standards for renovation of existing homes.
2. The regulations for existing homes need to be de-coupled from those for new builds. The idea of requiring comprehensive renovations to achieve standards within 40% of the new build target should be abandoned, as should the requirement that partial renovations meet the new build standard.

3. The '10% rule' needs to be abandoned, i.e. the requirement that EnEV standards have to be achieved if 10% or more of any one part of a building is being renewed or renovated.

4. A wide-ranging discussion needs to be initiated on the subject of economic efficiency in thermal renovation of existing homes, in two respects: (a) How can homeowners get the most value for money invested in thermal renovation? and (b) How can Germany get the biggest reduction in GHG emissions from such investment? The question as to whether it is worthwhile renovating to a modest standard now, which can bring big fuel and GHG savings, and additional comfort, for small amounts of money, needs to be opened up for nuanced discussion. Currently there is no such discussion because of the doctrinaire assertion that it is only worth renovating if the job is done to the highest possible thermal standard.

5. Proper surveys need to be undertaken of the German housing stock, with a view to finding the nature and prevalence of sticking points, such as the wall and roof dilemma, shallow basements, narrow driveways, etc., that cause non-linearities in the degree of difficulty in attaching thicker and thicker insulation. My own widespread travels and careful observations throughout Germany indicate that these are far more prevalent than the policy discourse would indicate. The German government needs to know more precisely what it is dealing with in its existing housing stock.

6. This survey information needs to be put together with the findings of recommendation 4 above. Together these would act as a guide as to how tight the thermal renovation standards should be, and for which type of buildings, in line with their actual physical characteristics and the most efficient use of money. Standards would be set in this way, rather than being linked to new build standards as at present.

7. The question of whether and in what circumstances thermal renovation should be compulsory needs to be carefully reconsidered, in the light of recommendation 6 above. Whatever standards are set in law, there need to be exceptions to allow for extreme cases. The current system for being granted an exemption is onerous, and many homeowners simply bypass it and renovate illegally to whatever standard they find acceptable. These projects do make people warmer for less money, and reduce

GHG emissions. Yet those who undertake them have to exclude themselves from official advice networks, not to mention subsidies, so as not to get found out.

8. The requirement for on-site micro-generation for new builds, economically questionable in itself, must not be extended to cover renovations, partial or comprehensive. It is a very economically inefficient way to generate energy, and diverts precious investment capital from better options, such as investment in large-scale renewable energy projects. While this thesis is not primarily concerned with new builds, I would also recommend the requirement be dropped from the new build regulations for these same reasons.

9. The Federal subsidy system needs to be modified so as to reward economically efficient thermal renovation to a sensible standard, rather than to finance the very economically inefficient last few kWh of energy saving at the high end of the standards. In this respect the German government might gain valuable insights from, for example, British practices of offering subsidies for economically efficient, low-end projects such as loft insulation and boiler replacement, or Hamburg's practice of giving subsidies in proportion to the amount of energy saved.

7.4.2 Recommendations for Federal policy procedures

1. The system for awarding contracts to write *Gutachten*, i.e. officially solicited expert reports, on thermal renovation issues needs to be reviewed. The dominance of building physicists (*Bauphysiker*) and a handful of ecologically-oriented think-tanks and technical university faculties in the authorship of these reports is not providing government with a balanced view of what is practically possible in thermal renovation. Other groups' perspectives need to be brought into the centre of discussion: architects, plasterers, landlords, private homeowners, for example.

2. The expert reports need to be read more critically, in that policymakers need to be able to distinguish between the reliable scientific knowledge in them, and the values and politics of the writers. There need to be people in the official policymaking apparatus who have trans-disciplinary skills of this type. On the one hand they need to be able to produce their own reliable knowledge of the relevant material realities (in

this case buildings, and their characteristics, etc.), so as to be able to identify which portions of the expert reports are reliable scientific knowledge, and where there are gaps in the knowledge presented. On the other hand they need to understand how discourse works, so as to identify the elements of the expert reports that are not reliable science, but are the values and politics of the scientists. They need sufficient understanding of the strands of discourse that dominate the policy domain, to be able to see how these experts' values can get embedded in this discourse as if it were reliable scientific knowledge. This type of interdisciplinary skill could enable policymakers to design policies that have a better match with the way the material world is.

7.5 FURTHER IMPLICATIONS

7.5.1 Toward zero-energy homes?

Underlying the policy discourse is a basic assumption that it is morally wrong for energy to be consumed and GHGs emitted through household activities. In the EnEV policy discourse this takes the form: the less energy consumed in homes, the better, even if it becomes increasingly expensive to reduce consumption below a certain level. The argument runs: the energy-saving potential of homes is enormous; measures to reduce energy consumption in homes are technically feasible and affordable in comparison with other sectors; we must reduce GHG emissions by 80%; therefore we must aim for zero-energy homes (e.g. Friedrich, 2007a: 3-6). The idea that homes should consume little or no energy seems to be becoming normalised in the EnEV policy community, i.e. the ideas it expresses are seen as normal, natural and obvious, while alternatives – such as a house consuming 150 kWh/m²a – are seen as deviant. Foucault's inverted notion of history can help us see how peculiar this is. In Chapter 2, Subsection 2.3.5, I noted Foucault's insight that we can better understand the strangeness of our own society by setting it against other epochs, in which notions of what is normal and what is deviant are different from, or even the reverse of, our own (e.g. Foucault, 1965 [1961]; 1976). The notion of the zero energy home is a case in point.

There is now clearly an attempt to influence society to see the energy-consuming (or CO₂-producing) house as deviant and the zero-energy (or CO₂-neutral) house as normal. The European Union has already ruled that all new buildings must be ‘nearly zero-energy’ by 2020, and at least two prominent voices on the fringes of the German EnEV policy community, Federal Green Party MP Hans-Josef Fell and Jochen Flasbarth, the director of the UBA (Federal Environment Agency), are speaking out for all existing homes to be renovated to zero-energy standards, using on-site micro-generation to offset any shortfall. Even the claim by DENA spokesperson Thomas Kwapich, that all houses can be renovated ‘problem-free’ to ‘factor-ten’ (IV_Kwapich [35:41]) is moving in this direction.

The implications, for global GHG abatement, of attempting such an economically problematic project, are discussed below. At this point it is the *normality* of the zero-energy house that is significant and the *deviancy* of consuming energy in the home. In almost every other sphere of life the consumption of energy is regarded as normal: transport, manufacturing, food production, cooking, music-making, many sports, the health system, etc. Yet in some of these, we could save energy far more cheaply than by driving down the minimum thermal standards in homes below, say, 100 kWh/m²a.

In Appendix 5, Figures 1 and 2 show the output of a simple mathematical model of the insulation thickness required to reduce space heating energy consumption down towards zero in a typical medium sized, multi-apartment house in German climatic conditions. The graphs show that over 45cm is required for the passive house standard of 15 kWh/m²a, increasing to 1 metre for 5 kWh/m²a and over 15 metres as energy loss approaches zero. So we need to ask, why the push to normalise the zero-energy home and class all other dwellings as deviant? Surely the deviant house is the one with 15 metres of wall insulation (or its technical equivalent).

This is a topic that needs investigation: what is the relationship between the discourse of zero-energy homes, and the material reality of homes? The theoretical framework developed in this thesis, combining materiality and discourse, would be very appropriate for such a task. Regarding the materiality, there needs to be careful research on the technical and financial aspects of building new zero-energy homes and renovating a range of types of older home to zero-energy standard. Research

needs to identify what is technically plausible and how much it costs. There also needs to be concurrent research, integrated with this, on the discourse of zero-energy homes and policy developments in this area. We need to find where the zero-energy discourse is coming from, where and how it meshes or clashes with the materiality to which it refers, which interest groups are promoting it, what advantages it brings certain groups and how it disadvantages or disempowers others.

7.5.2 On-site micro-generation?

In Chapters 4 and 6 I noted how the EnEV now requires on-site micro-generation of renewable energy for both new homes and comprehensive renovations. This enables thermal standards to be tightened further, as it offsets the shortfall in what can be achieved through insulation, the limits of which are now being approached.

Yet it is well-known that small-scale, on-site micro-generation, such as PV or small wind turbines, is an economically inefficient way to produce renewable energy compared to larger projects such as wind farms, hydro-electric power, and concentrating solar power. For example, as I have shown elsewhere (Galvin, 2009), PV is an extremely economically inefficient way of producing power. A very rough calculation would show that investing in micro-generation produces only about one-fifth the energy produced by equivalent investment in larger scale projects, such as wind farms (FME, 2007: 14; DWIA, 2009). If you were to install sufficient PV to offset the energy use of a home that consumes 50 kWh/m²a of heating energy, the annualised cost of the PV would be about equivalent to the heating bill of a home that consumes around 250 kWh/m²a of heating energy – making your total energy costs similar to those of some of the worst *Energiefresser* (energy-gobblers) in Germany. The fact that PV is heavily subsidised in Germany simply means your costs are transferred to other citizens – the costs still have to be paid.

Once again, the policy is out of step with materiality. Yet the weaknesses of micro-generation compared to large-scale renewable projects are well known among German policymakers. For example, the Federal Ministry of the Environment's commentary on the Renewable Energy Sources Act displays figures and graphs that show the large gap between the quantity of energy produced by German wind farms

(30.7 billion kWh in 2006) and that produced by PV (2.2 billion kWh) (FME, 2007: 6), and simultaneously that subsidies for PV are far greater than for wind power. We therefore have to ask what is driving the push toward compulsory micro-generation in the EnEV.

Clearly there are strong interests associated with the growth of the PV industry in Germany (Dohmen et al., 2010). There is also a strong tradition favouring decentralised services provision in the German Green Party (Gänzle, 2004), though the Greens have not been in Federal government in Germany since 2005. On the other hand, a number of policy actor interviewees, particularly outside Berlin and associated with building practice, expressed dislike of or even distain for PV as a viable, long term component for energy efficiency in buildings (e.g. IV_Neuhaus [09:20]; IV_Vogelsang [15:03]).

The solar thermal (home water heating) industry also stands to benefit from compulsory micro-generation. These areas and interests could be fruitful avenues for research, to find out what is driving the push for micro-generation despite its economic inefficiency and the burden it will place on homeowners. We need to note, too, that micro-generation and the concept of the zero-energy house fit together and seem to be driven by similar discourse, if not also similar interests.

7.6 CRITICAL COMMENTS ON THE RESEARCH

This research project has its limitations. Those of significance are: limitations of time; limitations of investigative scope; philosophical considerations; limitations imposed by the ecological modernisation framework in which German thermal renovation policy sits; and limitations of transferability. This is not to suggest these things could have been covered within the time and resources available to do a PhD. Rather, it highlights the limitations inherent in such a project, and points to ways in which research on this topic could be fruitfully extended.

7.6.1 Limitations of time

The empirical research covered contemporary events over two-and-a-half years, and included historical and documentary research covering key features of the policy's development over the last decade, while the intensive, interview phase took place within a 3-month period shortly after a general election. Even within this short period, changes in policy discourse were observed, but it was not possible to track these further within the time constraints of the thesis work. Ongoing research would be needed to see how such issues as the following develop: the longer term effects of the growing realisation that the energy saving goals of the EnEV are falling very short; the growing realisation that the biggest CO₂ emitters in the residential sector - small one-to-six-dwelling private homes - are doing the least thermal renovation; the material and economic effects of ongoing renovation to EnEV 2009 standards and of the coming tightening of thermal standards in 2012; the effects of discourse promoting further tightening toward zero-energy standard; the economic and thermal effects of increasing requirements for on-site micro-generation; the possible feedback effects when building inspectors, planned to be introduced, start observing first-hand the difficulties of renovating to EnEV standards. These questions are all interesting in the light of this thesis because they all involve discourse and materiality, and the interplays between them. They might also reveal how a policy that has significant mismatches with the materiality at which it is aimed will fare as these mismatches become more evident to policymakers.

There is evidence that the mismatches are indeed beginning to bite. In September 2010, a full year after Federal CDU/CSU politicians launched the ill-fated ESP130 in an attempt to relax the thermal standards demanded for refits, a new initiative of a similar type was launched. A four-person workgroup of Federal MPs chaired by Michael Fuchs, the vice-chair of the CDU/CSU caucus, proposed that the goal of reducing GHG emissions from home heating by 80% be dropped to 60%, and that standards only be demanded that make for clear financial payback for homeowners (Stern, 2010). This thesis was completed before any longer-term effects of this initiative became clear.

7.6.2 Limitations of scope

Some important issues could not be followed up in this research. Firstly, it is not clear to what extent the aspiration to have all homes comprehensively thermally refitted to extremely high standards relate to German cultural characteristics, a suggestion made by at least two interviewees (IV_Hauser; IV_Würzburg). This is also related to cultural expectations regarding thermal comfort. But there was no scope in the study for this thesis to delve effectively into questions of German culture and its impact on housing and renovation discourse.

Secondly, one of the main political parties involved in the inception and development of the EnEV, the SPD, would not permit its Federal interviewee's views to be reported in this thesis. The SPD assured me that this was because of the disruption in the Federal wing of the party after its crushing election defeat. The SPD's official views are well known through its policy publications and the statements of former BMVBS Minister Wolfgang Tiefensee (see, e.g. Tiefensee, 2006; 2007:363), and accord well with the dominant story-line identified in Chapter 6, and I did interview an SPD politician on the municipal level. But the thesis would have been enriched by reporting the actual words and ideas of this Federal interviewee.

Thirdly, some value would have been gained through being permitted to interview Professor Wolfgang Feist. Feist's views dominate the economic viability issue in EnEV policy, and his thinking is dominant in the expert reports that have informed policymakers in setting EnEV standards. Interviewing Feist's colleague and principal co-author, Oliver Kah, was a fairly good substitute, and hearing Feist speak, share a panel discussion and be questioned from the floor at a conference helped to make up the deficit. However it is very likely that the research would have been enriched by a searching interview with this policy actor whose views and actions shape and exemplify a good deal of the discourse on thermal renovation in Germany and beyond.

Fourthly, my pool of homeowner interviewees was very limited, despite its range and scope. A group of homeowners I did not interview was those who had never seriously considered doing thermal renovation on their homes. It would be interesting to find

out the extent to which this absence of intent to do thermal renovation is due to active resistance against the dominant renovation discourse, happy contentment with homes despite their being expensive to heat, a stoic acceptance of fuel poverty, or other attitudes. Informal conversations with homeowners gave indications of all these factors, and there were some enlightening encounters which, unfortunately, I do not have permission to report on.

Fifthly, I did not make any systematic attempt to interview architects. This was because architects do not figure with any prominence in the community of policy actors who have regular input into the development of EnEV policy. This is not just a German phenomenon. In respect of the UK, Fischer and Guy (2009: 2577) report that ‘architects appear to have little influence on the setting of the building regulations’. It seemed a more efficient use of research time and energy to interview professionals who were in the policy loop, rather than search for groups beyond the loop who might nevertheless have valuable and relevant things to say.

In the course of the research, however, I happened to meet architects informally or unplanned, and they had strong views on the EnEV. One, a homeowner interviewee, expressed her misgivings about mould triggered by renovation to EnEV standards (IV_Cottbus_B: see Chapter 5, Subsection 5.3.4). Another complained about directives to upgrade government buildings to EnEV standards which were not, in her view, appropriate for the buildings’ use – such as insisting on installing high-quality double-glazing in workshops that have large, hangar-like doors open all day. More interesting, an architect in North Rhine-Westphalia maintained that much of his and his colleagues’ time is spent applying for *Ausnahme* (exemptions) to the EnEV regulations, since the structure of so many homes being built or renovated cannot take the insulation requirements. My informant later wrote:

This means that in practice German clients can rely on their architects, who will always try to use one of those important exemptions of § 25 EnEV called “besonderer Umstand”/ “unangemessener Aufwand”/ “unbillige Härte” (“special circumstances”/ “disproportionate expense”/ “inequitable hardship” - RG).

He commented that architects tend to try to get around the regulations rather than make any attempt to lobby for change. He also gave me an in-house publication of the *Bundesverband Farbe Gestaltung Bautenschutz* (German Federal Association for Paint Design and Preservation of Structures: www.farbe.de), labelled ‘Exclusively for Guild Members,’ which gives specific, detailed advice on how to make best use of the exemptions clause in the EnEV (BFGB, 2010: 3).

This can be seen as a form of resistance to the hegemonic discourse of the EnEV, not in a direct, argumentative way, but by using legal loopholes to get around it.

There are, however, other architects who see themselves in the vanguard of ever more energy efficient housing design, though this is mostly evident in specialist new-build projects, such as passive house settlements, rather than in renovation.

More direct research interviewing architects and other practitioner groups would probably be very fruitful in mapping out a fuller picture of responses and resistances to the EnEV. UK research by Fischer and Guy (2009) could provide a useful framework for undertaking such research. They see a creative role for architects as ‘intermediaries’, whose close familiarity with building design can provide them with an understanding of what works – socially, aesthetically, practically – that can be fed back to policymakers.

Sixthly, and following from Fischer and Guy (2009), the research would have benefited from a broader look at the notion of ‘intermediaries’ in the policy space between policymakers, homeowners, and the commercial home insulation sector (see also Guy et al., 2011). In this sense, building physicists appear to act as intermediaries in the German thermal retrofit policy domain, as they play a crucial role in connecting up policymakers and homeowners. The problematic elements this leads to, as discussed in some detail in Chapter 5, might have been better framed using such an approach.

Seventhly, there was not time, during the interview schedule, to do more systematic and detailed ethnographic research. While I made many journal notes, and learned many interesting things through informal conversations with scores of people, it was not possible to record and process these rigorously while focusing on the interviews.

Nor was it as directly useful as recording questions and answers in a formal setting, doing full transcripts and studying these carefully in relation to documents and other pieces of deliberately produced semiosis.

Finally, the *theoretical* scope of this study was somewhat limited due to my omission of an important strand of policy discourse theorising, namely ‘Pragmatic’ policy analysis (e.g. Schneider and Ingram, 2003; Schnieder and Ingram, 2005; Shapiro and Schroeder, 2008). This has roots in the North American Pragmatist tradition associated with John Dewey and William James, and often draws on the philosophical position mapped out by Richard Rorty (e.g. 1989).

This approach aims to avoid allowing its world-view to be dictated by apparently logical, philosophical restrictions (Schneider and Ingram, 2003), and places great emphasis on what works in practice. As Morales (2003: xii) explains, it utilises an approach to ‘truth’ and ‘falsity’ similar to that of the law courts. In policy analysis within this tradition, emphasis is placed on discourse (as in the approach of this thesis), but science is treated in the same way as any other human activity. If the claims of a scientific community work in practice, then they may be accepted. There is far less concern with the truth or otherwise of abstract scientific theories.

An interesting question is whether the policy analysis carried out in this thesis, with its to-ing and fro-ing between the discourse of policy actors and the physical and thermodynamic characteristics of German dwellings, could have produced the same or comparable conclusions if attempted from a pragmatist perspective. A crucial difference between the two approaches may be seen in their treatment of scientific theories. Modest realism maintains that the theories produced by natural science do in fact refer to real entities in the world. These entities, it is argued, are at present beyond the scope of current observation, but we navigate our way into the unknowns of the world by treating them as if they really do exist, or are at least candidates for existence, and investing time, effort and money into testing these theories. In other words, we do not just invest in ‘what works’, as Pragmatism tends to, but in invisible things that have not yet been shown to work (see, e.g. Bhaskar, 1978 [1975]: 13).

It could be argued that this extra dimension of modest realism might not have been necessary for a study in which there was no cutting-edge theoretical issue at stake. On the other hand, the modest realist approach gave us provided guidelines for deciding which of the claims of certain building physicists are good science, and which are lacking in theoretical base. It would be interesting to see how a pragmatist approach would deal with these issues as raised in Chapter 5.

7.6.3 Philosophical considerations

In the theoretical work of this thesis, the modest realist ontology offered a robust account of what science is, while maintaining a social constructionist understanding of the production of knowledge and thus providing an epistemology consistent with discourse analysis. Insights from socio-technical systems theory enabled the raw materiality basis of this modest realist approach to be carried over into consideration of the intermingling human/material realities met with in everyday life, albeit as an analytic device. A modest realist approach to materiality also enabled the materiality that is embedded in society to be considered, along with its potency and obduracy, in respect of how it thickens up and strengthens some social rules, habits, expectations and agentive powers, and makes others weak or impotent.

The empirical work of this thesis has offered a test of the usefulness of this modest realist version of policy discourse theory, and it has proven its worth in this particular empirical setting. But it could be extended in several directions.

7.6.3.1 Risk and uncertainty

How would this theoretical framework perform in cases where material issues are highly contested even among scientists working in the same field? As this is not a pressing issue in the field of thermal renovation, it has not arisen here. The laws of thermodynamics are widely accepted, and it would be possible, at least in principle, to survey all German houses to see how many have what length of roof overhang, etc. Further, it need not be controversial to affirm that, while statements about heat loss in relation to U-values are of a robust scientific nature, claims that this or that house is due for a comprehensive refit are imbued with personal values and politics. However

in issues such as, for example, the disintegration and melting predicted for Greenland's glaciers, current science is a mixture of reliable knowledge and intelligent speculation. Here, issues of risk and degrees of uncertainty become important. To be more effective for analysing climate change policy discourse, the theoretical framework presented here could be broadened to provide a methodology for investigating issues where risks and uncertainties loom large. We need to go beyond a social constructionist analysis of how people construct or conceptualise risk and uncertainty, and simultaneously explore what the material features are of those uncertain things that people frame as risky. While there is already much good work in this area (e.g. Adger and Vincent, 2005), exploring a slippery issue such as risk would not suffer from a robust philosophical framework that carefully distinguishes the ontological ('being') from the epistemological ('knowledge'). In particular, it would be interesting to extend the modest realist framework into the field of probability studies.

7.6.3.2 Heuristic and representational models

In developing the theoretical framework for this thesis it was useful to distinguish, at the outset, between heuristic models and representational models, of the aspects of the world we are investigating. This distinction has more than proven its worth in guiding the discussion through complex and at times esoteric-sounding fields. It has also become clear, in reading the literature related to the issues of this thesis, that this distinction is almost always ignored in policy discourse literature and much related social science literature.

This is partly for philosophical reasons: if you do not believe we can ever have reliable knowledge about the world, it is fruitless to claim that your model represents the way something really is in the world. All models become heuristic, and the difficulties of arbitrating between them multiply. However, if we are prepared to concede that some knowledge does align well with the way the world is, we are at least closet realists and can begin to think about which of our models are merely heuristic and which are meant to represent things that could, at least in principle, be found to exist. I would argue that such discipline of thought could make many fuzzy areas in the social sciences much clearer. It would also save us from, in Harré's

(2009) words, looking for ‘unicorns’ - things that do not actually exist but have been invented in people’s imaginations to help them think more clearly about complex issues. The longstanding confusion about social structures, as if these were intangible but powerful entities that somehow come into existence and exercise an influence over people, is a case in point. We need to be able say which of our models represent something that could possibly be found, and which are, instead, useful imaginative devices to help focus our thoughts and discussions.

7.6.4 Ecological modernisation, reducing GHG emissions, and responding to climate change

The empirical work for this thesis has taken place within a global concept of climate change mitigation that is highly influenced by the discourse which is identified as (the heuristic device of) ecological modernisation (EM: see discussion in Chapter 1, Section 1.5). To begin with, this means that the perceived path to global reductions in GHG emissions is through modernising our technology in an environmentally sound direction. There is much literature on how global change can come about through technological innovations (e.g. Arthur, 1989; 1990; Liebowitz and Margolis, 1995; Lovell, 2007; Walker et al., 2004) and, as Jänicke (2008: 563) argues, ‘The potential of “ecological modernisation” to radically reduce the environmental burden of industrial growth is without any alternative.’

But EM avoids major structural change. Andersen and Massa (2000) comment:

In view of the serious environmental problems facing the global community in the 21st century, ecological modernization (sic) as a concept, in our opinion, only makes sense if reserved for a reference to *more radical structural changes* that promote ecological consistency rather than ordinary efficiency. (Andersen and Massa, 2000: 1, emphasis added)

This would imply that, even if we could make homes as energy-efficient as German Federal policy aims, it does not necessarily follow that this will reduce the global total of GHG emissions. More radical structural changes would be needed to achieve this.

There are several reasons for this. Firstly, reducing energy usage in a particular sector is not the same thing as reducing GHG emissions from the combustion of fossil fuels. If we want to reduce GHG emissions, we actually have to slow down and, before too long, stop extracting fossil fuels. Yet we are currently exploring for *more* oil and gas. This includes a number of OECD countries, which have stable populations and strongly worded commitments to GHG reduction. There appears to be a flaw in their logic, since to reduce GHG emissions you have to emit less GHG, and therefore you have to extract less fossil fuel. Unless you do this, no amount of energy efficiency will achieve your GHG reduction goal.

Secondly, the ‘rebound effect’ seems to have dimensions that go beyond a simple take-back of energy saved through energy efficiency. As Ruzzinetti and Basosi (2008) illustrate, in a study of efficiency gains in the transport systems of Europe’s post-Fordist industry, energy efficiency gains can actually lead to more energy being consumed within a system. This is because, as the energy efficiency of one unit in a system increases, its output increases for less cost, and therefore more demands are made on other units. These consequently have to increase their own efficiency to keep up with the demands, and at certain points the demands become so great that a new layer of command and control becomes necessary. This demands more energy. Meanwhile, as output increases and goods become cheaper, any absolute rise in energy prices is offset by people’s increasing wealth, so that more energy can be consumed than previously (Barker et al., 2007). This suggests that increasing energy efficiency in one sector does not bring any guarantee that the overall consumption of energy will fall. So we need to be very cautious about claiming that getting all houses insulated to an extremely high standard will automatically lead to a reduction in global GHG emissions.

In short, an EM framework is too narrow to enable us to relate the GHG emission reductions caused by thermal refits, to the larger question of the actual impact of this on global GHG emission reductions.

7.6.5 Limitations of transferability

The skills I was able to bring to this investigation were somewhat broad and specialised. As well as attempting the human science task of a policy discourse analysis, I was able to enter deeply into key mathematical, thermodynamic and ergonomic issues bearing of the policy area to which these applied. This made it possible to raise key questions about the efficacy of policy, and the use of both science and non-science by the writers of expert reports.

However, it would be problematic to assume that environmental policy analysis can only be done effectively when both these sets of skills are found in the one researcher. In the real world, much research – including interdisciplinary research – has to be done by people whose skills do not put them on a par with the natural scientists about whose area they are researching policy. This points to a limitation in the usefulness and transferability of the approach developed here. A study such as this could conceivably be undertaken by a team, where all the necessary skills were covered and there was good communication between members. Alternatively, a policy discourse analyst can consult a range of specialists in a particular field of natural science if her skills do not reach to that area. In such situations the theoretical framework developed in this thesis might not be appropriate for the task at hand.

Further, my ethnomethodological familiarity with German housing and home heating culture enabled a certain depth of understanding to be achieved, which would not be directly transferable to situations where I or another researcher was coming into a less intimately familiar situation.

Hence, while the theoretical framework developed here has shown itself to be useful in this particular type of analysis, its limits of transferability beg to be explored.

7.7 A CONTRIBUTION TO LEARNING¹¹⁴

There are four main areas in which, I would argue, this thesis makes a contribution to learning. Firstly, it offers a way to bridge the gap between policy discourse analysis, and the assessment of knowledge about the material objects of the policy, while holding firm to a social constructivist understanding of knowledge. Secondly, it poses a challenge to extend our competence in interdisciplinary research, and to think critically about what that type of research entails. Thirdly, it suggests a way of thinking about social structure, that avoids the reification of structures yet acknowledges that there are, indeed, things that constrain and enable people to act the way they want to act within society. Fourthly, it offers a challenge to the community of policy discourse theorists, to engage in in-depth discussions about the philosophical issues that are brought to light in this attempt to blend modest realism with policy discourse theory. These issues may be explicated as follows.

7.7.1 Discourse and materiality

In Chapter 2 I argued that it is possible to bridge the gap between policy discourse analysis and statements about materiality as such, while holding consistently to the social constructivist view that all knowledge is a human production based on interpretations within a specific social context. Policy discussion is not primarily a one-to-one mapping of utterances to physical and social reality, but is realities produced through semiotic means in specific social contexts, associated with specific practices. However, I have argued, it does not follow that there is no stable platform for assessing how well or closely policy actors' utterances reflect the truth about the material and socio-material entities about which they are speaking. Rather, as I have shown, a combination of Baskhar's transcendental realism and Harré's understanding of science as a 'moral' project, together with insights about how language is learnt in practical, everyday situations, provides us with a modest realist account of natural science knowledge, that enables us to judge well enough, for most practical purposes, which discourses reflect material reality better than which others.

¹¹⁴ This would normally be called 'a contribution to knowledge'. However, since the word 'knowledge' is used in a specialised way within this thesis, it seems appropriate to use a different word here.

The contribution I have thereby made to learning lies not in the originality of the ideas in the philosophy of science that I have drawn upon, but in my incorporating them into policy discourse theory. Baskhar's transcendental realism was developed in the mid-1970s (Baskhar, 1978 [1975]), and Harré's (2009) recent critique of critical realism really amounts to a more rigorously argued statement of Baskhar's original position. Archer's project of showing how discourse is anchored to material referents is decades long (Archer, 1995; 2000; 2007), while Harré's notion of science as a moral project entered the philosophy of science in the 1980s (Harré, 1986).

By drawing these insights into the ambit of policy discourse theory I have provided an approach that is particularly appropriate for the critical study of environmental policy. The contribution this makes to learning goes in several directions:

7.7.1.1 Extending policy discourse analysis

Since there are always material objects of environmental policy, those who research environmental policy discourse need to be able to judge how well or closely the policy and the wider policy discourse match the materiality. It is not good enough simply to take a 'sociology of knowledge' (a term taken from Berger and Luckmann, 1966) approach and suspend all judgement as to the truth or falsity of discursive claims about materiality. This will not provide good explanations of the how, why and what of policy discourse. For example, some discourse may assert that CO₂ molecules in the atmosphere absorb outgoing infra-red radiation of certain bandwidths and so cause global temperature to rise. Policymakers who assert this might not be doing so for political reasons, but simply because it is the only scientifically defensible position – i.e. they are asserting it because it is the case, not merely as a means to exert power within a discursive milieu. On the other hand, many assertions within policy domains that pass for reliable scientific knowledge are not reliable science, and the modest realist extension to policy discourse analysis can help us identify these.

The value of this approach is perhaps most clearly seen in my critique of the expert reports. I have not criticised expert report writers for misrepresenting the truths of thermodynamics and insulation properties to policymakers. Rather, having judged their understanding of these to be correct, I have been able to look at how their values

and politics enter their discourse at the next stage, where they report the implications of these truths to politicians, but dressed up with their (non-scientific) assertions about such things as how to count costs, what the discount rate should be, and when a building is due for a comprehensive refit. However I *have* criticised these experts for their sub-scientific view of the predominant physical shapes and forms of German dwellings, such as their under-representation of the roof-wall dilemma throughout the building stock. In this respect, I have maintained, their science is wrong.

At the same time, because this critique was situated within an interview-based analysis of the discourse in the policy realm to which the expert reports are addressed, I was able to identify how the experts' values and politics feed into and reinforce certain elements of discourse that lead to policies that do not match well with their material objects. This was not simply a two-way study, of natural science on the one hand, and policies on the other. The thread holding it all together was discourse analysis. I read the expert reports *with an awareness of the policy story-line*, and this alerted me to claims and assertions in the expert reports that were regularly reproduced in wider policy discourse *and yet were not of a reliable scientific nature*. This led to my exploring how intricately these value-based and political claims and assertions were interwoven with the genuine, reliable science in the reports (see Chapter 5). It was the modest realist policy discourse analysis approach that made this type of analysis possible.

So, because there are always material objects at issue with environmental policy, the modest realist approach here provides a means of clarifying the shape and nature of these, in relation to the politics and values that human actors produce in relation to them. Policy discourse analysis would benefit by being extended in this way.

7.7.1.2 Avoiding positivism and naïve realism

Positivism, as I explained in Chapter 2, Subsection 2.3.3, is the view that truth about the world can be arrived at by rational constructs based on detached observations. It avoids discussion of the socially constructed nature of scientific knowledge and the interpretive nature of views of the world; and maintains that sufficient observations,

together with correct logical reasoning, will make the truth clear. Naïve realism is the view that the world is simply as it appears to be.

The modest realist approach I advocate enables policy analysis to investigate both policy discourse, and knowledge about the material objects of the policy, without lapsing into positivism or naïve realism. If we lapse into positivism or a naive realism at this point, we put the integrity of our research at risk. We can end up reproducing a discourse regarding a particular aspect of materiality that has become so embedded in popular thinking that it is taken as normality, truth, the case, even by social scientists who should be critical of all assertions about the way the world is. One such item of discourse is the assertion that thermal renovation is (always) a cheap and easy way to abate CO₂ emissions, which I have attempted to debunk both in this thesis and elsewhere (Galvin, 2010a). This assertion is now so often reproduced, even among academics who are otherwise critical of discourse, that it appears to have become part of the furniture with which people think. Jakob (2006) is one such example. Having admitted his figures show that high-end thermal renovation in the Swiss context never pays back, he then produces a series of arguments to prove it does, actually, when looked at from different perspectives. The positivist-style assertion, that there is a truth that thermal renovation always pays back, acts as a control on what else can be said.

A typical example from more general literature is discourse about renewable energy produced by photovoltaics (PV) in Germany. Anthony Giddens, who has contributed much to academia's understanding of social phenomena, reproduces the dominant discourse about the 'achievements' of German PV as if it is fact (Giddens, 2009: 76-77). It could also be argued, however, that a closer examination reveals that PV in Germany is technically impotent, hugely expensive, a rapidly increasing tax on the poor, and a nil contributor to GHG abatement (Frondele, et al., 2008; Galvin, 2009)¹¹⁵. A modest realist approach would begin by treating all claims about PV in Germany as social constructions. It would then place these within the scientific community's rigorous moral commitment to produce knowledge that is reliable and trustworthy for

¹¹⁵ At the time of writing this chapter, the cost estimates for PV subsidies in 2011 were released by the energy provider Vattenfall Hamburg (Stürmlinger, 2010). The increase for 2011 over 2010 is around 70%. PV takes 50% of the renewable energy subsidy and produces 20% of the energy.

everyone everywhere. In this context it would use the methods, developed by the scientific community, appropriate to testing each type of assertion about PV. Some assertions are, for example, in the realm of physics, such as how many kWh of electrical energy a particular type of PV, in a particular place, can be expected to produce per year. Others will be proven to be non-science, such as the assertion that Germany is a 'Leader of the pack' (Giddens, 2009: 75) in respect of PV. Others will be shown to be fallacious arguments, such as Giddens' failure to mention how little energy German PV produces, while implying it contributes significantly to Germany's total production of renewable energy (*ibid*: 76).

The knowledge Giddens produces about German PV can, I would argue, be shown to be of a political, values-based type, not of a scientific type. Using the modest realist framework, we have a methodology for critiquing these types of assertions without ourselves lapsing into the naïve realism that tends to characterise them.

7.7.1.3 Distinguishing between what we know and what we do not know

Environmental natural science is a very incomplete science. There is much we do not know with a high degree of certainty. We do not know, for example, how much sea level rise will result this century from melting or break-up of Greenland's glaciers. However there are some things about which the scientific community has produced reliable knowledge. Examples are: that CO₂ and methane molecules in the atmosphere absorb outgoing infra-red radiation and thereby heat the lower atmosphere; that human activities over the last 200 years have been the major cause of the increased concentration of GHGs in the atmosphere; and that recorded global average temperature over the last decade has been higher than for any other decade of the past 100 years.

A modest realist approach would therefore not analyse policy discourse on climate change only from the perspective of the production of meaning and knowledge within the policy discourse. It would not lump all scientific knowledge of climate change together under the banner of uncertain or contextual knowledge. Instead it would set the uncertainties, together with policy discourses, against a stable background of defensible, reliable statements based on what natural science does know.

Further, policy discourse approaches make much of the idea that nature is a socially constructed reality and that therefore environmental policy is dealing, from the start, with human interpretive productions rather than true or false statements about the physical world (e.g. Fischer and Hajer, 1999). Dingler (2005), for example, takes an extreme version of this position, based on the ‘post-modern premise that there is nothing outside of discourse.’ In the policy world, however, most pieces of environmental legislation do not have to do with ‘nature’ or ‘the environment’, but with quite specific material entities: acid levels in a lake; tonnes of CO₂ emitted; quantities and types of particles in the air; locations of radioactive waste; quantities of energy consumed to heat a home. These make assumptions or declarations about physical matter, and these can and should be contested on scientific grounds. The modest realist approach offered here makes this side of the discussion possible.

7.7.2 Interdisciplinary research

The contribution I offer in this thesis has implications for the skills needed in policy discourse analysis – or at least, it could stimulate discussion of these. The researcher needs knowledge and skills in discourse analysis, but also, to a greater or lesser degree, in the area of natural science that the policy is aimed to affect. To discern which are the social or value factors influencing discourse, and which are coming from a good understanding of how the material world works, a researcher needs a degree of familiarity with the science of that part of the material world.

Interdisciplinary and trans-disciplinary research are now very much on the agenda in environmental science (see, e.g. Hirsch Hadorn et al., 2008). Many science graduates and researchers subsequently learn the theory and skills of discourse analysis in order to undertake environmental science research. Some might not find it easy to make the transition from one type of discipline to the other. There is also the issue of how long it takes to become proficient in natural science research, when one has already invested years of career development in the human sciences. This raises the question: how deeply does a researcher who is skilled in the social sciences need to know, and develop research skills in, the area of natural science that her interdisciplinary research reaches into? In this thesis, my own engineering and mathematical

background made a certain type and depth of interdisciplinary research possible. Well-co-ordinated team research might also have accomplished this. There can be other interdisciplinary research projects where different levels of technical competence are required. This points to an interesting area for ongoing discussion.

7.7.3 Social structure and policy change

A related issue explored in Chapter 2, Subsection 2.6.2, was that of social structure. I argued that this can be understood as an amalgam of materiality and discourse that constrains and enables people in their day to day lives and actions. I argued that the elements of structure arising out of discourse have no reified existence and no causal power as such (whereas people and material things do have causal powers). Narratives and discourse become embedded in routines, habits and memories, and material entities thicken up these routines and make them more stable and harder to change. People then reproduce them in daily habits of speech and action, or at times simply the persistence of their material aspects makes the threshold of change too difficult for people. Some of the more tenacious aspects of the policy story-line can be seen as held in place by social structures of this sort.

An unanswered question in this thesis is the extent to which social structure, as it is understood here, can be changed purely by discursive means – arguing, using rhetoric, playing discursive power games – and where the materiality dictates what can and cannot change. For example, to what extent could German policy on thermal renovation be changed simply by discursive means?

To address such questions, Hajer (1995), as I noted in Chapter 2 Subsection 2.6.2, draws on the ‘immanentist’ model of social structure put forward by Davies and Harré (1990). It will be recalled that in this model, structures exist only while they are being reproduced by discourse. Hence, discourse itself can change them. Harré has recently argued this position yet more strongly, concluding with the words (quoted previously in Chapter 2, Subsection 2.6.2):

All we have to do is to show people that they are trapped in the silken but fragile shrouds of a pattern of discourse conventions. (Harré, 2009: 142, emphasis in original)

In this view, we only need to convince the people who hold the reins of power that their policy is wrong, and they will change it. They will shift the materiality within the social structure this way and that, to get the new policy they have now opted for. Presumably, since Harré is also a modest realist, he is referring here only to the material things that people *can* shift around: such as earth-moving machines and the roofs of houses, not alps and the laws of thermodynamics.

But this research has raised two questions about this view. Firstly, the built environment is a material ensemble that has accumulated over time, and is the way it is despite the strongest political rhetoric or the cleverest discursive power-plays. Current German policy discourse on thermal renovation is out of step with this, as it takes its cue from the theory of new-builds rather than the obdurate, long existing stuff that makes up the current housing stock. In this sense, Harré's maxim needs to be reversed: the discourse needs first to *realign* itself with these aspects of the way the world is. Rhetoric needs to argue the case for what is there at the moment, not for some imagined utopia. And of course, what is there at the moment is real stuff, which we can obtain good-enough knowledge of, using the modest realist paradigm put forward in this thesis.

Secondly, on a more global level, GHG emissions are associated with structures (i.e. rules, habits, wealth distributions, organisations, ways of living) and with socio-technical systems, that have also accumulated over long periods of time and become deeply entrenched. These include energy and food production; transport and the location and configuration of roads, cities and waterways together with the historically developed vehicle industry; education and military systems and all their accumulated property, equipment and expertise; manufacturing and its supply and delivery networks, accumulated capital, property and expertise; the arts and all their equipment and property; the built environment and its service networks and the people in the buildings and what they say about them, and so on. This brings an awareness of the types of massive changes there would need to be in all this, if global

GHG emission reduction targets are to be reached. Harré (2009) would have us believe that it is all held together with ‘silken but fragile shrouds of a pattern of discourse conventions’, and therefore can be changed with discourse. People are causing it to happen; therefore if the people change their views and ways, the whole material structure will change.

The vision is almost intoxicating in its optimism. This thesis has made an important contribution to at least the possibility of working towards it: for such changes to come about, people will need to agree on what the material stuff is that they are shifting here and there and making changes in. We cannot afford the debate to be hampered by anti-realist claims that one group’s knowledge of, say, the Greenhouse Effect or the actual energy-productive capacity of photovoltaics is as good as *any* other’s. Despite its weaknesses, the Intergovernmental Panel on Climate Change (IPCC) is the closest we have to a scientific forum for producing reliable information about climate and GHGs. It would be a moral tragedy if academic-based anti-realism were to reinforce unfounded scepticism of science to the extent that the IPCC came to be treated by policymakers and the public as just another lobby group.

Hence in this sense the contribution this thesis makes is to offer a methodology to help us keep in close touch with the nature and shape of the material substance that is distributed throughout our social world in the production of GHG emissions, so that we know just what we are asking of world leaders, and others in powerful positions, if we are calling for genuine reductions in those emissions.

7.7.4 In-depth discussion of the philosophical issues

In Chapter 2, space permitted only a brief discussion of the version of modest realism I am proposing as an adjunct to policy discourse theory. Some theorists will quite rightly want a much fuller discussion of the approach offered, before incorporating it into their theoretical frameworks. Bhaskar’s work is notoriously difficult to read, and Harré’s account of science as a moral project is expressed in terms familiar to his intended, philosophical audience, rather than a broader audience of social scientists, building physicists, architects and engineers. However there need to be policy analysts who will engage with writers such as these, so that the tradition of policy

discourse analysis can robustly critique and renew itself. Hence I finish this thesis by making a call for this type of intellectual engagement.

Firstly, there needs to be discussion, among policy discourse theorists, of the natural sciences as a project that has enabled humanity to manipulate aspects of the world in ways that make life today so very different from much of what it was like for the first 5,000 years or so of civilisation. What must the *universe and its workings* be like for a community, namely natural scientists, to have been able to produce the knowledge that has shown itself to be so reliable in this respect? A few days before these words were written, it was announced that science has now eliminated the cattle disease rinderpest, bringing enormous benefits to herders, especially in the poorest countries. This is not just a piece of discursive power-playing: it is a real thing that is already making life easier for many people. What must the universe be like, for a community of human beings to be able to produce and communicate to each other all the various jigsaw-pieces of knowledge that contributed to this success, and to do so using the slippery phenomenon of discourse? Such questions, I maintain, demand an answer from those whose world-view amounts to the claim that one contextual, socially produced knowledge is as good as any other. How does this scientific community keep coming up with knowledge that proves more effective, for practical purposes, than other knowledges? There needs to be lively discussion of this among policy discourse theorists.

Secondly, policy discourse theorists who proffer a scepticism of natural science need to explore the *moral* aspects of the scientific community's commitment to the production of a certain type of knowledge. Admittedly, this morality is not always adhered to, yet it does seem to keep reasserting itself as the straight-and-narrow-way for scientists. I have not found any discussion of this issue among policy discourse theorists whose work intersects with that of science. Yet the picture is not complete without it.

Thirdly, in policy discourse theory, understandings of discourse, socially constructed realities, semiosis, narrative, and the ways humans produce knowledge, tend not to be pursued for their own sake in policy discourse theory texts.

More generally, policy discourse theory is a living discipline, which needs to be constantly renewed with fresh insights and understandings. One such area of renewal, I would argue, is a greater engagement with the question of scientific discourse and the physical, material entities it claims to be producing knowledge about.

So I end with a plea for the theoretical issues raised in this thesis to be discussed critically, both in relation to their philosophical underpinnings, and to the wider field of policy discourse analysis. With these considerations in mind, together with the empirical example I have presented of its usefulness, I offer the modest realist account of scientific knowledge as an extension of policy discourse theory.

Appendix 1. Deriving Formulae for Thermal Refit Payback Time Calculations

Let:

E = percentage annual increase in heating energy price

D = percentage annual discount rate

F = combined annual fuel increase and discount rate factor (see below)

S = annual saving in fuel costs due to refit, in present value €s.

A = sum of value of energy savings over n years, in present value €s

In this method we work out the *present value* of energy saved in future years.

F is a factor that converts a future year's monetary saving to present value.

$$F = (1 + E/100) / (1 + D/100)$$

In any particular year after the initial year, i.e. year n +1, we multiply the monetary saving by F^n to convert it to present value.

The sum of all the annual savings over n years is:

$$\begin{aligned} A &= S + S.F + S.F^2 + S.F^3 + \dots + S.F^{n-1} \\ &= S. (1 + F + F^2 + F^3 + \dots + F^{n-1}) \dots\dots\dots(1) \end{aligned}$$

Multiplying both sides by F:

$$\text{Hence: } A.F = S. (F + F^2 + F^3 + F^4 + \dots + F^n) \dots\dots\dots(2)$$

Subtracting equation (1) from equation (2):

$$\begin{aligned} \Leftrightarrow A F - A &= S. (F^n - 1) \\ \Leftrightarrow A. (F - 1) &= S. (F^n - 1) \end{aligned}$$

$$\Leftrightarrow A = S \cdot (F^n - 1) / (F - 1) \dots\dots\dots(3)$$

In the year the project achieves payback, the sum of all the energy savings in present value terms (i.e. A), is equal to the cost of the thermal refit. Hence we can substitute this cost for A in equation (3) and solve this equation for n, where n is the number of years to payback.

$$\text{From (3): } (A/S) \times (F - 1) = (F^n - 1)$$

$$\rightarrow (A/S) \times (F - 1) + 1 = F^n$$

$$\rightarrow n = \log [(A/S) \times (F-1)+ 1] / \log F \dots\dots\dots(4)$$

Example: (an actual example from empirical research)

A 3-storey house in a Bavarian village already has 3cm of polystyrene external wall insulation and a render in good condition. The windows were replaced in the late 1980s and the boiler was replaced with a modern, efficient model in 2004. An energy advisor has told the owners that if they re-insulate the external walls to a thickness of 12 cm this will cost €40,000 and they will reduce their heating energy consumption by 30%. This amounts to only 34 kWh/m²a, as the 2 occupants seldom heat the upper storeys above a recommended minimum. The current annual heating fuel bill is 1700 euros and the energy price 0.06 euros per kWh. The floor area is 250 m². Hence the expected monetary saving per year, in present value terms, is:

$$S = 34 \text{ kWh/m}^2\text{a} \times 250 \text{ m}^2 \times \text{€}0.06 = \text{€}510 \text{ (or simply take 30\% of €1700)}$$

Using an expected annual fuel price rise of 7% and a discount rate of 5% we get;

$$F = (1 + 7/100) / (1 + 5/100)$$

$$= 1.019$$

To find the number of years to payback, we use

$$\begin{aligned}
 n &= \log [(A/S) \times (F-1) + 1] / \log F \\
 &= \log [(40,000/510) \times (1.019-1) + 1] / \log 1.019 \\
 &= 48 \text{ years}
 \end{aligned}$$

However, the expected lifetime of the refit is much less than this. Hence this investment could not be described as economically viable.

This example assumes that the render is not due for replacement, as this was the actual situation in the case studied. If the render did have to be replaced ‘anyway’ this would reduce the ‘additional thermal’ costs to €21,000. In this case, the calculation is:

$$\begin{aligned}
 n &= \log [(21000/510) \times (1.019-1) + 1] / \log 1.019 \\
 &= 31 \text{ years}
 \end{aligned}$$

Again, it is clear that the investment will not pay back during the lifetime of the renovations. This is largely because the house is already relatively energy efficient due to its solar and modern heating system, its loft insulation and its relatively modern windows.

Thermal refits that can never pay back

Consider the equation for the payback time of a thermal refit:

$$n = \log [(A/S) \times (F-1) + 1] / \log F \dots\dots\dots (4)$$

If $(A/S) \times (F-1) + 1 \leq 0$, then the equation has no solution, since there cannot be a logarithm of a negative number or of zero.

This is the case where $F \leq 1 - S/A$

This represents a case where the annual fuel price rise, E , is smaller than the discount rate, D , so that each year's savings is smaller than that of the previous year, *and* the annual saving in present value terms, S , is quite small in relation to the cost of the refit, A .

This can also be seen in equation (1), namely:

$$A = S. (1 + F + F^2 + F^3 + \dots + F^{n-1}) \dots\dots\dots(1)$$

If $F < 1$, this will be a diminishing series. Payback will be reached when

$$S/A (1 + F + F^2 + F^3 + \dots + F^{n-1}) = 1$$

However if its sum to infinity is less than 1, payback can never be achieved. This is why equation (4) has no solution for this case.

Appendix 2. Costing of Thermal Renovation in a Detached House in Würzburg

This house of 104 m² of living space was thermally renovated in stages from 1998 to 2004. Fuel consumption for space heating was 250 kWh/m²a before renovation, and 60 kWh/m²a after, for this family. The house, built in 1953, had a roof overhang of approximately 30 cm, and no remodelling was necessary to take the insulation and new heating system. Typically, however the roof tiles had to be lifted and battens fitted to the rafters, to take the roof insulation. Insulation thickness was 10 cm.

Item	Date	Cost in D-Mark	Cost in Euros	Equiv. cost in 2004 Euros ¹¹⁶
External wall insulation	1998	14,000	7,300	8,500
Replacement double-glazed windows	1998	15,000	7,800	9,000
Replacement front door	1998	1,500	800	900
Roof insulation	1998	33,000	17,200	19,800
Replacement heating pipes and radiators	1998	6,000	3,100	3,600
Wood stove	1998	2,700	1,400	1,600
New boiler, solar collectors, oil tanks and heating water storage tank	2004		14,000	14,000
Total				57,400

$$\begin{aligned} \text{Reduction in fuel use per m}^2\text{a} &= 250 \text{ kWh/ m}^2\text{a} - 60 \text{ kWh/ m}^2\text{a} \\ &= 190 \text{ kWh/ m}^2\text{a} \end{aligned}$$

Assuming that the homeowner's personal discount rate is equal to the annual percentage rise in fuel price, we can do the simple calculation, assuming a **25-year lifetime** for the renovations:

$$\begin{aligned} \text{Cost of saved fuel per m}^2\text{a} &= \text{€}57,400 / 25 \text{ years} / 104 \text{ m}^2 \\ &= \text{22 €/m}^2\text{a} \end{aligned}$$

¹¹⁶ This assumes an annual inflation rate of 2.5% for the years 1998-2004.

Hence **cost of each kWh of saved fuel**

$$= 22 \text{ €/m}^2\text{a} / 190 \text{ kWh/ m}^2\text{a}$$

$$= \underline{\underline{0.116 \text{ €/kWh}}}, \text{ or approx } \underline{\underline{0.12 \text{ €/kWh}}}$$

This compares with a cost of heating fuel in 2004 of **0.05 €/kWh**

Hence the costs are about 2 ½ times as high as the benefits.

However, assuming an average **30-year lifetime** for the renovations:

$$\text{Cost of saved fuel per m}^2\text{a} = \text{€}57,400 / 30 \text{ years} / 104 \text{ m}^2$$

$$= \underline{\underline{18.4 \text{ €/m}^2\text{a}}}$$

$$\text{Hence } \underline{\underline{\text{cost of saved fuel}}} = 18.4 \text{ €/m}^2\text{a} / 190 \text{ kWh/ m}^2\text{a}$$

$$= \underline{\underline{0.097 \text{ €/kWh}}}, \text{ or approx } \underline{\underline{0.10 \text{ €/kWh}}}$$

Here the costs are twice as high as the benefits.

Alternatively, we can say the renovations would take 60 years to pay back, through fuel savings.

However the model used by policy experts, discussed in Chapter 5, counts only 10% of the cost of the windows, excludes the cost of the scaffolding and render for the wall insulation (€3,000), would not count the replacement tiles through insulating the roof (€3,000), and would exclude a major portion of the cost of the new boiler (say €5,000), radiators and piping (say €3,000). This would bring the additional thermal costs down by some €14,000, making the cost of saved fuel €0.09/kWh for a 25-year lifetime, or €0.075 for a 30-year lifetime, giving a payback time of 45 years.

Further, the policy experts' model excludes risk and lost opportunity costs in the homeowner's discount rate, so that costs of saved fuel appear lower. Using this method, a 25-year payback time would be achieved if the annual fuel price rise were about 7.5%.

Appendix 3 Cost of Thermal Renovation of Lutheran Vicarage in Bavaria

The Lutheran Church in Bavaria is currently doing comprehensive thermal renovation on all its vicarages, as part of its environmental responsibility project (Kirchliches Ambstblatt 11/2009: 280-281)

Table A1. Itemised cost of thermal upgrade of Lutheran vicarage in Bavaria, 2008			
Floor area 120 square metres			
Estimated lifetime of renovation measures: 25 years			
Item	Cost (€)	Relevant cost (€)	Additional Thermal component (€)
Heating system planning	4800	4800	4800
Energy report	1400	1400	1400
Wall and render work	5000	5000	0
Dry walling	4500	4500	0
Roof cladding work	11000	11000	0
Flashing	4500	4500	0
Scaffolding	5500	5500	0
Heating Boiler	15000	15000	15000
Boiler-related costs	50	50	50
Solar water heater and wood oven	25000	25000	25000
Plumbing	5600	5600	5600
Electrical work (interior)	3000	3000	0
Electrical work (façade)	1700	1700	0
Windows and external doors	16600	16600	1600
Glass, lightshades	1000	0	0
Shutters and awnings	4600	4600	2000
External wall insulation	18000	18000	18000
Insulation in ceiling	3000	3000	3000
Roof tile work	3000	3000	0
Painting	8000	8000	0
Wall cleaning	700	700	0
Related building costs	4000	4000	2000
Totals (€)	145950	144950	78450

Table A.1 shows the actual costs of specific components of the thermal refit of a vicarage of 120m² of liveable floor area. The second column shows the costs that would have to be paid by the property owner to do the thermal renovation, even though some of these items do not contribute directly to the thermal improvements. The last column includes only the costs which would be regarded as additional

thermal costs in the *Wirtschaftlichkeit* (economic viability) calculations as performed by German policymakers.

The payback time for this project may be calculated as follows:

Fuel consumption before upgrade: 250 kWh/m²a

Fuel consumption after upgrade: 70 kWh/m²a

Hence fuel saving: 250 – 70 = 180 kWh/m²a

Hence **annual fuel cost saving** = 180 kWh/m²a x 120 m² x 0.07 €/kWh = **€1512**

Using the model developed in Chapter 5 and Appendix 1, the payback time for this upgrade is calculated as follows.

Annual fuel price rise of 7% → E = 7

Annual discount rate of 8%: → D = 8

→ F = (1 + E/100) / (1 + D/100) = 0.999

Case 1: Counting all the relevant costs:

Total cost: A = €144,950

Annual saving: S = €1,512

Hence payback time: $n = \log [(A/S) \times (F-1) + 1] / \log F$

= **101 years**

This shortens to 88 years if the discount rate is 5%.

Case 2: Counting only the ‘additional thermal costs’ as defined by policymakers:

Total cost: $A = €78,450$

For annual fuel price rise of 7% and discount rate of 8%

Payback time: **n = 53 years**

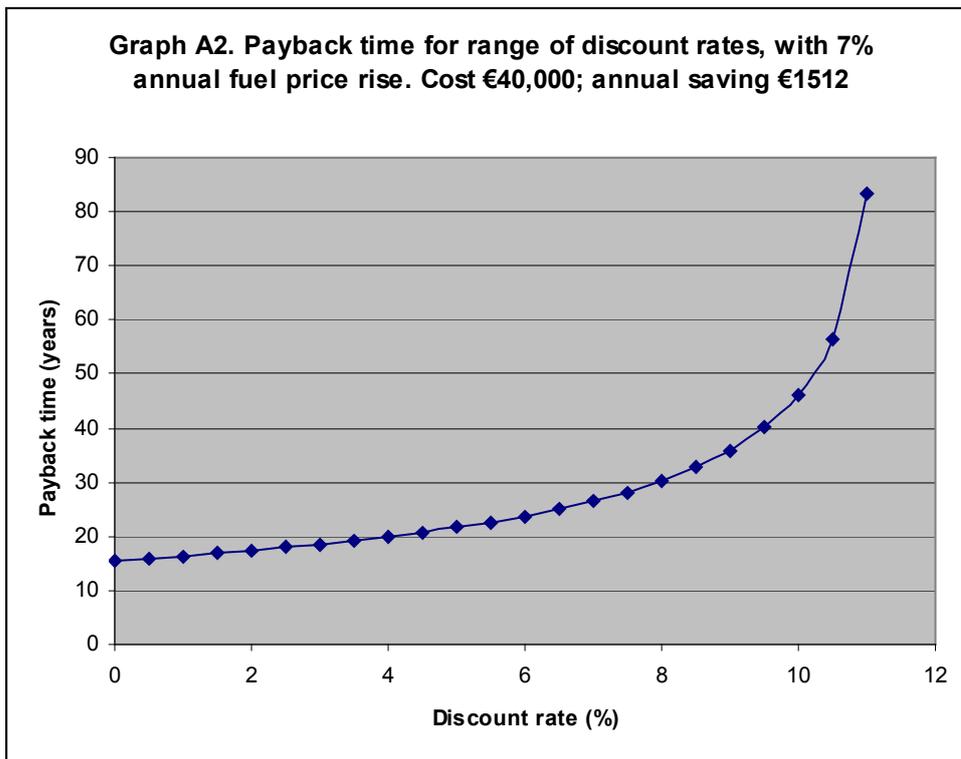
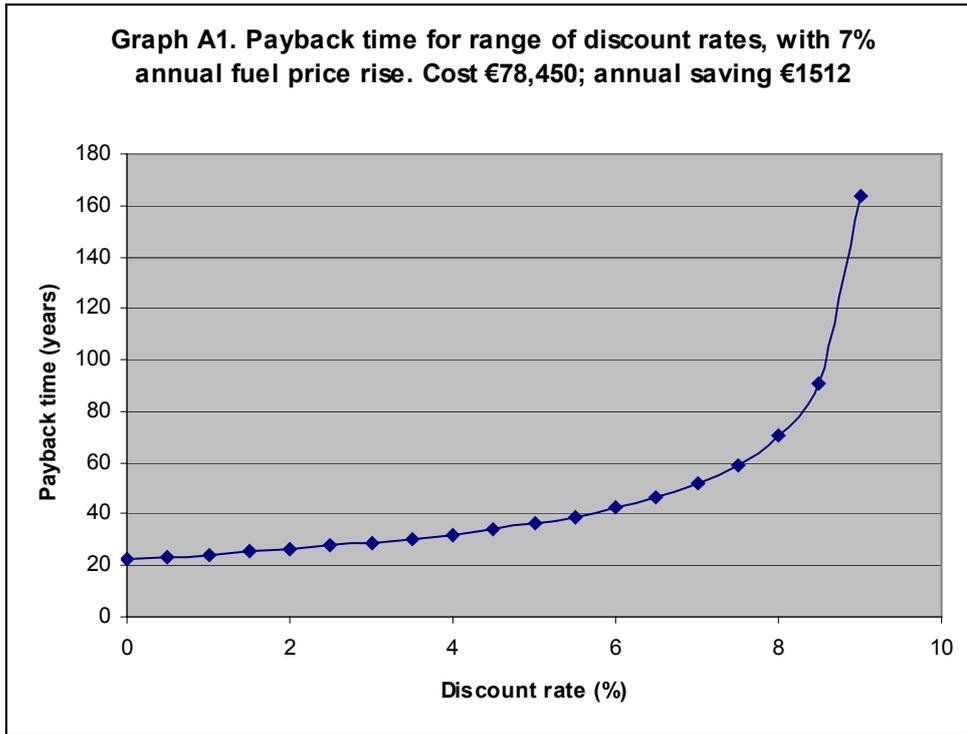
This shortens to 36 years if the discount rate is 5%.

Hence this refit is not economically viable, i.e. it will not pay back within 25 years, even using the discount rate and anyway/additional thermal cost division demanded by policymakers.

Further modelling:

Graphs A1 and A2 show how the payback time varies with the discount rate. Graph A1 uses the ‘additional thermal’ costs of €78,450 for the vicarage refit. It shows that if the discount rate goes above 9%, the project never pays back.

Graph A2 uses a much more modest additional thermal cost of only €40,000, again with an annual fuel saving of €1,512. This shows that if the discount rate goes above 11% the project never pays back.



Appendix 4. Permissible levels of space heating energy end-use and heat transmission loss for new builds in EnEV 2002 and 2007 (English translation of ‘Tabelle 1’ by the author)

Table 1. Permissible levels of space heating energy end-use and heat transmission loss for new builds. (Author’s translation of EnEV 2007: 2.3.1.1)			
Relationship A/V_e	Annual energy end-use		Specific heat transmission loss in relation to the heat envelope
	Q_p'' in kWh/(m ² ·a) according to building use area		H'_T in W/(m ² ·K)
	Residential buildings (apart from those in Division 3)	Residential buildings with predominantly electrical water heating	All residential buildings
1	2	3	4
≤ 0.2	66.00 + ΔQ _{TW}	83.80	1.05
0.3	73.53 + ΔQ _{TW}	91.33	0.80
0.4	81.06 + ΔQ _{TW}	98.86	0.68
0.5	88.58 + ΔQ _{TW}	106.39	0.60
0.6	96.11 + ΔQ _{TW}	113.91	0.55
0.7	103.64 + ΔQ _{TW}	121.44	0.51
0.8	111.17 + ΔQ _{TW}	128.97	0.49
0.9	118.70 + ΔQ _{TW}	136.50	0.47
1	126.23 + ΔQ _{TW}	144.03	0.45
≥ 1.05	130.00 + ΔQ _{TW}	147.79	0,44

$$\Delta Q_{TW} = \frac{2600 \text{ kWh/a}}{100 \text{ m}^2 + A_N} \quad \text{in kWh/(m}^2 \cdot \text{a)}$$

V_e is the total heated volume of the building. If, for example, the basement and the loft are not heated, they are not counted in V_e .

A is the total surface area that encloses V_e . This includes the outside walls, the floor of the bottom (heated) storey and the ceiling of the top (heated) storey.

$A_N = 0.32 V_e$. (The figure 0.32 is the reciprocal of the height, in metres, of one storey in a high-ceilinged building. Hence A_N is the floor area of a building of heated volume V_e with a floor-to-ceiling height of $1/0.32$, i.e. about 3.125 metres, or 10ft 2".)

Appendix 5. Insulation thickness for buildings' thermal standards approaching zero energy consumption

Figures 1 and 2 show the output of a simple mathematical model of the insulation thickness required to reduce space heating energy consumption down towards zero in a medium sized, multi-apartment house in German climatic conditions. It assumes that 8 cm of insulation are required to reduce energy consumption to 150 kWh/m²a, and that a 30% increase in insulation thickness is required for every 30% reduction in annual energy use (cf. Enseling and Hinz, 2006). The graphs show that over 45cm is required for the passive house standard of 15 kWh/m²a, increasing to 1 metre for 5 kWh/m²a and over 15metres as energy loss approaches zero.

These are modelled as follows:

Initial thickness $T_0 = 8$ cm

For successive 30% increases in thickness, $T_1 = T_0 \times 1.3$; $T_2 = T_1 \times 1.3 \dots$

Hence $T_n = T_0 \times (1.3)^n$

Initial energy consumption $E_0 = 150$ kWh/m²a

For successive 30% reductions in fuel consumption, $E_1 = E_0 \times 0.7$; $E_2 = E_1 \times 0.7 \dots$

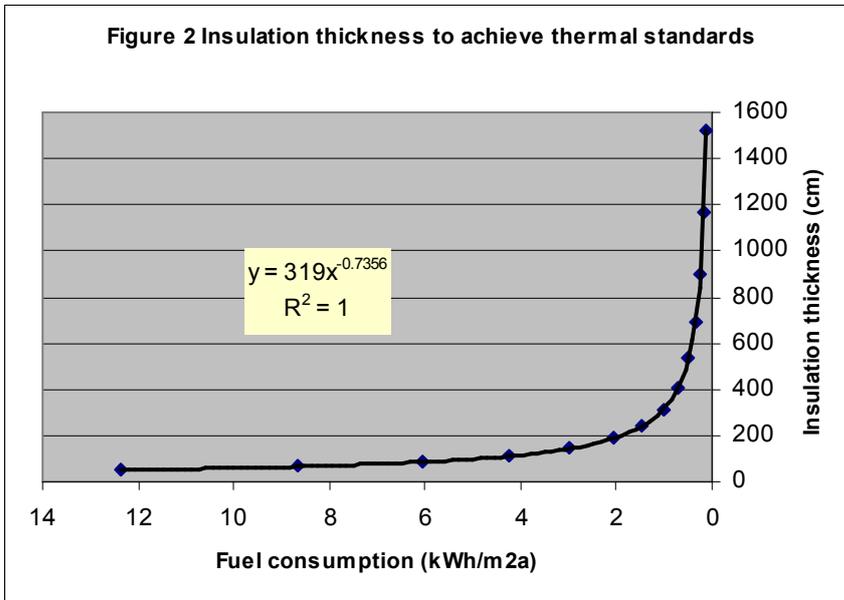
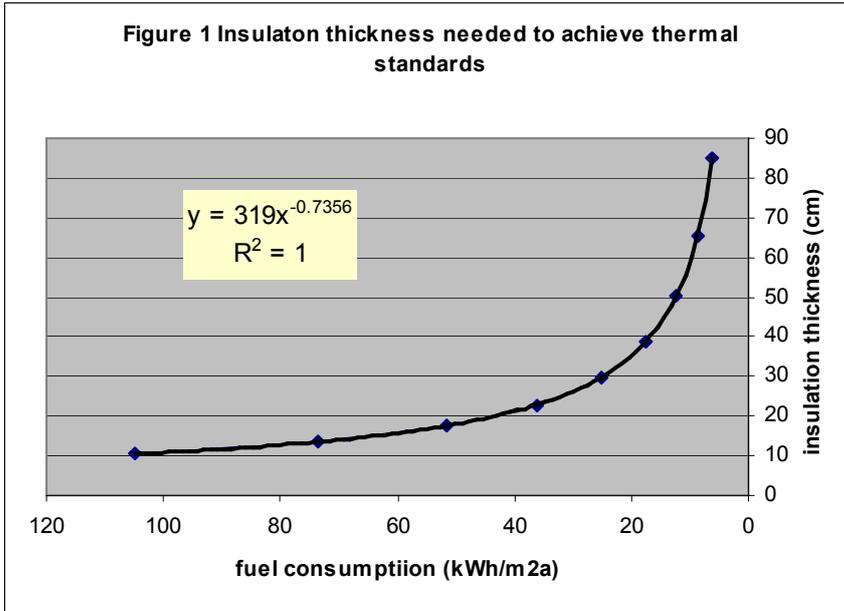
Hence $E_n = E_0 \times (0.7)^n$

Hence $T_n/E_n = (T_0/E_0) \times ((1.3^n) / (0.7^n))$

$$= 8/150 \times (1.3/0.7)^n$$

$$= 0.053333 \times 1.857143^n$$

Iterating this and reversing the x-axis gives the graphs in figures 1 and 2



Appendix 6. Interview Questions and Discussion Areas

This outline was sent to policy actor interviewees prior to our meeting, and used as a basis for the interviews (English translation given below)

Interviewfragen und Diskussionsbereiche

(A) Energetische Sanierung und regierungspolitische Programme

1. Was ist Ihrer Meinung nach der Hauptgrund dafür, dass Bundesregierungen innerhalb der letzten 10 Jahre versucht haben, HauseigentümerInnen dazu zu bewegen, den energetischen Standard Ihrer Häuser zu verbessern? Falls es mehrere Gründe gibt, welchen halten Sie für den wichtigsten?
2. Warum wurden Ihrer Meinung nach die EnEV Standards für die energetische Sanierung in 2002-4 um 30% verschärft, ebenso in 2009, und erneut in 2012?
3. KfW Fördermittel sind nur erhältlich für Sanierungsmassnahmen, die den EnEV Gebäudesanierungsstandard um 30% unterschreiten. Stimmen Sie dieser Praxis zu oder sollten Ihrer Meinung nach Anreize geschaffen werden für alle die:
 - a) im Rahmen des Gesetzes renovieren (also gemäß der EnEV Standards)
 - b) auf eine solche Weise renovieren, dass die benötigte Wärmeenergie um einen signifikanten Betrag reduziert wird.
4. Gemäß EnEV 2009 beträgt der maximal erlaubte Wärmeenergieverbrauch für ein saniertes Haus weniger als 100 kWh/m²a (kilowatt-Stunden pro Quadratmeter Bodenfläche pro Jahr). Im September 2009 hat der energiepolitische Sprecher der CDU/CSU die „Energiespar-Prämie 130“ in die Diskussion gebracht. Der Vorschlag beinhaltet, dass alle Sanierungsmassnahmen von 30 Jahre alten oder älteren Wohngebäuden finanziell gefördert werden sollen, wenn sie zu einem Standard von 130 kWh/m²a renovieren.
Im Vergleich mit EnEV 2009:
 - (a) Ist die Energiesparprämie 130 gut für Deutschlands Treibhausgasreduktion?
 - (b) Ist sie gut für Vermieter?

- (c) Ist sie gut für Mieter?
- (d) Ist sie gut für private Hauseigentümer?
- (e) Ist sie gut für die Bau-Sanierungs-Gebäudedämmungsindustrie
- (f) Ist sie gut für Deutschlands Image als international führend in energetischer Sanierung?

5. Welche Personen, Organisationen oder Gruppen haben Ihrer Meinung nach den größten Einfluss auf die Entwicklung der energetischen Sanierungsprogramme in Deutschland?

6. Gibt es irgendwelche Unterschiede zwischen den großen politischen Parteien bezüglich ihrer politischen Linie zur energetischen Sanierung von Altbauten? [ask before Q. 4]

7. Was halten Sie vom folgenden Kommentar, den ich von etlichen HauseigentümerInnen gehört habe: "Es ist viel zu teuer, mein Haus gemäß EnEV 2009 Standard zu renovieren, und ich werde das Geld niemals durch Heizölsparnisse rausholen."?

(B) Diskussionsbereiche und Unsicherheitsfaktoren bei der Berechnung von Kosten & Nutzen eines Gebäudesanierungsprojekts

1. Der zukünftige Preis für Heizbrennstoff

Im Moment beträgt der Heizölpreis ungefähr €0.55 pro liter (dies entspricht ungefähr €0.055/ kWh.). Um wieviel wird er in den künftigen Jahren Ihrer Meinung nach ansteigen? (z.B. ENTWEDER: Prozentualer Anstieg pro Jahr, ODER: Wie lange bis sich der Preis verdoppelt?)

2. Energetische Sanierungskosten und Sowieso-Kosten

Was würden Sie als energetische Sanierungskosten anrechnen, und was als Sowieso-Kosten?

3. Rückzahlzeitraum und Diskontsatz/Abzinsungssatz

ENTWEDER: Nach wie vielen Jahren sollte Ihrer Meinung nach einE HauseigentümerIn das Geld, das in die energetische Gebäudesanierung geflossen ist, aus Einsparungen in Heizbrennstoff wieder hereinbekommen?

ODER: Was wäre ein vernünftiger Diskontsatz/Abzinsungssatz für eineN WohneigentümerIn, wenn künftige Einsparungen durch energetische Verbesserungen des Gebäudes betrachtet werden?

4. Der Wiederverkaufswert eines Gebäudes

Auf welche Weise beeinflusst energetische Sanierung den Wiederverkaufswert eines Hauses auf dem Immobilienmarkt?

5. Berechnung der Energieeinsparung

Wie sollten Energieeinsparungen aus energetischer Wohnraumsanierung gemessen werden? Sollten wir unterstellen, dass vor der Sanierung jedes Gebäude ganzjährig auf 19°C beheizt wurde? Oder sollten wir die tatsächlichen Heizgewohnheiten der BewohnerInnen in Betracht ziehen?

(C) TECHNISCHE ASPEKTE

1. Welcher Wärmestandard sollte angestrebt werden:

Angenommen, ich besitze ein Dreifamilienhaus, 300 m², Baujahr 1960, das momentan 250 kWh/m²a für Heizung verbraucht. Der Boiler wurde vor 5 Jahren erneuert und ist modern und effizient. Ich habe €250,000 in der Bank.

Ein Energieberater schlägt vor, ich solle zu einem Standard von 60 kWh/m²a renovieren, und dies würde €0.15 pro kWh eingesparter Energie kosten, gerechnet auf die (25 Jahre) Zeitdauer der Sanierungsmassnahmen. Die Gesamtkosten wären €213.000.

Mein Nachbar, ein Ingenieur, rät mir jedoch, lieber zu einem Standard von 130 kWh/m²a zu renovieren. Dies würde €0.08 pro kWh eingesparter Energie kosten gerechnet auf die (25 Jahre) Zeitdauer der Sanierungsmassnahmen, und die

Gesamtkosten wären €72.000. Er schlägt mir vor, das restliche Geld für einen Windpark anzulegen.

(a) Welche dieser zwei Optionen wird einen grösseren Beitrag leisten zu Deutschlands Ziel, Treibhausgase zu reduzieren and die Brennstoffsicherheit zu verbessern?

(b) Welche Option wird mir langfristig mehr Geld einsparen?

(c) Welche Unsicherheitsfaktoren gibt es bezüglich (a) und (b)?

2. Kosten der energetischen Sanierung

Was muss passieren, damit die Kosten für die energetische Sanierung von Deutschlands Gebäudebestand weiter nach unten gehen?

3. Neubauten und energetische Sanierung

In der EnEV sind die Standards für die energetische Sanierung von Altbauten immer 40% weniger streng als die Standards für Neubauten, aber beide Standards werden schrittweise alle paar Jahre um 30% angezogen. Was sind die *technischen* Begründungen, die Altbausanierungsstandards an die Standards für Neubauten zu koppeln?

English translation of Interview Questions and Discussion Topics

A. Thermal renovation and government policy

1. In your opinion what is the main reason the Federal Government, over the last 10 years, has tried to persuade homeowners to improve their homes' thermal standards? If you feel there are multiple reasons, which do you think are the most important?

2. Why do you think the thermal standards were tightened by 30% in 2002/4 and again in 2009 and are planned to be tightened yet again in 2012?

3. KfW (German Development Bank) subsidies are offered for renovation measures that surpass the EnEV building renovation standard by 30% [now 10%, as the standards have been tightened further] Do you agree with this practice, or do you think there should be incentives for all who
- (a) renovate in such a way as merely to meet the legal standards
 - (b) renovate in such a way that the energy used for heating is reduced by a significant amount?
4. In accordance with EnEV 2009 the maximum permissible energy for heating in a newly renovated house is less than 100 kWh/m²a. In September 2009 the Energy Spokesperson of the CDU/CSU introduced the notion of 'ESP130'. This proposed that all renovation measures on a residential building 30 years old or older would get subsidies if they achieved a standard of 130 kWh/m²a or better.
- Compared to EnEV 2009:
- (a) Is ESP130 good for Germany's GHG reduction?
 - (b) Is it good for landlords?
 - (c) Is it good for tenants?
 - (d) Is it good for private homeowners?
 - (e) Is it good for the renovation and building insulation industry?
 - (f) Is it good for Germany's image as an international leader in thermal renovation?
5. In your opinion which persons, organisations or groups have the biggest influence on the development of the thermal renovation programme in Germany?
6. Are there differences in the policies of the major political parties in respect of their approach to thermal renovation of existing buildings?
7. What do you think of the following comment, which I've heard from various homeowners: 'It's far too expensive to renovate my house to EnEV 2009 standard, and I'd never get the money back through savings in fuel oil.'?

B. Discussion topics and uncertainty factors in the costs of a thermal renovation project

1. The future price of heating fuel

At the moment the price of heating oil is around €0.55 per litre, which corresponds to about €0.055/kWh. How much do you think this cost is likely to rise in the coming years? (either annual percentage or how long till it doubles)

2. Thermal improvement costs and ‘anyway’ costs

What would you count as thermal improvement costs, and what as ‘anyway’ costs?

3. Payback time and discount rate

Either: In your opinion, after how many years should a homeowner expect to get the money back, through fuel cost savings, that they spend on a thermal upgrade?

Or: In your opinion, what would be a sensible personal discount rate for a homeowner, in terms of investment in a thermal upgrade?

4. The resale value of a house

In what ways does a thermal upgrade influence the resale value of a home on the real estate market?

5. Calculation of energy savings

How should we measure the energy savings of a residential thermal renovation job?

Should we take it that the house was heated to 19°C before the upgrade? Or should we consider only the actual heating habits of the particular occupants?

C. Technical aspects

1. Which thermal standard to aim for:

Suppose I own a three-apartment house, 300m², built in 1960, that currently consumes 250 kWh/m²a for heating. The boiler was replaced 5 years ago and is modern and efficient. I have €250,000 in the bank.

An energy advisor suggests I should renovate to the standard of 60 kWh/m²a and that this would cost €0.15 per kWh of saved energy, worked out over the (25 year) life of the renovation measures. The total cost of the job would be €213,000.

However my neighbour, an engineer, suggests I renovate instead to the standard of 130 kWh/m²a. This would cost me €0.08 per kWh of saved energy over the (25 year) life of the renovation measures. The total cost of the job would be €72,000. He suggests I invest the rest of my money in a wind farm.

(a) Which of these two options would make the biggest contribution to Germany's aim to reduce GHGs and improve security of energy supply?

(b) Which option would save me more money in the long run?

(c) What are the uncertainties inherent in (a) and (b)?

2. Cost of thermal renovation

What would have to happen for the costs of thermal renovation of Germany's building stock to fall?

3. New builds and thermal renovation

In the EnEV the standards for thermal renovation of existing buildings are always 40% less strict than those for new build, and both standards are tightened by 30% every few years. What are the *technical* justifications for coupling the standards for thermal renovation of existing homes to those of new builds?

Appendix 7. Picture Gallery



Picture 1: The caption reads: "I prefer to live up at the top of the façade because view's better from here." Source: Poroton, 2009: 3.



Picture 2. Woodpecker damage on the façade of a school in Neunkirchen, N.Ö. Source: Zottl



Picture 3: Illegally renovated house in Thüringen, below EnEV standards but far superior to most other houses in the street. 8cm of external wall insulation.



Picture 4: 8cm of external wall insulation being (illegally) applied to a house extension. The legal minimum requirement is 16cm.



Picture 5: Würzburg house before thermal renovation. Note the large roof overhang.



Picture 6: Würzburg house after thermal renovation.



Picture 7: Apartment block with narrow balconies, which often become unusable when thick external wall insulation is applied.



Picture 8: Decoupled balconies, added to a communist-era apartment block in Berlin. This method reduces heat loss.



Picture 9: A de-coupled balcony attachment on the communist-era apartments in Picture 8.



Picture 10. Example of the 'wall and roof dilemma' (Freiburg). To attach 16cm of insulation requires the roof to be rebuilt.



Picture 11: A house in Brandenburg before thermal renovation. The upstairs bedrooms are in the loft.



Picture 12: The same house after an illegal thermal renovation job, with 6 cm of roof insulation and 4cm of wall insulation.

GLOSSARY OF ABBREVIATIONS AND FOREIGN TERMS

ANT actor-network theory

Ausnahme exception

BASF Badische Anilin- und Soda-Fabrik (Baden Aniline and Soda Factory)

Bauzentrum building centre

Begründung der EnEV Basis of the Energieeinsparverordnung (Energy saving regulations)

BBR - Bundesamt für Bauwesen und Raumordnung – Federal Office for the Built Environment and Planning

BMU - Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit – Federal Ministry for the Environment, Nature Conservation and Reactor Security

BMVBS - Bundesministerium für Verkehr, Bau und Stadtentwicklung - Federal Ministry for Transport, Building and Urban Development

BR Bundesregierung – Federal Government

Bundesminister – Federal Minister

Bundesrat – Federal Upper House of Parliament

Bundestag – Federal Parliament (lower house)

Bundesregierung Federal Government

Bundesverband Farbe Gestaltung Bautenschutz German Federal Association for Colour Design and Preservation of Structures

Bündnis 90/Die Grünen The (Federal German) Green Party

CDA critical discourse analysis

CDU - Christlich Demokratische Union - Christian Democratic Union (main centre-right party in all states except Bavaria)

CSU - Christlich Soziale Union – Christian Social Union (main centre-right party in Bavaria)

CO₂ carbon dioxide

CO₂e carbon dioxide equivalent, arrived at by translating the atmospheric heating effects of all GHGs into their equivalent impact in terms of an amount of CO₂, usually expressed in ‘parts per million’ (ppm) or ‘parts per million by volume’ (ppmv).

DENA - Deutsche Energieagentur – German Energy Agency

Die Linke The Left Party

EEA European Environment Agency

EEG Erneuerbare Energiengesetz – Renewable Energy Law

EEWärmeG - Erneubare-Energien-Wärmegesetz - Renewable energy heating law

energetische Mehrkosten additional thermal costs

EnEV - Energieeinsparverordnung - Energy saving regulations

EURIMA European Insulation Manufacturers Association

EM ecological modernisation

EPBD Energy Performance of Buildings Directive (of the EU)

ESP130 - Energie Spar Prämium 130 – Energy Saving premium 130

FDP - Freie Demokratische Partei –Liberal Democrat Party

Fraunhofer Institut für Bauphysik Fraunhofer Institute for Building Physics

Gebäude building

GdW - Gemeinschaft Deutscher Wohnunternehmen – German Association of Housing Providers

GHG greenhouse gas

Gutachten officially commissioned report, e.g. to government or to a sponsoring firm, always translated ‘**expert report**’ in this thesis.

H_T heat transmission loss, measured in W/m²K (note that the *lower* the value, the better the insulation quality)

IEA International Energy Agency

Ifeu - Institut für Energie- und Umweltforschung – Institute for the Study of Energy and the Environment

IfAÖ - Institut für Angewandte Ökologie Institute for Applied Ecology

IPCC Intergovernmental Panel on Climate Change

IV recorded interview

IVN non-recorded interview

IWU - Institut Wohnen und Umwelt – Institute for Housing and Environment

KfW Kreditanstalt für Wiederaufbau – German Development Bank

kg kilogram(s)

Koalitionsvertrag coalition agreement

kWh Kilowatt-hour(s)

kWh/m²a kilowatt-hours per square metre (of floor area) per year

LUWOGGE - Ludwigshafen Wohngossenschaft – Ludwigshafen Housing Co-operative.

Neopor an insulating material developed by BASF in the 1990s, more thermally efficient than Styropor

NGO Non-governmental organisation

OECD Organisation for Economic Cooperation and Development

Passivhaus Institut Passive House Institute (commonly translated as this, although the German 'Haus' is closer in meaning to 'building' than 'house')

ppm Parts per million

ppmv Parts per million by volume

PV photovoltaic(s)

Q_T Energy consumption, measured in kWh/m²a

Referenzgebäude reference building

RG Ray Galvin

Solarsiedlungen solar housing estates

SPD - Sozialdemokratische Partei Deutschlands – Social Democratic Party of Germany

SQL Structured Query Language

Statistisches Bundesamt Deutschland – Federal German Statistics Office

Styropor an insulating material developed by BASF in the 1950s, similar to polystyrene but harder

Tabelle table

UBA - Umweltbundesamt – Federal Environment Office

UEA University of East Anglia

UNFCCC United Nations Framework Convention on Climate Change

U-values Units of measurement of thermal losses through a given medium, such as a wall or window, express in W/m^2K (note that the *lower* the value, the better the insulation quality). In a particular house, the average of all the U-values of every square centimetre of the building's outer surface (the building envelope) is the **H_T** value (see above).

Verband Privater Bauherren [National] Association of Private Builders

Verband Sächsische Wohnungsgenossenschaften Saxony Association of Housing Co-operatives

W/m²K Watts per square metre (of wall area) per degree Kelvin difference (between indoor and outdoor temperature)

WSVO - Wärmeschutzverordnung (WSVO) - Thermal insulation regulations

Wirtschaftlich economically, in the sense of an investment paying back over time, always translated '**economically viable**' in this thesis.

Wirtschaftlichkeit (noun from *wirtschaftlich*) 'economical-ness', or the characteristic of paying back over time, always translated '**economic viability**' in this thesis.

WMA Windows Media Audio File (format)

WMP Windows Media Player

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