



Durham E-Theses

Re-working boundaries: values and legitimation at the climate science–policy interface

MACHEN, KATHERINE,RUTH,MARGRAVE

How to cite:

MACHEN, KATHERINE,RUTH,MARGRAVE (2016) *Re-working boundaries: values and legitimation at the climate science–policy interface*, Durham theses, Durham University. Available at Durham E-Theses Online: <http://etheses.dur.ac.uk/11514/>

Use policy

The full-text may be used and/or reproduced, and given to third parties in any format or medium, without prior permission or charge, for personal research or study, educational, or not-for-profit purposes provided that:

- a full bibliographic reference is made to the original source
- a [link](#) is made to the metadata record in Durham E-Theses
- the full-text is not changed in any way

The full-text must not be sold in any format or medium without the formal permission of the copyright holders.

Please consult the [full Durham E-Theses policy](#) for further details.

Academic Support Office, Durham University, University Office, Old Elvet, Durham DH1 3HP
e-mail: e-theses.admin@dur.ac.uk Tel: +44 0191 334 6107
<http://etheses.dur.ac.uk>

Re-working boundaries: values and legitimation at the climate science–policy interface

Katherine Ruth Margrave Machen

Abstract

Acknowledging the science–policy interface as an important site through which climate change is framed; this thesis provides an examination of the politics of boundary work. Through an analysis of the Scottish climate science–policy interface, the thesis draws attention to the *discursive value framings* involved in the making of climate responses – understood as discourses in which value commitments and orientations towards particular outcomes have been foregrounded. Empirical research focuses specifically on boundary work undertaken by ClimateXChange, a boundary organisation established by the Scottish Government in 2011. Comparing the work of ClimateXChange with boundary work by other science–policy actors, the thesis examines how different forms of boundary work enable different types of knowledge to circulate. Practices such as translation, science communication, co-production and knowledge brokerage construct legitimate knowledge differently, contributing to the legitimation and reproduction of particular discursive value framings over others. Offering an in-depth analysis of these boundary processes, the thesis opens up critical questions about the concept of ‘translation’, draws attention to how boundary practices construct claims for legitimacy, and to the multiple, cumulative and interacting micro-sites of boundary work through which passionate actors are legitimating different forms of political subjectivity.

Combining an STS approach to science – policy boundary work with Chantal Mouffe’s political theory to foreground questions of values, legitimacy and hegemonic power, the thesis draws attention to the value commitments of discourse. In doing so the thesis suggests potential for re-theorising values from a post-structuralist perspective, in order to contest hegemonic claims to value neutrality and account for passionate affective relations with discourse. This attention to the politics of boundary work illustrates the way in which scientific knowledge circulating at the science–policy interface in Scotland frames possible responses to climate change through discourses of economic growth and quantifying and pricing carbon. Such moves reproduce hegemonic policy values and prompt critical engagement with moves towards demand-led science–policy interaction.

Re-working boundaries: values and
legitimation at the climate science-policy
interface

Katherine Ruth Margrave Machen

Thesis submitted for the degree of Doctor of Philosophy
Department of Geography,

Durham University

2015

Summary Contents

Chapter 1	
Introducing the Value Politics of Boundary Work	11
Chapter 2	
Theorising Science–Policy Interaction: Debates over Values and Legitimacy	27
Chapter 3	
Researching Boundaries, Values and Legitimacy Methodologically.....	71
Chapter 4	
Mapping the Climate Science–Policy Landscape in Scotland	103
Chapter 5	
Struggles for Meaning at the Science–Policy Interface: CXC as a Translation Organisation	141
Chapter 6	
Translation as a Process of Legitimation	181
Chapter 7	
Reclaiming Political Subjectivities: Resistances and Re-articulations	221
Chapter 8	
Drawing the Thesis to a Close: In Search of the Elephant and Elpis	261

The copyright of this thesis rests with the author. No quotation from it should be published without the author’s prior written consent and information derived from it should be acknowledged.

Table of Contents

Chapter 1.	11
Introducing the Value Politics of Boundary Work	
1.1 Empirical focus and research questions	14
1.2 Unsettling climate change as a scientific problem	14
1.3 Revisiting values	18
1.4 A geographical approach to the value politics of boundary work	21
1.5 Contributions	24
1.6 Structure of the thesis	24
Chapter 2.	27
Theorising science–policy Interaction: Debates over Values and Legitimacy	
2.1 Values in environmental governance literatures: from explanatory tools to values in paradox	29
2.2 Boundary work: fact-value hybrids and the work of purification and translation	34
2.3 Bringing STS and Argumentative accounts together and the return of values	38
2.4 Science policy studies and legitimacy	40
2.4.1 <i>Legitimacy in crisis</i>	
2.5 Summarizing the critique: science, boundary work and depoliticisation of values	47
2.5.1 <i>De-politicisation and science–policy boundary work</i>	
2.6 A Mouffian approach to legitimacy and values	51
2.6.1 <i>An introduction to Mouffe</i>	
2.6.2 <i>Value politics</i>	
2.6.3 <i>Legitimacy and hegemonic power</i>	
2.6.4 <i>Passions</i>	
2.6.5 <i>Integrating Mouffe with science–policy thinking on climate change</i>	
2.6.6 <i>Critiques of Mouffe</i>	
2.7 Theoretical framework for the thesis	66
2.7.1 <i>Working theory of values</i>	
2.7.2 <i>Processes of legitimation</i>	
2.7.3 <i>Translation</i>	
Chapter 3.	71
Researching Boundaries, Values and Legitimacy Methodologically	
3.1 A place from which to start: Origins of the research	71
3.1.1 <i>Why Scotland?</i>	
3.2 Theoretical frameworks for methodology	74
3.2.1 <i>STS boundary work</i>	
3.2.2 <i>Feminist methodologies and sensitive research</i>	
3.2.3 <i>Post-structural discourse theory</i>	
3.2.4 <i>Joining practitioner and theoretical influences together</i>	
3.3 Designing and conducting research	77

3.3.1	<i>Choice of organisations and processes</i>	
3.3.2	<i>Choice of methods</i>	
3.3.3	<i>Exploring values and legitimacy construction – problems and strategies</i>	
3.3.4	<i>Positionality</i>	
3.3.5	<i>Disclosure and transparency</i>	
3.4	Analysis and producing the thesis	95
3.4.1	<i>Analysing discourse</i>	
3.5	Ethics and representation	98
Chapter 4.		103
Mapping the Climate Science–policy Landscape in Scotland		
4.1	History and development of climate change policy in Scotland	104
4.1.1	<i>Scottish climate change policy in the context of UK and international policy frameworks</i>	
4.1.2	<i>Climate change governance in Scotland</i>	
4.2	Scottish policy discursive value framings	108
4.2.1	<i>Scotland the brave? The politics of a sub-nation and trajectories towards independence</i>	
4.2.2	<i>Evidence based – outcomes orientated politics</i>	
4.2.3	<i>Sustainable economic growth</i>	
4.2.4	<i>A Socialist tradition</i>	
4.2.5	<i>Summarising discursive value frameworks and the scope for opening up political debate</i>	
4.3	Bringing science into climate policy making in Scotland	119
4.3.1	<i>A changing framework for climate science–policy interaction in Scotland</i>	
4.3.2	<i>ClimateXChange</i>	
4.3.3	Other organisations studied	
	<i>Sniffer</i>	
	<i>Met Office</i>	
	<i>Ad hoc science–policy exchange</i>	
4.4	Problematising models of science–policy interaction in Scotland	130
4.4.1	<i>Roles for science and associated science–policy models</i>	
4.4.2	<i>Problematising a single macro science–policy boundary</i>	
4.4.3	<i>Problematising value-free boundary work</i>	
4.5	A summary and looking forward	138
Chapter 5.		141
Struggles for Meaning at the Science Policy Interface: CXC as a Translation Organisation		
5.1	Translation as boundary work between similarity and difference	142
5.1.1	<i>Laclau and Mouffe on similarity and difference</i>	
5.1.2	<i>Reading translation through logics of equivalence and difference</i>	
5.2	Translation as a process in CXC	145
5.2.1	<i>Active use of the term ‘translation’</i>	
5.2.2	<i>Making knowledge meaningful to the audience</i>	
5.2.3	<i>Differences in epistemic understanding of the process of translation</i>	
5.2.4	<i>Designating similarity and difference</i>	
5.3	Preparing scientists for translation: CXC’s Policy Awareness Workshops	154
5.3.1	<i>Emphasising the fit with existing policy discourses</i>	
5.3.2	<i>Internalising and rehearsing framings</i>	
5.3.3	<i>‘Speaking their language’</i>	
5.3.4	<i>Affectual strategies</i>	
5.3.5	<i>Summarising the Policy Awareness Workshops – the</i>	

	<i>scope for encouraging/discouraging policy challenge?</i>	
5.4	Distinctiveness of Translation	163
	5.4.1 <i>Sniffer and knowledge brokering</i>	
	5.4.2 <i>Met Office and communicating science</i>	
	5.4.3 <i>Co-production through facilitated conversations: CXC's Woodlands Adaptation Workshop</i>	
	5.4.4 <i>What does translation do differently?</i>	
5.5	Understanding boundary work as translation	174
Chapter 6.		181
Translation as a Process of Legitimation		
6.1	Multiple forms of legitimacy	182
6.2	The call-down service	186
	6.2.1 <i>Call-down 1: Peatlands</i>	
	6.2.2 <i>Call-down 2: MAC Curves</i>	
	6.2.3 <i>Call-down 3: Extreme weather variability</i>	
6.3	Translation, legitimation and hegemony: Analysing the three cases....	207
	6.3.1 <i>What makes successful translation?</i>	
	6.3.2 <i>Legitimation and hegemonic practice</i>	
	6.3.3 <i>Legitimation through translation: One anchor or two?</i>	
6.4	Translation and legitimation in summary	215
Chapter 7.		221
Reclaiming Political Subjectivities: Resistances and Re-articulations		
7.1	Political subjects	223
	7.1.1 <i>Vibrant discursive subjectivity</i>	
	7.1.2 <i>Attention to opening up alternative subjectivities to be occupied</i>	
	7.1.3 <i>Political identification through passions</i>	
	7.1.4 <i>Summarising Mouffe's political subject</i>	
7.2	Political scientists? The construction of legitimate subjectivities	229
	7.2.1 <i>Political subjectivity through discourses of fear</i>	
	7.2.2 <i>Opening up spaces of challenge through personalisation</i>	
	7.2.3 <i>Summary of scientific passions</i>	
7.3	Collective political voice: Resistances within boundary work	241
	7.3.1 <i>Utilising the voice of others – C2020 and difficult issues</i>	
	7.3.2 <i>Trust and reframing the question</i>	
	7.3.3 <i>Alliances of the willing and political collectives</i>	
	7.3.4 <i>Summary of boundary actors passions</i>	
7.4	Analysis of cases of resistance – reclaiming Political subjectivity	248
	7.4.1 <i>Producing values, subjectivities, and legitimacy alongside knowledge</i>	
	7.4.2 <i>Neutrality and legitimation through boundary work</i>	
	7.4.4 <i>Affectual dimensions and the legitimation of political voice</i>	
7.5	Multiple boundary working and constructing subjectivity	257
Chapter 8.		261
Drawing the Thesis to a Close: In Search of the Elephant and Elphis		
8.1	Reflections on research findings	261
	8.1.1 <i>Translation</i>	
	8.1.2 <i>Legitimation</i>	
	8.1.3 <i>Values</i>	
8.2	Evaluation of theoretical framework	270
	8.2.1 <i>Mouffe's contributions to researching values legitimation and</i>	

	<i>boundary work</i>	
	8.2.2 <i>Problematics of Mouffe and the role of reasoning</i>	
8.3	Contributions of the research	274
	8.3.1 <i>Theoretical contributions</i>	
	8.3.2 <i>Methodological contributions</i>	
	8.3.3 <i>Theoretical and methodological research limitations</i>	
8.4	Contributions to science–policy practice	279
	8.4.1 <i>Specificity of CXC</i>	
	8.4.2 <i>Specificity of Scotland</i>	
	8.4.3 <i>Summary of recommendations</i>	
8.5	Future Research	284
	8.5.1 <i>Empirical attention to post-structurally conceived values</i>	
	8.5.2 <i>Role of science</i>	
	8.5.3 <i>Affect in the governance of climate change</i>	
Appendix A	Climate Change Related Policy Events Attended and Additional Documentary Sources	289
Appendix B	Research Interviews Conducted.....	295
Appendix C	Samples of Interview Schedule Mind-Map.....	301
Appendix D	Interview Excerpt - detailing a model to policy for predicting the needs of migrating species under a changing climate.....	305
Appendix E	Policy Awareness Workshop Sample Agenda.....	311
Appendix F	Summary of Findings for CXC.....	315
References	321

List of Figures and Tables

Figures

- Figure 3.1: Representation of the organizational landscape of climate policy in Scotland
- Figure 4.1: Scottish Government National Performance Framework 2011
- Figure 4.2: Main areas of CXC activity
- Figure 5.1: Identification through positive characteristics vs. through shared difference
- Figure 5.2: Slide shown at CXC-PAW2 on the policy discursive value framing of climate change
- Figure 6.1: Methodology for shortlisting measures in UK MACC for Agriculture and Land Use and Forestry Sectors

Tables

- Table 4.1: Key UK and Scottish climate policy developments
- Table 4.2: Reasons suggested for turning to science
- Table 5.1: Key differences between the processes of translation, knowledge brokerage, science communication and co-production
- Table 6.1: Reasons for omission of options in UK MACC for Agriculture and Land Use and Forestry Sectors
- Table 7.1: Summary of the five empirical cases of alternative boundary workings

Acknowledgements

My time back in Durham Geography Department has been a privilege for which I have many people to thank. Thanks must go to those who gave me courage in the early stages, to leave work and follow my heart. I also owe a debt of gratitude to Mathew Kearnes, Phillip Lowe, Marc Rounsevell, Andy Kerr and Heather Lovell for helping me to shape a successful funding application and to Durham University who funded the research through a Durham Doctoral Studentship – without which this journey would not have been possible. A special thank-you must go to the directors and secretariat of CXC, Sniffer, and all those who I interviewed, for your openness and generosity in sharing your time and experiences with me.

I'd like to express profound gratitude to all who helped me along the way. This has to start with Harriet Bulkeley and Andrew Baldwin whose insights, patience and persistence have taken me on an incredible journey. Thank you for your unrelenting support. I'd also like to thank the many inspiring colleagues in Durham Geography who provided me with more than my fair share of time and encouragement – Gordon MacLeod, Lyn Staeheli, Rachel Pain, Ben Anderson, Nicky Gregson, Paul Harrison, Rakshe Pande, Katie Oven, Matt Finn, Lizzie Richardson, Gerry Aiken, Abi McNiven, Brendan Doody, Boris Popov, Philip Robinson, Raihana Ferdous, Holly Hawthorn, Emma Ormerod, Ruth Raynor, Hanna Ruszczuk, Simon Beer and Sarah Hughes – thank you for your wisdom, advice, encouragement, cups of tea, chocolate, carpentry skills, early morning runs and surprise stationary gifts. I also benefitted greatly from working as a research assistant for Harriet Bulkeley and Simon Marvin during the period of doctoral research, helping me to learn the profession beyond the PhD. I'd like to thank several people for inspiring conversations that helped shape the thesis at various points, particularly Mike Hulme, Sam Randels, Huw Davies, Ioan Fazey, Geoff Whitman, Suraje Dessai, Eva Lövbrand, and the wider Reconciling Supply and Demand workshop (2014), and also those who provided me with feedback on early chapters – James Porter, Gareth Edwards, Lizzie Richardson and Jenny Laws; your suggestions have all been invaluable.

Thanks must also go to my longstanding friends outside academia who have been patient during my prolonged disappearances from social life, who haven't asked too often how the thesis is going, and have still invited me to beach bonfires, fancy dress parties, climbing sessions and weddings, as if the world was going on as usual. And finally to those closest to me – to both my parents for their unfailing support, encouragement and proofreading, to Andrés whose patience, advice, positivity and belief in my research carried me through difficult times, and to Teal, my shadow without whom I may never have made it at all.

*For climate science–policy colleagues in
Scotland, North East England, and worldwide,
who struggle, and hope, and do not give up
on the possibility for things to be otherwise.*

Chapter 1.

Introducing the Value Politics of Boundary Work

“Every order is the temporary and precarious articulation of contingent practices...predicated on the exclusion of other possibilities. It is always the expression of a particular configuration of power relations... never the manifestation of a deeper objectivity that would be exterior to the practices that brought it into being” (Mouffe, 2009: 549)

This thesis examines the processes and practices of boundary work at the climate science–policy interface in Scotland and how these bring particular social orders into being. Boundary work is understood as the practices undertaken by actors, organisations, objects and processes to mediate between science and policy, and is recognised to both connect and demarcate science and policy communities (Jasanoff, 1987; Halfman, 2005; Miller, 2001a; Guston, 1999; Guston, 2001; Gieryn, 1983; Gieryn, 1999). The science–policy interface is an important site through which problems of climate change come to be framed, and policy responses are constructed; through which “knowledge is both made, and made mobile” (Meyer and Kearnes, 2013: 427). Boundary work is widely recognized to be political, through serving various *interests* (of science, of policy, or of boundary organizations themselves). This thesis understands the politics of boundary work not simply in terms of interests, but instead in terms of *discursive value framings*: discourses that frame particular value orientations. The thesis aim is to investigate the value politics involved in these processes of boundary work, asking which discursive value framings are produced and re-produced through boundary practices, and how particular discursive value framings come to matter and others become excluded through boundary work. Questioning which knowledges and policy responses are made legitimate, and how, this thesis focuses on a particular form of boundary work being described by practitioners as ‘translation’. It is through examining the processes of

translation alongside other forms of science–policy boundary working, that these questions of discursive value framings and legitimacy are explored.

In recent geographical climate change literatures, Hulme has advocated for reframing climate change debates in terms of differences in values (Hulme, 2013; Hulme, 2009). Hulme has been joined by a number of scholars who focus attention on values as explanations for action, predictors of future policy acceptance, or approaches to risk through debates in journals such as *Global Environmental Change* and *Wires Climate Change* (Lorenzoni *et al.*, 2007; Corner *et al.*, 2014; Wolf *et al.*, 2013; Demski *et al.*, 2015). O'Brien and Wolf suggest a values approach to climate change is necessary because of four reasons. Firstly, the existence of value pluralism means that climate change cannot be responded to in just one way. Secondly, in addressing climate change, value conflicts will arise. Thirdly, as values are temporal and dynamic today's values will be different from those in future. Finally, climate change challenges us on a value level (O'Brien and Wolf, 2010). However, all these geographical approaches continue to conceptualise values in essentialist and structuralist ways. Departing from Hulme's approach, this thesis takes a post-structural view of values, understanding values in more relational and political ways.

Drawing from Laclau and Mouffe (1985), the thesis understands post-structuralism as an ontological and epistemological departure from essentialist claims to being and meaning. Post-structural ways of thinking disrupt the assumptions that underpin singular and naturalised claims to meaning and therefore the stability of dominant relations, and instead seek to demonstrate their constructed, contingent and contested condition. In doing so, conditions of plurality, multiplicity, contradiction and difference are foregrounded. It is suggested that a post-structural approach to thinking about values is important for three reasons. Firstly, by denying any singular, stable ground or reference point, yet at the same time recognising the passionate attachments and investments in particular discourses, a post-structuralist approach to values enables an examination of the value-commitments of particular discourses, whilst critiquing any final claim for closure. In effect, it re-claims territory for examining values critically and politically, whilst rejecting any essential, natural, stable, or final claim to meaning. Secondly, with environmental controversies such as climate change increasingly involving differences in value positions that are irreconcilable through appeals to science, a non-essential understanding of values offers the possibility of political space for values-based contestation along agonistic, rather than antagonistic, lines (c.f. Mouffe 2005 in which

agonism is defined as recognition of the legitimacy of positions of difference, and as such is dependent on non-essential claims). Thirdly, where anti-essentialist approaches have critiqued the concept of values (understood and evoked in essentialist terms) for closing down debate, boundary decisions over which discourses come to be positioned as values-rich, and which as value-free, escapes attention. This situation enables some discursive value framings to claim hegemonic power over others, unchallenged. Some way of discussing values that does not depend on essentialist claims is needed in order to render these boundary decisions subject to analysis.

To this end the research takes a post-structuralist approach to investigate the politics of values and boundary work at the Scottish science–policy interface, exploring how questions of values and knowledge interact, and foregrounding questions of which values are enabled or disabled from circulating. In opening up these empirical questions, the theoretical problematic of re-conceptualizing values post-structurally becomes unavoidable. Building on O’Brien’s (2010) call for a broader interpretation of values than those defined in monetary worth but rejecting her understanding of values as “intrinsically desirable principles” (O’Brien and Wolf, 2010: 232), this thesis suggests that the political theory of Chantal Mouffe offers ways to think about values post-structurally, from which geographical thinking about values could benefit. Value plurality is a central tenet of Chantal Mouffe’s anti-essentialist approach, pushing us to think about values politically rather than morally or ethically (Mouffe, 2005b: 122). This is useful in developing an understanding of values that recognizes multiplicity and without relying on essentialised claims to right and wrong. Following Mouffe, this thesis suggests that values need to be thought in terms of political choices rather than intrinsic moral or ethical principles, for it is only in thinking values in non-essentialist ways that differences in values might take the relation of legitimate adversaries, about which there can be political debate.

Existing research at the science–policy interface within boundary literatures has focused on the hybridity of knowledge and inseparability of fact from values (Miller, 2001a: 496; Wynne, 1979; Latour and Woolgar, 1986: 70; Jasanoff, 1990: vii; Backstrand, 2003: 38; van Egmond and Bal, 2011: 123; Jasanoff, 2003a: 160). However, greater attention has been given to the construction of scientific fact and objectivity, than to the construction and circulation of values. In argumentative policy analysis, Shön (1983) and Rein and Shon (1993) both suggested that the persistence of complex social problems is due to “reconciling different value perspectives” (Head, 2008: 3). However, argumentative

policy studies moved away from the language of values because of its association with essentialist ways of thinking. Values, understood to be held by individuals, pre-existing discursive interactions, and often associated with moral or religious positions over right and wrong, were considered unhelpful as an analytical concept during wider foregrounding of discursive understandings of power and distributed notions of agency. The language of values therefore became replaced with a different language of discourse, frames and norms, which were considered to better reflect a constructivist and relational understanding of meaning. However, what this language fails to capture is the sense of why things matter to people (Sayer, 2011) and the passions embroiled in particular claims to meaning (Mouffe, 2005b).

While the thesis remains grounded in STS approaches to science–policy boundary work, particular dimensions of Mouffe’s political thinking are explored to help re-think values, to foreground relationships between boundary work and hegemonic power, to focus attention on the political contingency of claims to meaning and the vibrant subjectivities and possibilities for alternatives from which these claims are never foreclosed. The shift away from essentialist understanding of values by argumentative science–policy scholars is an important move that should not be reneged, for mobilizing values in essentialist ways is problematic to the recognition of value plurality and the addressing of conflict (Mouffe, 2005b). Responding to the hybrid nature of discourse, it is argued, does not mean reasserting an essentialist pure notion of values any more than an essentialist pure notion of fact. Envisaging values, like facts, as constructed through processes of boundary work suggests that we should not accept their claim to purified essence (any more than we should accept the claims to purified fact) but instead, politically challenge the acts of power that try to fix these claims in static ways.

1.1 Empirical focus and research questions

These questions concerning the value commitments produced through processes and practices of boundary work are explored empirically through the case of Scottish climate science–policy interactions. Scotland’s climate science–policy interface underwent significant restructuring in 2011 with the establishment of a new Centre for Expertise in Climate Change Research called ClimateXChange (CXC). CXC’s goal is to establish a demand driven, rather than supply driven, relationship with scientific advice. The research focuses on CXC as a ‘boundary organization’ and the process of boundary work

CXC call 'translation'. However to understand translation, it is also compared to other forms of boundary work at the Scottish climate science–policy interface.

Examining the value politics involved in these processes of boundary work is pursued through the following research questions:

1. How do values and knowledge interact during processes of boundary work at the climate science–policy interface in Scotland?
2. Through what processes is legitimacy constructed for particular discursive value framings through boundary work?
3. What effects do different processes of boundary work have on the types of policy action being considered in response to climate change?

These questions were developed partly in response to previous experiences as a climate change policy practitioner and partly through theoretical engagement with science–policy boundary literatures. As fieldwork progressed, three conceptual themes – values, translation and legitimation – began to shape the research and the narrative produced. The specific conceptual approach to each of these thematic concepts is discussed in section 2.6 and they provide the framework for conclusions in section 8.1.

1.2 Unsettling climate change as a scientific problem

Climate change is generally framed within policy and media settings as a scientific problem, amenable (with greater scientific knowledge) to various forms of organizational management that render it governable (Hoppe, 2010: 109). Diverse forms of (predominantly) natural but also social scientific research tend to be funnelled through computerized climate impact models that Sundberg argues have “become gatekeepers for claims about climate change” (2007: 473). This has led climate policy at many governance levels to turn to scientific advice in the development of policy responses, and development of a wide range of ‘boundary organisations’ to promote, perform and manage knowledge circulation between science and policy. However, many science–policy theorists have pointed to the error of assuming a deficit of knowledge is at stake (Crow and Boykoff, 2014; Backstrand, 2003; Irwin *et al.*, 1996), and some have also demonstrated that other forms of knowledge are also important (Jasanoff, 2010; Owens

et al., 2006). Although many practitioners recognise that scientific knowledge is only one among many components of decision-making, the predominant sources of information cited in public discourses still frame climate change in scientific terms, and science is looked to as a provider of answers to policy challenges (Miller, 2001a: 479; Hulme, 2008: 5; Hoppe, 2010: 109; Demeritt, 2001; Dilling and Lemos, 2011).

Framing climate change as a scientific problem evokes particular ontological and epistemological commitments. Despite diversity within scientific practices, narratives of science often rely on evoking neutrality and universality. As Jasanoff highlighted back in 1987, “much of the authority of science in the twentieth century rests as well on its success in persuading decision-makers and the public that the Mertonian norms present an accurate picture of the way science 'really works'.” (1987: 196). In the thirty years since, despite many STS accounts of science challenging this value neutrality and revealing its careful construction (Jasanoff, 2012a), public and practitioner discourses around science continue to rely on ideas of neutrality. Climate science in particular, because of its disruptive implications for established interests, often finds its own epistemic neutrality the focus for attacks funded by those whose interests are threatened (Mann, 2013; Goldenberg, 2013). Under such circumstances it is understandable that climate scientists focus on re-asserting epistemic neutrality and consensus findings. Scientific approaches and knowledges that are open to contestation within science become hardened through presentation to non-scientific audiences. Further, they often become used by policy practitioners to try to ground policy responses in terms not open for political debate in order to guard against domination of policy by interests (Hajer, 1993: 57). In this way positivist understandings of science as neutral knowledge have benefitted the authoritative standing of both science and policy (Jasanoff, 2003b; Owens, 2012: 15). However, this rests on an opposition between interests and neutrality that obscures questions of values. Values and interests have become conflated in the struggle to assert neutrality. These claims to neutrality are thereby central not only to science but also to boundary and policy actors in the construction of climate change policy responses, such that as Hajer describes, “decision making cannot be based on social concern; it has to be legitimised through scientific discourse” (1993: 58).

However conflicting anxieties are arising over the role of science in decision-making based on these tensions over neutrality. Scientists who wish to uphold a value free ideal (Wilhere *et al.*, 2012) perceive neutrality as being under threat from an increase in mode

2 or 'post-normal' science (Funtowicz and Ravetz, 1993b) where science is increasingly being drawn into answering values questions (see Jasanoff, 2003b: 235). Post-normal scientific challenges are those in which the "facts are uncertain, values in dispute, stakes high and decisions urgent"(Funtowicz and Ravetz, 1993a: 86). In these cases, of which climate change is an example, the traditional fact-value distinction is unable to be upheld (Funtowicz and Ravetz, 1994: 1884) and uncertainty, diverse values, and plurality of legitimate perspectives are profiled (Funtowicz and Ravetz, 2003). At the same time, claims for neutrality are considered culpable in the de-politicisation of political questions, by Foucauldian science-policy theorists (Litfin, 1994; Hajer, 1993: 68-69), STS scholars (Jasanoff, 1996; Jasanoff, 2004; Jasanoff, 2008) and post-political theorists (Swyngedouw, 2010; Mouffe, 2005a), who all draw attention to the utilisation of science in de-politicising political debate. These theorists alert us to observations that debates over values are being played out through debates over facts (Litfin, 1994: 35) and that the "predominance of a managerial logic in all aspects of life" (Swyngedouw, 2010: 225). Reducing political questions to technical and administrative ones, is "reinforcing the boundaries that allow value judgements to be reduced into technical puzzles" (Löwbrand, 2007: 45). As Kenis and Mathijs suggest framing climate change in terms of measurable volumes of carbon dioxide conveniently "narrows the debate to ignore the human-societal root causes... and focus on technical solutions that remain within the parameters of what currently exists" (2014: 151).

Far from insulating policy from interests, this vision of neutrality is obscuring attention to both which, and whose, values are being constructed as neutral. Addressing climate change involves highly political future-orientated values questions that are too important to be blinded by constant defence of neutrality, especially given the role of particular neoliberal hegemonic values in causing the climate change problem (Parr, 2014; Newell, 2011; Newell and Paterson, 2010). Jorgensen and Phillips (2002: 37) suggest that the problem of emphasizing a scientific framing for climate change is science's claim to objectivity that naturalises their truth claim, obscures the contingency of such claims, and denies possibility of alternatives; "Objectivity can therefore be said to be ideological" (Jorgensen and Phillips, 2002: 37). Further, while scientific knowledge has focused on demonstrating consensus over scientific knowledge (in order to build sufficient collective weight of opinion to initiate a political response), responding to scientific knowledge of climate change involves political decisions that concern differences in values that cannot be resolved inclusively through consensus (Goeminne, 2012; Hulme, 2015). Instead,

certain values are shaping climate policy futures whilst others are being excluded. As Pielke highlights, “science has exceedingly little capacity to reconcile differences in values” (2007: 137). While his suggestion that “where value conflict exists, political debate thrives” (2007: 137) resonates with Mouffe’s approach, this PhD research is mindful of Jasanoff’s critique of Pielke’s oversimplification of science–policy interaction (Jasanoff, 2008). Further, his favouritism of the role of science as an honest broker retains the scientific ideal of value-free science.

Rather than advocate for any one mode of science–policy interaction over another, as Pielke does, this PhD thesis attends to the politics of different forms of scientific boundary work – *especially* where an honest broker role is being claimed. During boundary work, knowledge, values and legitimacy are constructed through relations of power which privilege some discursive value framings over others and it is these relations that the thesis seeks to further understand. In particular, it is suggested that science has developed a resonant relationship with neoliberalism, understood as a contested family of approaches that favour markets over governments, liberalization and individual responsibility (Harvey, 2005: 2; Moore *et al.*, 2011: 508). This relationship is less through any natural affinity, and more through their mutual co-production (Moore *et al.*, 2011; Lave *et al.*, 2010) and the increasing reliance on scientific authority under deregulation (Jasanoff, 2011a: 632; 1987; 1990). This produces “technical and administrative machineries... based on narrow and dominatory scientific rationalism” (Healey, 1993: 233). Recognising both the neoliberal character of science and the failure of a science, that never was neutral, to proof policy from the influence of interests, this thesis seeks to disrupt these claims to neutrality and instead revive the value politics of science and of decision-making. This contributes to the work of a community of scholars who highlight processes through which science–policy interactions serve neoliberal agendas (Lave *et al.*, 2010; Hess, 2013; Jasanoff, 2003b) whilst nevertheless recognizing that science’s role is not pre-fixed but “may be political or anti-political in its implications” (Barry, 2007: 290).

1.3 Revisiting values

There have been particularly significant revivals of interest within broader post-structural social science and political theory to conceptualising values differently - in recent work

by Latour (2013c) and the political theory of Chantal Mouffe (Mouffe, 2005b; Mouffe, 2005a; Mouffe, 1999; Mouffe, 2002; Mouffe, 2013). Latour suggests:

“I am all too well aware that the words ‘value’ and ‘institution’ can be frightening... What! Go back to values?... But isn’t this what we’ve finally gotten away from, what we’ve done away with, what we’ve learned to fight and even to dismiss with scorn?... the scope of the ecological crisis obliges us to reconsider a whole set of reactions, or rather conditioned reflexes... can certain of the concepts that we have learned to cherish be offered the opportunity for a type of development that the much too narrow framework of modernization has not given them?”(Latour, 2013c: 7-8).

In introducing his recent book *An Enquiry into Modes of Existence* Latour describes his task as “an inquiry into values” (2013c: 16) and concludes, “values, if they are not to disappear, have to be diplomatically negotiated” (2013c: 481). It is in this task of rethinking values that this thesis is interested. Yet it is not to Latour that the thesis turns primarily but the political theory of Chantal Mouffe for whom the plurality of values has had a longer centrality. Mouffe described that she and Latour (her good friend) agree on many things except she foregrounds question of hegemony which Latour admits his work does not well engage (Mouffe, 2012: online). In considering the discursive interactions of values through boundary work in this thesis, questions of power and hegemony are considered central to this analysis into values. The thesis contributes to the engagement of science–policy debates on climate change with Mouffe’s work, which has already begun to receive attention through the work of Hulme (2015) Machin (2013), Stephan *et al.* (2013), Goeminne (2012) and Chilvers (2008).

So how might values be thought differently? Drawing from Mouffe’s deployment of values as relational, collective and political (section 2.5.2), this thesis understands values as relational orientations to the future that are neither fixed, nor pre-exist discursive interaction, neither individual, nor questions of right and wrong. Instead values are collective political choices, about what matters, with which we identify differently, and to which we come to hold passionate attachment. Inevitably discursively constituted, values hold a sticky, affectual attachment for those who align themselves politically with their reproduction. This sets values apart from rationalities or interests, which foreground rationality and instrumentality in their subjective connections. Values involve a commitment and an orientation towards action that fixes normative claims over the way things should be. Seeing values as relational processes of prioritisation, and as attachments to outcomes, enables values to be seen as political battlegrounds through

which particular realities are produced. Conflict around values is not eradicable, but necessary to the functioning of democratic responses to climate change (Machin, 2013; Hulme, 2015; Bayard and Clark, 1996: 138; Mouffe, 2005b: 122). In contrast bracketing out values from official narratives removes them from political debate (Sayer, 2011).

The concept of values is preferred over interest because values extend to a broader range of meanings that we might hold to matter, and about which we may seek to act politically, without these necessarily being self-benefiting. Science and technology controversies are “increasingly framed as moral rather than as merely technical disputes” (Nelkin, 1992), and many argue that appealing to moral and ethical principles are the last grounds through which addressing climate change might be approached. Mouffe argues that it is vital *not* to understand values in moral or ethical terms, for these construct essentialist claims that reduce possibility for agonistic political expression (Mouffe, 2005b: 122; Mouffe, 2002: 11). Understanding climate change in terms of moral disputes frames problems in terms of right and wrong, which develop situations of antagonism with little compromise (section 2.5.2). It is precisely framing values as essential moral positions in opposition to rational scientific findings that has constructed science in such a strong position to be draughted in to “resolve” otherwise impassable disputes. It is in challenging this binary opposition, and the essentialist claim of values, that reclaiming a political space for values based debate might be achieved.

Conceiving values as contingent political choices rather than essentialist battlegrounds enables refocusing of attention onto the political nature of decision-making, without evoking finalising claims of science or morality from which no legitimate alternatives might be envisioned. Understanding climate change in value terms constructs it as a far more difficult problem concerning the human-environmental relationship, than a management problem requiring more scientific knowledge, and one with even less certainty that any form of resolution is possible, let alone desirable. However, it does at least leave space for hope that as diverse and often divided global communities, we will be facing the difficulty of the matter head on and facing the decisions and consequences climate change is likely to bring, in all their political ramifications. As Castree suggested, “policy is too political – too much about power and values – to be simply passed off as a domain of technical judgements and practices” (2002: 360).

Mouffe’s definition of hegemony as “the collapse of objectivity and power” (Mouffe, 2000: 14) provides an important tool with which to contest claims to neutrality.

Hegemonic discourses stake a claim to neutrality that positions them as stable (therefore resistant to change); naturalised (therefore unquestionable and held outside of the space of political debate); and standing for the collective (therefore unified and universal). The fact that questions of values become an ‘elephant in the room’ for practitioners and academic analysis alike is convenient to the maintenance of hegemony, something which relies on the continued collapse of objectivity and power. Pointing to the values implicated within all discourses, but particularly those that claim to be natural and neutral, serves to disrupt any claim to objectivity and associated natural claim to power. Positioning these naturalized neutral claims instead as particular values that have achieved a degree of hegemonic power, enables them to be problematized as contingent and open to political debate. This helps to expose their value orientations and inverts structuralist approaches to values, which would tend to naturalise, fix and essentialise. Attention to the value dimensions of discourses can therefore serve as a tool of post-structural critique, but only if values themselves are understood in post-structural terms.

In this thesis, when examining the discursive circulation of particular values through processes of science–policy boundary work, the concept of ‘discursive value framing’ is deployed in order to distance the concept of values in the thesis from its traditional lineage. The concept of discursive value framing provides a temporary resting point in the process of rethinking values post-structurally, emphasizing both the relational, constructive discursive practices through which values emerge, and the inseparability of discourses from value orientations. It foregrounds the value commitments framed and embodied in discourses in ways which attend more to the stickiness of why some discourses matter and become the focus of passionate attachment than does the concept of discourse alone.

1.4 A geographical approach to the value politics of boundary work

The thesis approaches climate change and values through the discipline of human geography, which has long had society-nature and environmental interactions as a prevailing theme (Aspinall, 2010: 715; Castree, 2002: 357). As well as a thematically integrating role, taking a geographical approach offers spatial sensitivity and opens up a

particular set of critical questions around power, difference and inequality that attend to marginalized voices and context specific productions of power.

Geographical research pays particular attention to ways of problem framing (O'Brien, 2010) that foreground the situated provisional and partial nature of knowledge - seeking to contest a view from nowhere and related universalizing narratives and instead to situate and contextualize claims and reveal the contexts that shape both processes and outcomes (O'Brien, 2010). As recent approaches to systems of top-down global negotiations, quantification and trading of carbon are falling short on delivery (Pielke Jr, 2009; Hoffmann, 2011: 155) and geographers are joining other science-policy scholars such as Jasanoff (2010) to draw attention to the way that scientific epistemologies addressing climate change through global universalizing and abstract knowledge generates placeless knowledge segmented from a wider whole and devoid of local meaning (Hulme, 2008: 8; Hulme, 2010). Demeritt (2001) has called for greater reflexive understanding of the role of science as a situated social activity and, together with Jasanoff (2010) Wynne (2010) and Hulme has expressed concerns about the way in which scientific knowledge generates detached ways of relating to climate change (Hulme, 2010; Demeritt, 2001). Such distancing fails to generate ownership of the climate change problem (Wynne, 2010) and encourages us to act as spectators (Demeritt, 2001). Attending to the situated production of meaning for scientific knowledge plays an important role in developing attention to differences in what matters to whom, where, why and when.

Critical human geography in particular also embraces the tensions generated through sticky social situatedness that renders geographical knowledge always *related to* the world. It is in this sense that "critical scholarship realizes its role in society not to blindly reproduce existing social orders, but to create the conditions in which progressive change can occur" (Bauder and Mauro, 2008: 1). Political geographers join political scientists and international relations scholars to highlight a lack of attention to capitalism and/or neoliberalism as hegemonic powers in relation to climate change (Newell, 2011; Newell and Paterson, 2010; Parr, 2014; Head and Gibson, 2012). These approaches profile socio-economic and political questions about relationships with oil, capital and profit, international governance initiatives (such as the creation of voluntary carbon markets, carbon offsetting and clean development mechanisms), and modes of privatizing resource governance on a macro scale. Some geographers have taken this critique in the direction of highlighting detachment of climate change from political

economic responsibilities for emissions (Neumayer, 2000) while others concentrate on fairness and justice in the differentiated abilities to adapt (Adger *et al.*, 2006; O'Brien *et al.*, 2007; Moser, 2010). As O'Brien suggests, understanding climate change requires more than the physical science of biophysical processes and impacts, but

“calls for recognition of multiple perspectives on human-environment relationships, alternative economic pathways, changing constellations of power, new modes of politics, and differing ways of approaching the future” (O'Brien, 2010: 3).

At the heart of this PhD research is an interrogation of the role of scientific boundary work in shaping the types of discursive value framings that circulate in climate science–policy debates, in order that they might be recognized as partial not total, politically contingent not necessary or natural and as a result open to challenge – as the opening quote of this chapter suggests. Taking a geographical approach firstly places emphasis on the situated processes through which meaning for climate knowledge is historically and spatially constructed (Liverman, 1999), which is important in a Laclau and Mouffe discourse theory approach (Howarth, 2000). Secondly, geography brings an empirical focus - attending to the specificities of process and questions of how constitutions in practice operate, with what effect. Thirdly, translation as a concept implies spatial movement, re-location and change yet it is perhaps surprising that theoretical engagements with translation as a concept have (with the exception of Sidaway, 2008) predominantly occurred outside geographical debates. Taking a geographic approach to translation focuses on designations of similarity and difference and implications of power in the how such boundaries are constructed. Finally, a geographic approach opens up critical questions around the politics of values with a concern for marginalization in the context of specific productions of hegemonic power.

In taking a geographical approach the research contributes to deconstructing the workings of neoliberal hegemony at the small-scale of science–policy knowledge interaction, and seeks to explore potential for politically claiming spaces of difference in the micro-scales of science–policy practice. As Head and Gibson (2012) suggest, geography is particularly suited to combining deconstruction with generative and creative thinking beyond ‘modern’ categories (which I argue, extends to values), to explore practically the ramifications of thinking in relational and non-modern ways. This is a point of proposed resonance between a geographical approach and Chantal Mouffe’s emphasis on both de-articulation and re-articulation. With Mouffe’s emphasis on the

contingency and partiality of claims to meaning, and an implicit spatiality in her approach to legitimacy that is unexplored (Sziarto, 2008: 410), this PhD suggests there is a resonance between Mouffe's work and geographical thought that merits further engagement.

1.5 Contributions

Through attending to the politics of discursive value framings as they are produced and reproduced through different boundary work practices, the following contributions are made to thinking about translation, values and legitimacy at the science–policy interface.

1. Firstly, an argument is developed that CXC translation (as a particular form of boundary work) is a practice through which the hegemonic discursive value framings within policy are reproduced.
2. Secondly, the thesis suggests that Mouffe's approach to values is helpful in starting to scope out how values might be rethought post-structurally and suggests that destabilizing claims to neutrality and universality are helpful in hegemonic critique.
3. Thirdly the thesis contributes to thinking about how legitimacy is constructed through boundary work. While legitimacy is found to be constructed in different ways through multiple and interacting forms of boundary working, in the case of CXC's translation, legitimacy is constructed through the discursive value framings of policy. This demonstrates legitimacy being constructed through the translation as well as purification processes of boundary work.

1.6 Structure of the thesis

The thesis is made up of eight chapters, including this introduction. Chapter 2 introduces the theoretical debates underpinning the thesis, and outlines moments of critique or intersection that have prompted and orientated this research. The chapter begins by reviewing two important science–policy literatures that provide a theoretical home for the research – argumentative policy analysis and STS boundary work – engaging with

their approach to values and to legitimacy and identifying strengths and challenges in each approach. The second half of the chapter introduces the political theory of Chantal Mouffe and opens up a theoretical framework for the thesis that draws attention to the concepts of translation, values and legitimacy in science–policy boundary work. Chapter 3 discusses the methodological approach to the research including formulation of the research idea within a practitioner context, the theoretical influences on methodology and the challenges encountered in conducting research on values.

Empirically this concern with values, legitimacy and boundary work is explored through examination of the processes of boundary working occurring at the science–policy interface in Scotland. Chapter 4 contextualizes and orientates the reader, both to the context of Scotland where the empirical research took place and also to the narratives and operations of science–policy boundary work upon which this research has been based. This chapter draws on empirical research as well as desk-based review, to open up some political questions around the model of science–policy interaction pursued in Scotland at a broad level, in preparation for the closer attention to boundary work in the three main empirical chapters.

The main empirical chapters then focus on a detailed examination of one or more processes of boundary work in action. Chapters 5 and 6 focus primarily on workings of ClimateXChange – a mainstream organizational process for engaging with climate science initiated by the Scottish Government while Chapter 7 looks at several more ad-hoc boundary interactions. Chapter 5 first considers the discursive emphasis on translation by CXC and compares it to other forms of science–policy boundary work by other boundary actors such as knowledge brokerage, science communication and co-production. It is argued that positioning boundary work as a process of translation is significant in the context of Scotland’s emphasis on policy responsive science, and that translation performs discursive work in shaping the practices of boundary work to privilege the audience’s discursive value frameworks of meaning. Using Laclau and Mouffe’s concept of the logics of equivalence, it is argued, helps to understand this emphasis on audience in ways not captured by STS translation narratives. Chapter 6 then focuses on the specific call-down function that is a signature of CXC’s translation work and considers how legitimacy for knowledge is constructed through the processes of the call-down itself. Building on Leigh Star’s emphasis that boundary objects such as the briefing reports produced through the call-down service need to generate meaning for both sides of the science–policy boundary, chapter six suggests that while this dual

accountability (1989) is necessary, the pull of each side need not be equal. It is suggested that 'successful' translation involves the generation of knowledge with meaning that resonate with the policy audience's dominant discursive value framing. Chapter 7 then explores alternative forms of boundary interaction out with those being termed translation. Alternative collections of boundary practices driven by passionate boundary actors are establishing different types of science–policy relationship that construct claims to legitimacy differently and hold potential to open up different 'discursive value framings'. The successes or failures of these approaches as alternatives are then discussed.

Engaging with values through the 'discursive value framings' enabled or disabled in each case of boundary working, leads to a final discussion in chapter eight that offers reflections on whether a return to values is helpful in critically engaging with the politics of boundary work, and on the usefulness of Mouffe's political theory in complementing existing science–policy approaches. Here, some limits to Mouffe's work are identified, for which it is suggested the benefits of interaction between STS and Mouffe's political theory might work both ways. In particular Jasanoff's work on wider forms of reasoning could extend Mouffe's theoretical applicability to science–policy interaction. A number of avenues for further research are also indicated, arising from the research, that open up productive research opportunities.

Chapter 2.

Theorising Science–policy Interaction: Debates over Values and Legitimacy

Values and legitimacy are the subject of much theoretical discussion in science–policy literatures, but rarely in combination. In seeking to develop greater attention to specific relations between values and legitimacy, this chapter situates the thesis within two important traditions of science policy theorization – those of the argumentative turn and STS boundary work. Argumentative studies within environmental governance debates focus on the way that science is drawn into processes and practices of governance, while STS boundary literatures focus on boundaries between science and policy as constructed by science and policy actors alike (Owens, 2012: 8). Within both literatures a diversity of questions are asked of the science–policy interface from different theoretical traditions. This thesis draws particularly from Foucauldian environmental governance approaches, such as work of Hajer and Litfin and STS approaches that respond to a Latourian tradition, such as those of Jasanoff and Miller. In doing so, an argument is made for the addition of Chantal Mouffe’s approach to values, legitimacy and hegemony in thinking about the politics of boundary work. Together these three literatures form the theoretical framework for the thesis. During these discussions, the concepts of *values*, *legitimation* and *translation* are drawn into particular focus.

As specified in Chapter 1, this thesis reinterprets the concept of values through the device of ‘discursive value framing’ to separate the approach to values being taken from essentialist and structuralist notions of values. Discursive value framings are simply discourses in which the value commitments, and orientations towards particular outcomes have been foregrounded. Instead of starting from questions of what values are, or where they come from – which search for an essence – this thesis starts from the position that values are inseparable from discourse and have particular future-orientated effects (as outlined in section 1.3). Importantly, this inseparability does not assume that

connections between particular discourses and particular outcomes are necessary, pre-established or singular in their possibilities, rather than discourses are made to work towards particular value outcomes through on-going performative claims over meaning, which could always be otherwise. In this process values are conceived as emergent through discourse and practice, in constant challenge and flux, but nevertheless sticky in their affectual relation¹ (for further discussion on opening up the 'affectual' quality of legitimacy and values for future research see chapters 7 and 8). Discursive value framings, offer a way of talking about discourse that captures why discourses matter to people (Sayer, 2011), around and through which, gather the passions that Mouffe argues animate political collective forms of identification (Mouffe, 2000). This approach to thinking about values has been developed through engagement with the three main bodies of literature indicated above – STS boundary work, argumentative policy analysis and Mouffe's political theory.

Many recent science–policy approaches consider interaction in terms of policy needs (Cash *et al.*, 2002) or supply and demand (Sarewitz and Pielke, 2007). This research takes a contrasting stance, instead joining Hess, Jasanoff and others, it suggests we need to be critical of the way in which science–policy approaches might lose their critical stance. Arguing that values have been decentred but not eradicated from science–policy debates, this thesis suggests that even after the decentring of values in post-structural science–policy approaches, there is still need to attend to the value commitments of discourses, frames, storylines and narratives and to the boundary practices that enable particular discursive value framings to circulate. However in this task, further attention is required to theorise values post-structurally. The political theory of Chantal Mouffe offers one such approach to thinking about values post-structurally. As will be shown Mouffe offers attention to questions of legitimacy and power that in many ways complements existing approaches within science–policy studies. Mouffe's foregrounding of the specific relation between rationality, legitimacy and hegemony in the context of her emphasis on value pluralism, is suggested to provide one possibility through which science–policy's critical edge might be revitalized and enable questions around values to be thought politically rather than rationally or morally. Mouffe's approach offers a

¹ Affect is understood here in terms of the emotional relational influences on the capacity to act and be acted upon that Gregg and Siegworth (2010) describe in their opening passage to their 'Affect Theory Reader'. Notions of affect in many ways haunt the chapters of this thesis but further engagement with these literatures is considered outside the scope of this thesis.

helpful avenue through which to explore values post-structurally, signalling that although values might be evoked as essentialist and naturalized concepts, their meaning is nevertheless always politically fixed through discursive processes.

This chapter develops this argument by discussing firstly how values have been understood and/or problematized by environmental governance and STS boundary work literatures (sections 2.1 to 2.3), and then how legitimacy is conceived in both science–policy approaches (section 2.4). Whilst the thesis seeks to build forward from these literatures in thinking about science policy interaction, it also seeks to problematise elements of both approaches. These critiques are developed through the text but are summarised in section 2.5, where implications for de-politicisation through science is discussed. Section 2.6 introduces the work of Chantal Mouffe to complement and extend work by STS scholars such as Shiela Jasanoff who attend to the intricate relations between value plurality, processes of legitimation, and boundary work. Finally, section 2.7 pulls these theoretical influences together to define the theoretical framework for the thesis.

2.1 Values in environmental governance literatures: from explanatory tools to values in paradox

Environmental governance literatures have in the last two decades been little interested in values as an analytical category, largely due to the rise of Foucauldian discourse-centred approaches that criticised essentialist understandings of values as a source of explanation. A concept of values was prominent in the early work of Fischer (1980), Sabatier (1987) and Haas (1989). Sabatier and Haas in particular argued that groups of actors coalesce around shared values: scientific actors form epistemic communities around shared sets of principles (Haas, 1989: 385) and policy actors form ‘advocacy coalitions’ with those who share similar values and causal problem framings (Sabatier, 1987: 663). Both advocacy and epistemic community approaches share a structuralist understanding of values: pre-existing interactions, relatively static and resistant to change (Sabatier, 1987: 663). They offered explanation for policy change or patterns of behaviour that tended towards top down explanations implying coherence and permanence in values (whether held by individuals or within policy systems). These approaches are part of a wider realist approach to knowledge and power in which the

basic attributes of a problem are seen as stable characteristics. A linear model of science and policy is assumed, in which knowledge and science hold a neutral role and are thought only to be used politically by policy (Sabatier, 1987).

With the 'argumentative turn' attention was increasingly focused on the role of language, argumentation and discourse in policy making (Majone, 1989; Fischer and Forester, 1993; Litfin, 1994; Hajer, 1995; Rein and Shon, 1993). Drawing from Bourdieu's recognition that how we talk about things helps to bring them about (Healey, 1993: 244), these authors argued that language not just describes, but also creates the world (Hajer: 44). Processes of argumentation establish narratives (Kaplan, 1993) or storylines (Hajer, 1995) that "not only solve but formulate problems" (Fischer and Forester, 1993: 14). Utilising notions of framing, Hajer showed that much of the struggle around environmental conflicts was around how the problem becomes defined (1995: 22), and how other actors become positioned through discourse (1995: 53). Application of Foucauldian understanding of the co-production of knowledge and power (Litfin, 1994), foregrounded relationships between language, practice and meaning in ways that generated a paradigm change (Kuhn 1962) in understanding science-policy interaction. This demonstrated that meaning was discursively constituted, de-centred actors in favour of discourses, and put the neutrality and objectivity of science in question.

In these literatures, however questions of values developed an increasingly uneasy place. On one hand, a Foucauldian emphasis on the intricacies of practice (Hajer, 1995: 47) often emphasized the value-laden nature of policymaking, of science, and of science-policy interaction (Majone, 1989; Fischer and Forester, 1993; Rein and Shon, 1993). Yet at the same time, the increasingly Foucauldian post-structuralist aversion to causality (Hajer, 1995: 47) also meant that values, which were associated with a realist ontology, lost purchase as an analytical category. Within these discussions nevertheless lie foundations for thinking about a more relational view of values that will be briefly outlined.

Majone emphasized values in policy making, refuting any notion of policy as objective and scientific, and instead emphasised argumentation in which "to say anything of importance in public policy requires value judgments" (1989: 222). Majone described the way that values are bound to problem definition (1989: 58) measurement standards (Majone, 1989: 59), decision making processes and policy-instruments which are seldom "ideologically or "distributionally" neutral (Majone, 1989: 116-117). In so doing, Majone

moved the notion of values some way towards a relational ontology, foregrounding the *on-going processes* of valuing, in which values become formed through “persuasive interchange” (1989: 8). He suggested that “these values are neither given nor constant, but are themselves a function of the policy making process that they are supposed to guide” (1989: 24). Following Majone, values were also emphasised in the formation of narratives and storylines (Kaplan, 1993: 172; Forester, 1993: 199) and discursive frames (Rein and Shon, 1993: 145). Rein and Shon in particular suggest that disputes

“cannot be understood in terms of the familiar separation of questions of value from questions of fact, for the participants construct the problems... through frames in which facts, values, theories and interests are integrated” (1993: 145).

This inability to distinguish fact from value in discursive practice means that forms of argumentation are described as “inescapably both normative and descriptive” as they “express or resist broader relations of power and belief” (Fischer and Forester, 1993: 14). As Forester emphasises stories “are not just idle talk; they do work. They do work by organizing attention, practically and politically” (Forester, 1993: 195).

Drawing on Foucauldian approaches to knowledge and power and Rein and Shon’s concept of framing, Litfin examined the way in which particular scientific knowledges prefigured particular types of policy response. Litfin first emphasizes the falsity of separating science as fact and policy as values, emphasizing that scientists as much as policy makers act in relation to values (1994: 33). Secondly, she emphasizes that science is drafted in on both sides of a dispute to harden existing political positions which tend to be around political values (1994: 186), arguing that “epistemic community approaches downplay – almost to the point of neglect – the ways in which scientific information simply rationalizes or reinforces existing political conflicts” (Litfin, 1994: 12). Thirdly, she argues that the way in which debates on values become rehearsed is through debates over facts,

“no matter what values underlie a controversy, the debates generally focus on technical questions; questions of value become framed as questions of fact” (1994: 35).

Central to her critique around the role of science in policy legitimation is the way in which political value debates come to be framed in scientific terms (1994: 4). In these three ways, Litfin highlights the inextricability of values from discursive practice. These

literatures all emphasise the inseparability of values from facts in discourse and indicate values as an orientation towards particular outcomes over others.

Yet at the same time challenging the premise that values were shared was central to Hajer's (1995) critique of advocacy coalitions, and Litfin's (1994) critique of epistemic communities. For Hajer, both the development of actor coalitions and discourse development could not be explained through values. He demonstrated that coalitions of actors occurred around collective discursive storylines in which values were not necessarily shared (1995:13), emphasizing that such discourses are not coherent (1995: 44), but fragmentary, contradictory and evolving with diverse problem definitions (1995: 15). Through the example of ecological modernisation he argued that public discourses are not predefined, with clearly defined actors and storylines, but are instead a complex and continuous struggle over problem definition (1995:15) in which discourses emerge, and are not pre-envisaged (1995: 29). There were, he argued, no grand guiding narratives, no orchestrated attempts to put ecological modernization at the centre of discursive debates, but instead, inter-subjective discursive struggles resulting in incremental shifts in meaning, in which success of one discourse over another is a product of seemingly trivial micro-practices (Hajer 1995: 267-8). Similarly, Litfin criticised the vagueness around what is actually shared in epistemic communities, pointing to multiple instances of bonding within disciplines with little consensus (Litfin, 1994: 47).

Hajer's approach in particular was seminal in moving understanding of environmental politics away from realist notions, not only of values but also of meaning, emphasizing the way in which, although actors may share storylines, one discourse could offer many different meanings to different groups (1995: 13). With values understood within a psychology and economics intellectual heritage as individually held, prior to interaction and unchanging, the notion of values made little sense in examining discursive practices of meaning making. The terminology of values therefore became sidelined in favour of a new language of discourse, frames, storylines and narratives that better encapsulated the social construction of meaning.

Hajer's foregrounding of discourse, and his attention to the fragmentary, contradictory, and relational struggles over meaning, in which values are not pre-existent or shared, provides an important foundation for this thesis in understanding discursive struggle. However, his approach to values remains ambiguous. A close reading of Hajer's text reveals that his main objection to Sabatier was not the presence of values per se, but

rather the individualist and realist ontology that suggests that values and beliefs are pre-given and fixed in advance of discursive interactions. Hajer suggests instead that people have 'value positions':

“People are not seen as holding stable values but as having vague contradictory and unstable ‘value positions’. New discourses may alter existing cognitive commitments and thus influence the values and beliefs of actors, for instance because new storylines create new cognitions that may give people a new idea about their potential role and the possibility for change (i.e. new subject and structure positions)” (1995: 71).

Here values are not expunged altogether, but adapted into 'value positions' reflecting their relational qualities and enabling values to be thought non-essentially – as positions, temporarily held, that are always unstable and not necessarily coherent across interactions. Further, Hajer draws on a notion of 'discourse affinity' to describe the way in which particular discourses hold appeal for some actors over others (1995:66-67). Discourse affinity moves reasons for discourse selection away from individualist choice or logical deduction, and instead hints towards the way in which affiliation with a storyline is based on it “sounding right” (Hajer 1995:66- 67). In other places Hajer refers to actors who are “*for various reasons (!) are attracted to a specific (set of) story lines.*” (Hajer, 1995: 65). Here, the exclamation mark suggests at least some form of acknowledgement of the ambiguity in not accounting for why individuals are attracted to particular discourses over others. This void in what discursive affinity describes, warrants further attention. It is possible to read discourse attraction in terms of potential for serving interests, however this reduces people (both individually and collectively) to acting as rational, self-interested actors. Instead this opens up potential to further develop a relational notion of values, displaced but not eradicated in Hajer's work, which Hajer does not develop.

Difficulties concerning the attachment and affinity to some discourses over others have seen recent attempts to reference to values again within discourse coalition approaches (Di Gregorio, 2012) for as Di Gregorio suggests: “common discourse... requires at least some level of compatibility of value” (2012: 18) as opposing values would exclude a discourse coalition from developing a successful master narrative (2012: 7). It is precisely these questions of attachment and affinity to some discourses over others that suggest all notions of values cannot be relinquished. As Howarth suggests a discourse “must offer points of attachment and identification that can grip subjects in particular ways”(Howarth, 2010: 321) .

This thesis shares Hajer's important emphasis that coalitions often do not share values, however it is suggested that shared storylines promise a route to realize different value positions through equivalence built through shared opposition (c.f. Laclau and Mouffe, 1985: 127). These value positions may still emerge differently, and unexpectedly, through their process of shared discursive interaction.

The argumentative turn reflected broader post-structuralist movements across the social sciences that challenged essentialist framings of actors, politics, knowledges and cultures as discrete bounded entities, and understood these categories instead in terms of fragmentation, instability and outcomes of political struggle. Both Hajer and Litfin's account demonstrate that meaning is "inter-subjectively constituted and constantly made and remade" (Paterson, 1996: 7). In doing so they addressed many of the limitations in earlier models of science policy interaction by focusing attention on knowledge and power to denaturalize the production of meaning. They shifted emphasis away from understanding values as the neat unveiling of a master narrative to the cumulative result of micro-practices, in many cases without individual actor driven intentionality as conventionally understood. However, this move left questions of values with an unresolved paradoxical status – as both strongly present but unable to be an object of attention in analytical argumentation.

2.2 Boundary work: fact-value hybrids and the work of purification and translation

In parallel to these debates within environmental governance, a specific body of literature within STS focuses on the constitution of science–policy boundaries and the on-going work in managing these divides. The term boundary work was first used in the sociology of science to describe the demarcation by science, of science from non-science (Gieryn, 1983). However, as interest in boundaries became increasingly characteristic of post-positivist approaches to science–policy (Backstrand, 2003: 27) ordering between science and policy soon became understood as mutually constructed by science and by policy (Owens, 2012: 8) and as occurring between different types of domains: science and public knowledge (Wynne, 1996) science and business (O'Mahony and Bechky, 2008) or science and law (Jasanoff, 2006). During these accounts various dimensions of boundary work became highlighted: boundary objects (Star and Griesemer, 1989),

boundary ordering devices (Shackley and Wynne, 1996), boundary organisations (Moore, 1996; Guston, 1999; 2001; Miller, 2001a), boundary people (Hoppe, 2010; Cash *et al.*, 2002: 17) and a broader array of collaborations - hybrid management (Miller, 2001a), boundary configurations (van Egmond and Bal, 2011) and boundary arrangements (Hoppe, 2010: 121). These theoretical contributions to the study of boundaries changed the way in which the boundary as an object of study was conceptualized. Rather than a dividing line between science and non-science as two pre-existing domains, Star and Griesemer (1989) understood the boundary as a zone of objects with multiple identities. The notion of a boundary zone was further elaborated by Gallison (1999) and later defined by Star as a 'shared space' not a demarcation line (2010: 603). STS literatures focused on the processes and work performed in boundary spaces themselves to construct domains that come to be understood as science, or as policy.

Like the argumentative turn in policy studies, boundary literatures foreground practice. For Guston, it is not particular characteristics that demarcated science but rather contingent circumstances and strategic behaviours (1999: 87; 2001: 399). Focusing on boundaries as a shared space of active management removes the focus on exact sites where science and policy meet, or where science stops and policy begins, that characterise more linear 'truth to power' approaches. Instead a focus on boundaries allows us to understand the contingent drawing of boundaries in different ways, often at different times and for different purposes. This attends to the plurality and instability of boundaries and to the constructive practices of stabilising particular formations (Gieryn, 1983; Jasanoff, 1987; Bijker *et al.*, 2009; van Egmond and Bal, 2011).

Like the argumentative turn, values are in many ways central to boundary narratives that criticise any naturalised separation of science and policy. Boundary scholars that draw from a Latourian tradition ontologically rebut any natural distinction between values and facts (alongside other binary oppositions - nature/culture, science/policy). For example, Callon (1986) and Law (1991; Law, 1992) emphasise the messy middle ground of hybrid networks in constantly establishing, contesting and re-establishing fragile, multiple, contingent and transitory science-policy orderings. From this perspective facts and values, science and policy, are not separate wholes brought together, but rather domains created in part by their artificial separation (Latour, 1993). Studies of boundary work often draw attention to the way that science-policy "discourses, material artifacts, and institutions... are hybrids, complex mixtures of facts and value" (Miller, 2001a: 496). The work of purification - in making facts and values, science and policy appear separate

when in fact they are co-produced - is profiled by STS scholars who draw attention to the constant intermingling of facts and values (Jasanoff, 1990: vii; Backstrand, 2003: 38; Kleinman and Kinchy, 2003: 580; van Egmond and Bal, 2011: 123; Latour and Woolgar, 1986: 70; Wynne, 1979) and emphasise that acts of boundary work themselves involve both “judgments of fact and value” (Miller, 2001a: 493; Jasanoff, 2003a: 160; van Egmond and Bal, 2011: 118). In contrast to the construction of science as value neutral (Moore, 1996: 1594), Miller proposes hybrid management as a suitable language that “explicitly confronts and emphasizes the value-laden character of policy-relevant scientific knowledge and expertise” (Miller, 2001a: 496). As Jasanoff argues, objectivity is “operationally constructed” by multiple actors at multiple sites (2012a: 2) for when starting in the messy middle ground “it takes work to detach judgment from fact” (2012a: 9).

This work of separating science from policy, fact from value, is termed purification in Latour’s ‘modern constitution’ (1993) and refers to discursive demarcations between concepts which at the same time are being connected through Latour’s second process - translation. Translation for Latour describes the unofficial work of ‘mixing’ or ‘mediating’ between the two dichotomous poles of nature and society that enables the official narrative of separation to hold (1993: 10). Attention to the way in which translation and purification operate in tandem became foundational to STS understandings of boundary work, particularly Jasanoff’s emphasis on simultaneous separation and mediation (Jasanoff, 1990; see also Quick and Feldman, 2014; Star and Griesemer, 1989).

Translation is an important concept in the empirical narratives of this thesis. However, although translation is a central concept in the theoretical foundations of STS (Latour, 1993; Latour, 1983; Callon, 1986; Law, 1992), as Baiocchi *et al.* remark, “its definition is slippery and has received different accents by different authors and at different moments in ANT’s life course” (2013: 1). This slipperiness revolves around the tension between stability and change. On one hand, translation refers to establishing connections through equivalence (Callon and Law, 1982: 619), which is not stable but rather a constant work of shuttling back and forth (Latour, 1993: 3). On the other, translation within STS also refers to treason (Callon, 1986; Law, 2007), a sense of betrayal and dissonance (1986: 75). Law introduced the distinction between *traduction* (from Latin ‘to lead across’) and *trahison* or ‘betrayal’ to draw attention to the presence of dynamic change in that which is transferred (Law, 2007). In this attention to similarity and difference, attention is drawn to change in the information travelling as well as in

the target domain, as a result of the act of translation, leading Law to conclude that the notion of translation denies fidelity, that “all representation also betrays its object” (Law, 2007: online). This emphasis on change focuses attention on translation as a process (Callon, 1986: 75). Translation as “the means of linking one thing with another” (Harman, 2009: 15) is required precisely because the two domains are not the same, because “it is impossible to derive instantly one thing from another without the needed labour” (Harman, 2009: 18). As such, Law argues that translation “does the work of difference” (2007).

Power struggles are ever present in these accounts of translation. For Latour, (Latour, 1983) translation referred to a system of ‘making meaning’ through which actors tried “to dominate an association by making the others accept its translation” (Vernon, 1990: 345). Similarly, Callon suggested actors were able to produce “scientific” knowledge through instituting and preserving various forms of privilege (Callon, 1986: 58), drawing attention to the way that claiming status as translator creates ‘obligatory passage points’ (1986: 59) through which legitimacy of voice is secured. To perform translation is to “express in one’s own language what others say and want...it is to establish oneself as a spokesperson” (1986: 75). Callon also draws attention to the way in which translation created hegemony in the voices represented: “if it is successful, only voices speaking in unison will be heard” (Callon, 1986: 75). In both Latour’s (1983) and Callon’s (1986) accounts, translation is a strategic approach through which actors mobilise power – creating acceptance of particular views of the world over others. This is important in attending to the politics of translation, for “the result is a situation in which certain entities control others” (Callon, 1986: 75).

Translation is a struggle for meaning, which does not just describe the world but brings about relations in particular ways (Asdal *et al.*, 2007: 29). Translation is not a one off process, but an on-going struggle of power in which, as Callon describes, actors continually challenge, deny and offer alternative relations of meaning (Callon, 1986: 75). However, when used to describe the communication of science to policy, the process of translation itself is often taken for granted and deployed uncritically (c.f. Jasanoff, 2003b: 227; Hoppe, 2010: 109; Cash *et al.*, 2003; Boykoff, 2007; Jasanoff, 1997). Cash *et al* in particular mobilise translation as one of three functions of boundary work that “facilitate mutual comprehension in the face of...differences” (Cash *et al.*, 2003: 8088) yet do not interrogate what the actual process of translation entails or what the implications of viewing science policy interaction in this way might be. In his study of climate modelling

and the public acceptability of science, Wynne is critical of seeing communication failure as a “problem of ‘translation’” arguing this is itself a key part of the problem (2010: 291). This calls for greater attention to the mobilisation of the term translation in boundary work and critical attention to the blurring of facts and values it performs.

Science–policy boundary work interactions are the substance of empirical observation in this thesis. STS boundary literatures provide a useful theoretical starting point in seeking to understand the boundary making and boundary blurring practices through which hybrid knowledge forms circulate. They focus attention on the regulation and management of boundaries – asking what material and discursive processes are at work and how, where, and importantly, with what effect, are boundaries between science and policy produced? These questions help to open up the type of political questions around values that this thesis is interested in, and provide a good starting point for exploring the contingency of processes that fix particular relations of power.

2.3 Bringing STS and Argumentative accounts together and the return of values

Boundary and argumentative turn literatures connect through scholars such as Hajer and Jasanoff who found broad ontological compatibility between a Foucauldian inspired discursive approach to science–policy interaction and an STS understanding of the domains and distinctions between science and policy as relational constructed and contingent. Both boundary and argumentative science–policy approaches rejected previous realist understandings and instead sought to emphasise the messy, complex, fragmented, constructed, achieved, fluid and precarious nature of such categories and distributed understandings of the operation of power. The role of language as discursively constructing boundaries is emphasised in boundary literatures (Gieryn, 1983; Jasanoff, 1987) and the inseparability of fact and value are prominent in the argumentative approaches profiled in section 2.1.

Recently there has been a revival of interest in values within geographical literatures. Although practice theory problematized the relationship between values and action (Shove, 2010), values are once again being positioned to explain differences in the acceptance of scientific knowledge and acceptance of policy or technology proposals (Demski *et al.*, 2015), attitudes to risk (Leiserowitz, 2006), public engagement with

climate change and barriers to public action (Lorenzoni *et al.*, 2007; Corner *et al.*, 2014) to predict the propensity to act (Howell, 2013) or as a necessary target for policy strategies (Wolf *et al.*, 2013). Mobilization of values in such debates tends to draw from essentialist understandings of values in influencing behaviour, action and risk perception from psychology (Stern, 1992; Karp, 1996; Bardi and Schwartz, 2003; Weber, 2006; Nilsson *et al.*, 2004). These studies around public engagement with science in that mobilize values within geographical journals appear divorced from argumentative policy literatures.

Mike Hulme has been at the forefront of this return to values focusing attention to the way in which conflicts and different understandings of climate change are underpinned by differences in values and beliefs (Hulme, 2009). In an interview in 2005 Hulme stressed the importance of moving the debate “onto what really is, I think, the legitimate debating point in climate change which is about values” (Hulme, 2013: 83-84). While agreeing with Hulme that a return to thinking about values is necessary, this thesis suggests that any revival of the language of values needs to build upon the contributions of the argumentative turn in refuting essentialist foundations - not only because of Hajer’s work on discourse coalitions which refute shared values as the cohesive factor (see section 2.1) but also to defend the possibility of plurality as outlined by Mouffe (see section 2.6.2). However, Hulme does not elucidate a post-structural understanding of values or address the tensions around referring to values within a post-structural approach despite also turning to the work of Chantal Mouffe through the work of Amanda Machin (2013). This is a gap to which this thesis seeks to contribute – beginning to scope out how an anti-essentialist notion of values from Mouffe’s work might be envisioned and take forward value debates in way that build on argumentative critiques.

These moves within theoretical literatures have been mirrored by an interest in practitioner approaches that focus on values, including; the UK focus on segmentation in fostering pro-environmental behaviours (DEFRA, 2008) community-based social marketing (McKenzie-Mohr and Smith, 1999) and the common cause (Crompton, 2010). Engaging with this focus on values prompts attention to rearticulating a post-structural language of values with which to contribute to these debates.

There is also an intricate connection between discursive framing and what becomes possible in both argumentative and boundary literatures (whether through collective storylines or boundary demarcations). In attending to the way that science–policy

boundary work enables or restricts particular discursive value framings over others, what is understood to be possible is of paramount importance in the way that the framing of boundary work takes place. Possibility can be considered in practical terms (e.g. feasibility in terms of cost, knowhow or time); through acceptability, implying agreement by existing actors; or in terms of legitimacy, implying in lay terms a sense of what is proper through conformity with regulations, frameworks or laws. All these dimensions are likely to be important in establishing what is possible. In STS literatures and in Mouffe's political theory legitimacy is discussed, whilst in argumentative theory both legitimacy and acceptability are both referenced. Jasanoff described boundary work as producing legitimacy (1990) and so it is to discussion of legitimacy within science–policy literatures that the chapter now turns.

2.4 Science policy studies and legitimacy

Questions of legitimacy are central to boundary literatures (Miller, 2001a: 479). Discussions of legitimacy in STS are often focused on the way that boundaries between scientific and political domains establish and maintain legitimacy for expert scientific knowledge (Backstrand, 2003: 27). Jasanoff has perhaps done most to engage the STS community directly with questions of legitimacy, first highlighting that legitimacy is constructed through boundary work (as an outcome of purification). In her study of scientific advisory committees, Jasanoff concluded:

“If negotiation is the engine that drives the construction of regulatory science, boundary work is the casing that gives the result legitimacy...by drawing seemingly sharp boundaries between science and policy, scientists in effect post ‘keep out’ signs to prevent non-scientists from challenging or reinterpreting claims labelled as ‘science’...When the boundary holds, both regulators and the public accept the experts’ designation as controlling and the recommendations of advisory committees, whatever their actual content, are invested with unshakable authority” (1990: 236, emphasis added).

This extract emphasises legitimacy as a process and as an achievement of boundary work – contingent and requiring constant performance (Jasanoff, 2012a: 20). The de-facto legitimacy claimed for science through adhesion to scientific process and peer review is dependent on the on-going work of *separating* fact from values through boundary work to produce “independent expert advice” (Jasanoff, 2003b: 229). As this quotation suggests, boundary work also produces legitimacy for policy as well as science, for the

separation of fact from values becomes important to the legitimation function of science within policy (Owens, 2012: 15). A specific contribution of this thesis is to assess the way in which legitimacy is constructed through the process of translation as well as purification.

Jasanoff also drew attention to the spatially and culturally contingent nature of legitimacy through the notion of ‘civic epistemologies’ – differences in public knowledge ways observed between the USA, UK and Germany which value and legitimise differently (2005). Presenting legitimacy as both spatially and temporally contingent, serves to denaturalise it, opening up both the examination of processes and operations of power that stabilise particular forms of legitimacy. Jasanoff’s foundations in thinking about legitimacy as a context specific process of achievement, constructed in part through boundary work, is an important foundation for the empirical chapters in the thesis that explore different ways through which legitimation occurs and denaturalizes boundary demarcations over legitimacy (see chapters 6 and 7).

At the micro-scale, when Star and Griesemer described boundary objects as “objects which both inhabit several intersecting social worlds and satisfy the informational requirements of each of them” (Star and Griesemer, 1989) they emphasised the necessary accountability of such objects to both worlds. This allows them to ‘speak to’ differing audiences simultaneously, “maintaining interests” of both communities (Star and Griesemer, 1989). A decade later, Guston emphasised a similar dual process for boundary organisations, whose success depends on “pleasing two sets of principles”, those of science and of policy, such that boundary actors have “direct lines of accountability to both” (Guston, 2001: 401; Guston, 1999). This dual accountability, he argues, is the main distinguishing factor of boundary organisations from intermediary agencies or boundary spanning organisations, both of which either retain independence from either party, or defer to one over another. In both Star and Griesemer’s and Guston’s accounts, accountability does not equate to legitimacy, for as Black describes, the two terms are conceptually distinct and it is entirely possible to have legitimacy in ways that do not require accountability (Black, 2008). However, the emphasis on dual relationships in terms of accountability, interests and knowledge requirements might suggest that similar requirements for dual legitimation are also required for boundary objects. Miller takes this to be the case when he highlights potential differences in the ways in which credibility, legitimacy, and authority are accorded on each side of the boundary (2001a: 482; see also Cash *et al.*, 2002). Such processes of legitimation appear

to be required in a dual sense within both policy and science for legitimacy to hold. However little detail is provided within boundary literatures on what these specific processes of legitimation involve.

Argumentative theorists emphasise the discursive constitution of what is considered legitimate. For Litfin, Foucauldian inspired attention to the intricate connections between knowledge and power provided insight into the processes through which science is called upon to legitimate policy (1994: 13). Argumentative approaches makes two important contributions to thinking about legitimacy from which this thesis builds. Firstly, employing Rein and Shon's concept of framing, Litfin argues that scientific knowledge, being constructed discursively, already had "important political implications even before the international negotiations" got under way (1994: 10). Scientific discourses prefigure particular forms of response and "define the range of policy options, thereby functioning as precursors to policy outcomes", highlighting the role of science in constructing legitimacy for policy responses – for designation of 'legitimate' knowledge, acts "as determinants of what can and cannot be thought" (Litfin, 1994: 13).

Secondly, scientific knowledge is "incorporated into pre-existing stories to render it meaningful" (Litfin, 1994: 15). Hajer emphasised that legitimacy is constructed within discursive boundaries, suggesting

"the politics of discourse is not about expressing power-resources in language but is about the actual creation of structures and fields of action by means of storylines" (Hajer, 1995: 275).

In this quotation Hajer is pointing to the way in which discourses set the terms of possibility for action. This alignment with existing discourses is echoed by Lister for whom "organizational legitimacy can be considered to depend on conformity with dominant discourses" (Lister, 2003: 188) and Rein and Shon who suggest "the desire to do something[often leads to]'hitching on' to a dominant frame and its conventional metaphors, hoping to purchase legitimacy for a course of action actually inspired by different intentions" (1993: 151). Hajer highlights that any particular framing "makes certain elements appear as fixed or appropriate while other elements appear problematic" (1995: 54). It is these designations as appropriate or problematic that set the framework for what is perceived to be legitimate and indicates the role of policy discourses in constructing legitimacy discourses of science.

Litfin and Hajer's development of the discursive constitution of legitimate forms of science and policy is an important foundation for this thesis, drawing attention to the way that what is possible is judged within discursive frameworks. However while their connection between discourse and legitimacy is helpful, Hajer's conceptualisation of the relationship between hegemony and legitimacy is considered problematic. Hajer distinguishes 'discourse institutionalization' (defined as the solidification of discursive meaning claims through institutions and moments when actors consent to the rhetorical power of one framing over another (Hajer, 1993: 66) from hegemony, defined as the sense that "no other discourses are to be found in the environmental domain" (1995: 30). This account of hegemony appears to take the claim for totality at its word, as final – the eradication of alternatives and thereby the closure of power. This demonstrates what Goeminne has described as the "incapacity to think of 'the excluded'" (2012: 162) and suggests the reproduction of dominant relations are inevitable. Hajer's concept of hegemony might be contrasted with that of Laclau and Mouffe whose approach to denaturalizing and exposing hegemonic claims to totality and neutrality, draws attention to the always-present alternatives that are excluded by such claims. Further, in suggesting that although ecological modernisation "came to be the most legitimate way to speak about environmental problems" (1993: 50), whilst its bid for hegemony failed (Hajer, 1993: 67), Hajer separates legitimacy from hegemonic power. This division appears inconsistent with his emphasis on the construction of legitimacy within dominant discursive boundaries, prompting a need to explore further the specific relations between legitimacy and power in discursive approaches. In considering boundary work as constructing what is/is not claimed as considered legitimate, the always-present alternatives are the very substance that makes boundary practices contingent and therefore need not to be lost.

2.4.1 Legitimacy in crisis

Backstrand identified "a legitimacy crisis for modern science" (Backstrand, 2003: 29) in which previous reliance on the special status of scientific knowledge (Gieryn, 1983) and trust in and reliance on the authority of experts (Jasanoff, 2003a; Litfin, 1994: 35; Hajer, 1995: 10-11; Irwin, 2006) is often undermined by political controversy. Bijker et al have further developed this as a paradox of scientific authority in which "the more urgently scientific advice is solicited, the more vigorously scientific authority is questioned by policy makers, stakeholders, and citizens" (Bijker *et al.*, 2009). In the presence of post-

normal challenges, like climate change, in which stakes are high, knowledge uncertain and values in conflict (Funtowicz and Ravetz, 1993a) the image of a disinterested valueless science has been difficult to uphold (Jasanoff, 2003b). Legitimacy of scientific knowledge is based on the separation of fact from value is under strain and science is turning to other processes of constructing legitimacy, notably increasing civic involvement in science, turning to consensus or to policy as a reference point for legitimacy.

Response 1 – Civic participation

Civic participation as a source of legitimacy draws from Locke's shift towards "replacing the divine right of kings by the consent of the people" (Dogon, 1992: 116). The turn to increasing participation and transparency responds partly to the rise of post-normal scientific questions which demand extended peer review involving non-experts (Funtowicz and Ravetz, 1993b) and also a wider post-positivist questioning of the role of expert knowledge (Backstrand, 2003: 27). Indicative of the tendency in STS to focus on input side or procedural legitimacy, many scholars adopt a normative stance to increasing civic participation in science (Irwin, 2006; see Girod *et al.*, 2009: 3; Jasanoff, 2011a: 621; Jasanoff, 1990: 234) generating a participatory turn (Jasanoff, 2003b) in both policy practice and academic debates. According to Backstrand,

"A basic tenet in this model is to promote public use of reason, argument and free deliberation...to transform preferences, enable a new collective will and render public decisions more legitimate" (2003: 34).

Whilst there may be many reasons for wanting broader engagement in science and greater public deliberation, there are a number of problems in this response. Firstly, Irwin sees this move as a further extension of the knowledge deficit model, which posits the problems in developing a policy response to science as a lack of knowledge (Irwin, 2006). Whether the deficit is seen in understanding, representation, scientific democracy or trust – more knowledge in one way or another is being used to increase public understanding of scientific debates and rectify questions of public trust (Backstrand, 2003: 31; Irwin, 2006). This ignores previous accounts that demonstrate that more knowledge is not the critical factor in policy response failure. Secondly, several theorists argue that "participatory procedures do not per se improve the democratic legitimacy and accountability of policy-making" (Abels, 2007: 104) but instead risk "encouraging public deference to the establishment's experts" (Yearley, 2000: 107; see also Bora and

Hausendorf, 2006: 487). Indeed, Jasanoff highlights that in the case of climate change specifically “Participation in the absence of normative discussion can lead to intractable conflicts” (2003b: 243).

Response 2 – Consensus

A second response to the legitimisation crisis has been to mobilise scientific consensus in pursuit of policy argumentation and media representations in both practitioner accounts and science–policy academic debates (Oreskes, 2004; Doran and Zimmerman, 2009; Boycoff, 2007; Miller, 2001b; Jasanoff, 2013: 439). Miller suggests that “the normative weight of collective agreement helps buttress the credibility of value-laden choices” (2001a: 495). Reliance on notions of consensus is strongly criticised by scholars who point to the lack of representation of dissent and exclusion (Hinchcliffe, 2001; van der Sluijs *et al.*, 2010; Stirling, 2009). As Kelly remarks in her study of bioethics, deliberation did nothing to open up debate but rather

“ways in which procedures for consultation and the determination and meaning of consensus are negotiated....operate to prefigure “legitimate” forms of participation and deliberation. Even though panel members openly debated...[and] narrowed possible avenues” (Kelly, 2003: 354-355).

Discomfort with the possibility of a rational resolution to value plurality has led Hulme to question the focus on consensus in climate politics (Hulme, 2009; Hulme and Mahony, 2010; Hulme, 2015). Drawing on Machin (2013), Hulme argues instead that consensus misunderstands science and politics in equal measure suggesting,

“it is politically necessary for us to disagree about climate change. The aspects of climate change that really matter for human and non-human life entail debates about values” (2015: 14).

Both Hulme and Machin draw explicitly from Mouffe’s theory to contest pursuit of consensus in climate change, particularly her emphasis that not just procedurally but ontologically “every consensus is based on acts of exclusion” (2005b: 11). As Goeminne suggests, when the focus is on consensus, participation in effect means that “everybody is included as long as one plays to the consensual rules of the game” (2012: 162). Consensus itself is an ontological claim to hegemony that both obscures and naturalises - speaking for the totality as the only legitimate approach. Agreeing with Hulme (2015) and Machin (2013) that it is necessary to enable values-based disagreement in climate

change, this thesis is interested in the politics around exclusions rendered necessary in generating a claim to consensus. Appeals to consensus have largely been unsuccessful in ameliorating the legitimacy crisis, and are not just procedurally but ontologically restricting the possibility of plurality. Section 2.3 will continue discussion of Mouffe's objection to consensus politics.

Response 3 - Legitimacy according to policy

Recent attention to legitimacy has been guided by Cash *et al.*'s credibility saliency legitimacy framework (2002; 2003). In considering the effectiveness of knowledge in policy, Cash *et al.* consider legitimacy in terms of process, and define it as

“whether an actor perceives the process in a system as *unbiased* and *meeting standards of political and procedural fairness*. Legitimacy involves the belief that S&T systems are ‘fair’ and *consider appropriate values*, interests, concerns, and specific circumstances *from multiple perspectives*” (Cash *et al.*, 2002: 5, emphasis added).

Cash *et al.*'s approach is promising in its recognition of the importance of respecting diverse values and multiple perspectives. In doing so, it also recognises the way in which legitimacy is constructed differently by different groups (2002: 4), that there will be differential emphases on credibility salience or legitimacy at different times (2002: 6), and indeed differences in understanding over these terms on different sides of the boundary (2002: 8). Their approach also places importance on the perception of a system being unbiased and fair without making any claim that such a system achieves these qualities. As a result very many considerations of legitimacy in science policy literatures are framed through, or at least cite, Cash *et al.*'s tripartite framework (White *et al.*, 2010; Lemos and Morehouse, 2005; Vogel *et al.*, 2007; McNie, 2007; Kunseler *et al.*, 2015; Sarkki *et al.*, 2013).

However, there are several problems with their approach. Firstly by starting with what is salient, credible and legitimate for the decision maker, their framework naturalizes policy as a reference point for the judgment of legitimacy. Whilst this helps promote knowledge that is useful to policy, it does not enable a critical stance towards the politics involved, but naturalises the dominant policy approach. Secondly, Cash *et al.*'s procedural definition implies that if a ‘fair’ process that considers values and interests is undergone legitimacy is somehow automatic, not an achievement or outcome of struggles through power. If this were the case any values-based perspective would be legitimate as long as

the process had followed principles of procedural fairness and considered different perspectives. Reasons for why some values are able to predominate over others are left unaccounted for. Thirdly, reliance on procedural principles renders legitimacy a resource to be drawn from and what it means to be legitimate is consistent regardless of context. Yet as Jasanoff and other STS scholars have shown, legitimation is not consistent between cultures, disciplines or epistemic communities. Finally, their approach implies that consensual politics in which everyone agrees on the principles of political and procedural fairness is possible. Despite emphasis on the *perception* of fairness and lack of bias not its achievement, Cash *et al.*'s framework nevertheless draws the possibility of procedural fairness and idealised discursive participation (Habermas, 1992). As Mouffe would argue, this denies the possibility of plurality and multiplicity of value systems.

Understanding legitimacy in terms of adherence to procedural rules is helpful in explaining how knowledge becomes useful to policy. However, in stopping at the level of procedural fairness Cash *et al.*'s approach to legitimacy takes an uncritical approach to the way in which the terms of legitimacy are themselves constructed by policy makers – how, why and in whose interests they come to matter (Backstrand, 2003: 27; Lister, 2003: 178). Cash *et al.*'s account allows policy alone to set the terms by which legitimacy is assessed. It is precisely Hajer's discursively constrained fields of action that Cash *et al.* naturalize and take for granted (Hajer, 1995: 275). Several scholars have criticised Cash *et al.*'s approach practically (White *et al.*, 2010), but most engagements have focused only on trade-offs between credibility, saliency and legitimacy (White *et al.*, 2010: 231; Sarkki *et al.*, 2013) and wider political questions about deferral to policy do not seem to have been raised. Chapter 6 will explore the extent to which concurrence with prevailing science and policy values plays a role in the conferring legitimacy on boundary knowledges.

2.5 Summarizing the critique: science, boundary work and depoliticisation of values

This discussion of values and legitimacy in science–policy literatures from the argumentative turn and STS boundary work has illustrated a two-part problem – firstly the difficulty of discussing values post-structurally, and secondly a weak conceptualization of the relationship between legitimacy and hegemonic power.

Values are recalcitrant in both science–policy literatures. Although necessarily and helpfully deposed from the status of an analytical category, values remain present throughout the argumentative turn and reasons why particular discourses hold ‘discursive affinity’ over others fail to be accounted for (Hajer, 1995). Further, the language of values is once more being evoked in recent debates. Where argumentative scholars identified the inability to separate fact and value, boundary literatures emphasised their ontological inseparability. However, in practice (with the exception of Jasanoff), more attention has been directed at the production of claims to fact in STS accounts than to the functioning of values. It is suggested that while the language of discourse intended to capture a sense of values in the production of meaning in ways that do not imply an essentialist object, the ‘mattering’ of discourse has in many ways been lost. Sayer’s critique of social science for insufficiently recognizing that human relations to the world are relations of concern (2011), draws attention to the way in which Foucauldian inspired post-structural approaches struggle to address the notion of attachment and commitment to discourse, but his critical realist stance with emphasis on ethics (claims to right and wrong) is problematic for recognising value plurality. Further he pays little attention to questions of legitimation and hegemonic power.

Similarly, although argumentative theories have developed an understanding of legitimacy as discursively constructed, and STS emphasize legitimacy as a contingent outcome of boundary work constructed differently in different spatial and temporal contexts, troubling questions over the relation between legitimacy and hegemonic power remain. Recent responses to problems of legitimation, through the separation of fact and value, are being addressed through prioritization of hegemonic policy discourses or emphasis on rational civic deliberation or consensus. It is argued that these approaches, both individually and collectively, provide an inadequately critical approach to the politics and struggles of power involved in processes of legitimation. All three approaches resolve plurality of value positions through exclusion. In considering how boundary work as a process of legitimation enables legitimation of some discursive value frameworks over others, a more critical approach to the relationship between legitimation and power, particularly in the face of dominant policy discourses, is required. The role of science and boundary work in contributing to a politics of exclusion warrants greater attention and Jasanoff (Lanzarotta, 2009) Lovbrand *et al.* (2011) and Goeminne (2012) have all called for STS to think more about what models of legitimacy

are being employed. Understanding processes of legitimation vis á vis politics and power is necessary to a more politically critical understanding of both translation and values.

2.5.1 De-politicisation and science–policy boundary work

Both science–policy studies and evidence-based policy critiques highlight the way in which science often taking the form of ‘evidence’, embodying particular claims to fact, truth objectivity and neutrality that are established by the very boundary practices discussed in 2.2 and 2.3. Critiques of evidence-based policy (EBP) suggest that a focus on evidence promises “a new ‘post-ideological’ approach to government” (Sanderson, 2002: 3; Solesbury, 2001; Parsons, 2002) and claims “an ideology/value free zone” (Sanderson, 2002: 54) that transcends values debates. Parsons argued that rather than recognising “that ‘facts’ are embedded in the swampy world of values and politics and competing frames. EBP wishes to extricate them from the political/value quagmire” (Parsons, 2002: 58). As Packwood highlights, this is itself ideological (2002). In assuming science can answer any policy question (Sanderson, 2011) EBP places enlightenment values at the heart of science–policy interaction and promotes a particular vision of rationality, modernity and progress that is “not so much a step forward as a step backwards: a return to the quest for a positivist yellow brick road leading to a policy dry ground” (Parsons, 2002: 45).

Both Weiss and Head have pointed to the partisan use of evidence, more likely to be sourced when research findings are non-confrontational to the status quo (Weiss, 1998) and rarely sourced to say things can’t be done or that foundational frameworks are flawed (Head, 2008: 8). Evidence and expert advice thus becomes a way of fighting political opposition through technical means (Wesselink *et al.*, 2013: 5; Jasanoff, 2003a: 159). Extending the logic of naturalised conclusions and detached decision-making to policy seeks to “de-politicise and managerialise knowledge production and its utilisation” (Parsons, 2002: 56). This creates an official narrative of policy as the domain of value debate whilst in practice; values-based political debate is being denied² and raises important questions around the role of science in shortcutting or erasing political deliberation over values (van Egmond and Bal, 2011: 124). As Jasanoff suggests, “there is

² That official narratives of policy convey a values rich debate, whilst attention to practice reveals post-political technocratic decision making, offers an important counterpart to accounts within sociology of science and STS that reveal the official narratives of science as neutral to obscure a proliferation of values.

apparently little concern that policy issues will illegitimately be decided by scientists under the guise of technical decision making” (1987: 225).

Swyngedouw has developed this argument further in relation to climate change – arguing that an emphasis on consensus, globalised threat, and socially homogenizing catastrophic consequences, exemplifies what he and other post political theorists term the post-political condition (Swyngedouw, 2010: 221). This post-political condition is defined as “a politics in which ideological or dissensual contestation and struggles are replaced by techno-managerial planning, expert management and administration” (Swyngedouw, 2010: 225; see also Goeminne, 2012: 160). In such circumstances, Goeminne suggests that the proliferation of climate denial can be read as “a symptomatic outburst of the political in a completely depoliticized landscape” (Goeminne, 2012: 164). Mouffe is part of this body of post political theorists who resist the condition of the post-political, striving to revive agonistic forms of politics.

Boundary work is implicit in this work of de-politicisation. Firstly in continuously demarcating science as a value free sphere that provides a useful tool in de-politicising endless value disputes (van Egmond and Bal, 2011: 124). Secondly, through the role of boundary objects (and likewise organisations) in managing conflict (Star and Griesemer, 1989) and internalising differences and tensions (Guston, 2001: 402). Guston describes such boundary work as “a strategy of neutrality” (2001: 403). However, at the same time as being a tool for depoliticisation, White draws attention to the way in which boundary organisations use this strategy of neutrality to “develop decision-making options” without being “overtly political” (White *et al.*, 2010: 221) and Edge and Eyles emphasise the power of boundary work in determining which participants become legitimate (Edge and Eyles, 2013: 294). This provokes important questions around the politics enabled and concealed within boundary work.

Hess (2013) and Kleinman and Kinchy (2003) both criticise STS as a discipline for its inability to be critical of neoliberal hegemonies. Hess suggests STS is itself inflected with neoliberalist ways of thinking (2013: 178) and “lacks the capacity to develop a critical analysis of neoliberalism” (2013: 188). Kleinman and Kinchy further mount a structuralist critique of STS around two important points. Firstly they emphasises that non-science also secures legitimacy through scientific assessment, and this receives less focus within STS (Kleinman and Kinchy, 2003: 578). Secondly, they argue that the discursive participation of actors is often implied to be strategic within STS accounts, while in their

own research, discursive compliance was often habitual (Kleinman and Kinchy, 2003: 582). As Halffman suggests “Boundaries tend to become harder when they become routinized in such discursive, social, and material practices” (Halffman 2003 cited in van Egmond and Bal, 2011: 111) suggesting that patterns of practice develop habitual inclusions/exclusions of values that may be legitimating particular forms of knowledge and values in non-intentional ways. Where Kleinman and Kinchy’s critiques are helpful, their approach rests on structuralist understandings of discursive constraints. Whilst Jasanoff’s sustained critique of neoliberalism might stand in defence of Hess’s attack, increased attention to the way in which questions of power, value legitimacy and boundary work become intertwined in practice to generate and reproduce particular value systems would contribute towards avoiding grounds within STS literatures for Hess’s critique. It is proposed that turning to a Mouffian post-structuralist understanding of the production of legitimacy might offer an improved route for attending to both Hess and Kleinman and Kinchy’s important concerns.

2.6 A Mouffian approach to legitimacy and values

Chantal Mouffe’s political theory is premised on the plurality of values and offers specific attention to the relationship between legitimacy and power through the foregrounding of hegemony. This section introduces key tenets of Mouffe’s approach, summarises key criticisms of her approach and how it might be brought into dialogue with science–policy.

2.6.1 An introduction to Mouffe

Mouffe’s post-structural, anti-essentialist approach is part of a wider left Heideggarian post-foundational movement characterized by the impossibility of a final ground or closure (Marchart, 2007). As Tambakaki describes, incomplete closure allows the possibility for alternatives (2014: 3). For Mouffe it is the ability to contest, expose contingency and challenge relations of subordination that ensures “democratic politics remains dynamic and alert to instances of closure” (Tambakaki, 2014: 3). Mouffe’s political theory revolves around her specific concept of ‘the political’ which insists upon the irreducible presence of antagonism as “inherent in human relations” (Mouffe, 2000: 15). Drawing from Schmidt’s notion of a friend-enemy distinction, political identities (always collective) involve “the creation of an ‘us’ that can only exist by its demarcation from a ‘them’” (Mouffe, 2009: 550). Antagonism is eradicable because the very

demarcation of us/them always creates exclusion and prevents formation of a homogeneous political sphere (Mouffe, 2009: 550). A state in which there are no alternatives to hegemonic power would be a state devoid of the possibility for political identity.

For Mouffe, although difference and exclusion are always involved in political thinking, and hostile relations of antagonism are an ever present possibility (2009: 550), political relations are not *necessarily* antagonistic. Mouffe's attention is on the form that this us/them relation takes (how the 'them' is envisaged) and in turning relations of antagonism into relations of agonism. This distinction between antagonism and agonism is crucial in Mouffe's theory: "Antagonism is struggle between enemies, while agonism is struggle between adversaries" (2000: 16). The distinction rests on an understanding of the adversary as legitimate, a feature central to agonistic pluralism (Mouffe, 2005a: 14):

"Agonism is a we/they relation where the conflicting parties, although acknowledging that there is no rational solution to their conflict, nevertheless recognise the legitimacy of their opponents" (Mouffe, 2005b: 20).

An adversary is someone "whose ideas may be fought, even fiercely, but whose right to defend those ideas is not to be questioned" (Mouffe, 2005a: 7). Mouffe sees the task of democratic politics as turning antagonism into agonism and hence making space for plurality. Although Mouffe's focus is on the constitution of democratic politics and not on the relations with science, her thinking around legitimacy and value plurality is considered helpful in attending to the questions of the legitimizing role of boundary work in relation to the claims to hegemonic power of neoliberal policy. Without claiming to attend to all forms of power operating in boundary work, her approach to emphasizing the connection between legitimacy and hegemonic power is found to be a useful addition to the approaches to thinking about legitimacy outlined in section 2.3.

2.6.2 Value politics

Mouffe's political theory is premised on plurality of values (Elliott, 2010: 152). As Crowder observes: "there is behind the notion of antagonism the still deeper idea of 'value pluralism'" (Crowder, 2006: 7). For Mouffe differences in values are what constitutes the forms of political identification necessary for 'the political' and what makes antagonism eradicable (Mouffe, 2014: 150) as some values "are exclusive of each other" and it is impossible to reconcile all points of view (Mouffe, 2000: 15). In premising

value plurality, Mouffe explicitly draws from Nietzsche, Weber and Berlin (Mouffe cited in Bayard and Clark, 1996: 137). For Nietzsche values were never intrinsic, fixed or objective, but relational – both to other things and to the valuing subject (Mouffe cited in Bayard and Clark, 1996: 138). Values for Nietzsche both expressed an attitude towards life and were also a way of ordering (Flyvbjerg, 1998: 36). Being context specific, “values always have to be affirmed; they do not ‘exist in themselves’” (Mihai, 2014: 219). Both Nietzsche and Weber emphasised ways in which people create their own values rather than draw from naturalist categories. For Mouffe, this inability to get beyond the plurality of values demands agonism, which “nourishes and protects democratic pluralism” (Tambakaki, 2014: 5).

For Mouffe any political system involves a hierarchy of values with inevitable tradeoffs. It is these differences in possible value combinations which mean that one hierarchy cannot claim any natural superiority over any other (Mouffe in Bayard and Clark, 1996: 139), (Mouffe, 2005b: 126-129). However Mouffe’s commitment to plurality does not mean that anything goes, a charge often brought unfairly to her work (Karppinen *et al.*, 2008: 8), instead Mouffe emphasises:

“Some limits need to be put to the kind of confrontation which is going to be seen as legitimate in the public sphere. But the political nature of the limits should be acknowledged instead of being presented as requirements of morality or rationality” (Mouffe, 2000: 19).

Mouffe makes three important points in relation to values for this thesis: that values cannot be based on morality, that plural values cannot be resolved through rational consensus, and that values are only known through re-articulation.

Values cannot be based on morality

Mouffe’s specific understanding of values moves the concept away from morality and closer to politics. This is important in the defence of plurality for morals are based on essentialist identities and universal commands (Mouffe, 2005b: 122) and are thus non-negotiable (Mouffe, 2002: 11; Elliott, 2010). Understanding political debates in terms of morality would replace “the opposition between Right and Left with the opposition between Good and Evil” (Mihai, 2014: 36) leaving no possibility of disagreement among legitimate alternatives. Yet Mouffe does not equate values with politics, but retains the term ‘values’ stating clearly:

“The conflict is between values: to recognize the pluralism of values means that, necessarily, there will be conflict” (Mouffe, cited in Bayard and Clark, 1996: 138).

Mouffe’s retention of the term values, alongside passions (which she uses to describe collective affective states of attachment) and politics, (which she splits into the condition of the political and the formal apparatus of party administrations), suggests some form of goal, object or condition to be passionate about. Such values in Mouffe’s work form the grounds through which, and about which, the political condition is wrought. In this sense values describe a claim to meaning within particular discursive framings that matters, however contingently.

Plural values cannot be resolved through rational consensus

For Mouffe pluralism of values means there can be no rational resolution in politics (Mouffe, 2000: 15), for “relations of identity/difference... cannot be resolved through appeal to common reason” (Tambakaki, 2014: 3). Mouffe suggests that whilst not all conflicts are agonistic “properly political ones are, because they always involve decisions that require a choice between alternatives that are un-decidable from a strictly rational point of view” (Mouffe, 2014: 150). Mouffe finds fault with many contemporary approaches to democratic politics (aggregative, deliberative democracy and third way politics) because of their turn to consensual and rational resolution to political problems rather than recognizing value pluralism and conflict. Mouffe’s objection to each form of democratic model is in part specific, and in part collective, and is outlined in detail in Mouffe (2005b; 2005a).

Her principal concern with the Habermasian deliberative democratic approach is their turn to deliberation and rational consensus (Mouffe, 2000: 4). Here Mouffe’s objection is both to rationality and to consensus. She insists that differences in value cannot be resolved rationally because this is a universal claim that brings closure to political questions in ways that prevent legitimate adversaries and plural contestation. Claims to rationality veil exclusion and hinder agonistic debate, by defining alternatives as irrational and illegitimate (Mouffe in Martin, 2013: 124). The inability to eradicate antagonism means an inability to bring rational closure (Mouffe, 2000: 5). For Mouffe,

“The frontier that it establishes between what is and what is not legitimate is a political one, and for that reason it should remain contestable. To deny the existence of such a moment of closure, or to

present the frontier as dictated by rationality or morality, is to naturalize what should be perceived as a contingent and temporary hegemonic articulation of 'the people' through a particular regime of inclusion-exclusion" (Mouffe, 2005a: 49).

Habermas's approach in particular emphasises securing of legitimacy through rational deliberation (discussed further in section 2.5.3).

Likewise, consensus, Mouffe argues, is always partial; any claims to consensus always hide exclusion (Mouffe, 2000: 27). Drawing from Wittgenstein's emphasis on the limits of consensus she insists that

"rational... consensus cannot exist. We have to accept that every consensus exists as a temporary result of a provisional hegemony, as a stabilization of power, and that it always entails some form of exclusion." (Mouffe, 2000: 17).

Consensus for Mouffe is neither possible nor desirable, as it removes choice between legitimate alternatives, which for Mouffe is at the heart of what it means to be political (Mouffe, 2009: 551-552). Mouffe argues that despite their differences Rawls and Habermas both maintain the possibility of eradicating antagonism and both try but fail to "circumscribe a domain where consensus without exclusion is possible and not affected by the pluralism of value" (Mouffe, 2000: 8). Both negate the necessity of antagonism based on value pluralism, are blind to power and deny the un-decidability and lack of complete closure that recognises that any given order could always be different (Mouffe, 2000: 17). Consensus she argues will always be the expression of hegemony and the crystallization of power relations (Mouffe, 2005a: 49) and suggests "bringing a deliberation to a close always results from a decision which excludes other possibilities and for which one should never refuse to bear responsibility" (Mouffe, 2000: 17).

Values are only known through re-articulation

Mouffe argues that it is only through processes of re-articulation that we gain a sense of who we are and what our values are (Janaway and Robertson, 2012: 47). Values are part of what it means to identify politically (Mouffe, 2002: 10). Such identities 'can never be completely fixed' (Mouffe, 2005b: 18) but instead "are necessarily precarious and unstable" (Willems, 2014: 10). In this sense values are emergent through practice not pre-existent. Although Mouffe (2000: 17) emphasises an agonistic pluralism which "forces us to keep the democratic contestation alive [and] make room for dissent",

unlike other post-foundational theorists like Connolly who resist any form of closure she recognises the practical necessity of some form of closure and ordering – “undecidability cannot be the last word. Politics calls for a decision” (Elliott, 2010: 151). However, she encourages this form of closure to occur as a political decision that recognizes its own contingency and partiality of political claim, rather than presenting closure as the necessary or permanent resolution of tension. For Mouffe, social order always involves some form of hegemony as the institution of order in conditions of contingency (Mouffe, 2014: 151; Mouffe, 2009: 549) and, if challenged, one hegemony will be replaced by another counter-hegemonic claim (Tambakaki, 2014: 8). Mouffe therefore argues that agonistic struggle should not only attend to the de-articulation of existing hegemony but also a re-articulation as fundamental in politics (Mouffe, 2012; Mouffe, 2014: 152).

Mouffe’s own work is split into an analytical approach of ‘agonistic pluralism’ (disrupting naturalized hegemonic articulations) and a political project of rearticulating ‘radical democracy’ for the left. Radical democracy is based on agonistic pluralism and Mouffe’s own political commitment not to relinquish democracy but to transform it (Mouffe, 2000: 10). Re-articulation “captures the moment of politically constructing an alternative to the hegemonic order” (Tambakaki, 2014: 8). However, in line with her emphasis on contingency, Mouffe emphasises that the political project of radical democracy is only one such re-articulation among many, insisting that the two are not connected in any necessary relation for “different hegemonic projects can be envisaged and the outcome of the agonistic struggle is never pre-determined” (Mouffe, 2014: 155).

Mouffe’s theory is a good place to start from in considering questions of values post-structurally because she starts from a position that champions value pluralism and envisages values in ways that are neither individually nor pre-existently circumscribed. The aim of social enquiry is not to “unveil ‘true reality’ or ‘real interests’” but to demonstrate contingency and point to the possibility of alternatives (Mouffe, 2005a; Mouffe, 2005b). Mouffe’s approach starts to offer a post-structuralist understanding of values – as plural, collective, relational and discursive commitments that emerge through practice and form part of the construction of collective identity (Chilvers, 2008: 31) through which a range of meanings might be constructed, which cannot be known in advance.

2.6.3 Legitimacy and hegemonic power

Legitimacy is a central concept in Mouffe's work although often appearing as an outcome rather than a process. In thinking about legitimation of particular values, three contributions can be taken from her work. Firstly, her emphasis on the absence of an unabridged divide between legitimacy and power, secondly her emphasis on seeing alternatives and adversaries as legitimate, and thirdly her refusal to ground legitimacy in rationality.

No unabridged divide between legitimacy and power

“[T]here is no unbridgeable gap between power and legitimacy – not obviously in the sense that all power is automatically legitimate, but in the sense that: a) if any power has been able to impose itself, it is because it has been recognised as legitimate in some quarters; and b) if legitimacy is not based on a aprioristic ground, it is because it is based on some form of successful power. This link between legitimacy and power and the hegemonic order that this entails is precisely what the deliberative approach forecloses by positing the possibility of a type of rational argumentation where power has been eliminated and where legitimacy is grounded on pure rationality” (Mouffe, 2000: 14).

When Mouffe speaks of legitimacy it is both an outcome (achievement) of successful power, and at the same time a claim (recognized at least among some groups) that enables power to succeed, she does not imply that securing legitimacy in some quarters is sufficient for hegemony to be achieved without political struggle. Rather she claims that any hegemony must have a claim to legitimacy that is recognised by some groups. Here, legitimacy is not a resource to be drawn from but an outcome of processes that both facilitates and signals the success of power. There are two interconnected implications of thinking about legitimacy in this way.

Firstly it makes Mouffe's concept of legitimacy relativistic and non-deterministic. In separating legitimacy from moral judgment, there is no independent adjudicator - no third party judge (Mouffe, 2009: 556). This lack of foundation through which to determine legitimacy makes several theorists uncomfortable: Elliot suggests that Mouffe offers “no explicit means for determining what ‘constitutes’ legitimacy” (2010: 62) and Crowder critiques her notion of legitimacy for not being grounded in moral terms suggesting “If fascism achieved ideological dominance, then presumably it would be fascist values that were legitimate” (Crowder, 2006: 11). Uncomfortable as this may be,

this is precisely Mouffe's point. What is considered legitimate is no longer based on essential fixed characteristics, established in advance. Secondly it is the hegemonic discourse that sets the terms through which legitimacy is claimed (as argumentative scholars identified). As Crowder suggests "Since the current hegemony is liberal, it seems that liberal values are 'legitimate', for us now" (2006: 11). Legitimacy is achieved through the struggles of power that result both in claims to hegemony, and the claim to set the terms through which legitimation takes place without making these morally right. Without an "Archimedean point from which to adjudicate" (Kapoor, 2002: 474), any distinction between the legitimate and the illegitimate "can only be done from within a given tradition, with the help of standards that tradition provides" (Kapoor, 2002: 474-475; see also Howarth, 2000).

Legitimate adversaries

A second way in which Mouffe utilises the concept of legitimacy can be seen in her *validation* of difference – through emphasis on the legitimation of dissent and conflict (Mouffe, 2005a: 119-120) and the right of the legitimate adversary to hold a position of difference (Mouffe, 2009: 551). In both cases, legitimacy appears to refer more to the recognition of validity or right to exist than a contingent achievement of power. This might confuse the first understanding of legitimacy, for the contestability and sense of outcome from a process of power is much less apparent, perhaps suggesting that difference in values should be granted the right to exist without political struggles. However, as Tambakaki argues, While antagonism is inherent, the transformation of antagonism into agonism requires constructive work and it is in this way that Mouffe's theory triggers the work of politics anew (Tambakaki, 2014: 6). In this sense Mouffe's use of legitimacy in both contexts refers to the on-going work of construction that legitimation involves.

Legitimacy cannot be grounded in rationality

Finally, for the same reasons that values cannot be resolved through rational debate (universal claims bring closure to political questions in ways that prevent plural contestation), Mouffe attests legitimacy cannot be grounded in rationality. For Mouffe "*legitimacy is not based on a aprioristic ground*" (Mouffe, 1999: 753) but is constructed through power, and as such should remain open to contestation (2005b: 121). Argument

through rationality denies the possibility of plural positions and hence the possibility of contestation. Despite claims to neutrality, rationality will always involve exclusion and hence involve politics and power.

“When a point of view is excluded ...required by the exercise of reason; therefore the frontiers between what is legitimate and what is not legitimate appear as independent of power relations” (Mouffe, 2005a: 31).

The implication of this for thinking about legitimacy, as for values, is that any claim to legitimacy should be seen as political and contingent, not rational and necessary – further supporting the intricate connection between legitimacy and power.

The concept of hegemony is central to Mouffe’s demonstration that any existing social order (and process of legitimation) is not natural or neutral but a particular, historical, contingent claim to power that has been successful. Mouffe’s definition of hegemony, drawing from Laclau and Mouffe (1985), is “the collapse of objectivity and power” (Mouffe, 2000: 14). This extends Gramsci’s notion of presenting one set of interests as the expression of the collective will (Torphing, 2005: 163) and suggests that ‘speaking for all’ as opposed to ‘speaking for one’ is not only politically grounded, but is also epistemologically rooted in a claim to value neutrality. Neutrality and social objectivity are never given (Tambakaki, 2014: 7) but constituted through acts of power (Jones, 2014: 19). Sedimentation of hegemonic practices conceal their contingent and political nature “so that they appear to proceed from a natural order” (Mouffe, 2014: 151). Such neutrality, Mouffe argues, “is never the manifestation of a deeper objectivity that would be exterior to the practices that brought it into being” (Mouffe, 2009: 549).

What is specific to Mouffe’s approach that sets it apart from Hajer or Foucault (who also emphasise the need to denaturalise sedimented practice) is twofold. Firstly Mouffe’s emphasis on the primacy of values and connection between hegemony and claim to neutrality opens up the contestation of hegemony through *contestation of value neutrality*. Secondly while Hajer and other argumentative theorists highlight the way in which legitimacy is established within discursive frames (Hajer, 1995), they stop short of specifying the connection between legitimacy and hegemony, which in Mouffe’s account are co-constitutive, and focus instead on other forms of power. It is Mouffe’s attention to the exclusion necessarily involved in hegemony that prevents us from accepting naturalisation of this claim to power. In doing so she reveals its contingent status as a political achievement and therefore the capability for boundaries between legitimacy

and illegitimacy always to be otherwise. To speak of hegemony is for Mouffe, unlike Hajer, to point to the absence of a final ground, and instead to the contingency of a partial fixing of social order - “nothing more than a particular and contingent ordering of power relations” (Jones, 2014: 20). Mouffe’s approach furthers Hajer’s attention to the political work being performed through hegemonic policy articulations of what is or is not legitimate by emphasising the contingency of such constructions of legitimacy in ways that allow for alternatives and contestation. Both Hajer and Mouffe’s approaches may be contrasted with those of Cash *et al* who un-critically allow dominant policy discourses to set the terms of engagement within which legitimacy is assessed. Through a focus on fair terms of engagement and remaining unbiased, there are distinct similarities between Cash *et al.*’s approach to legitimacy and that of Habermas, Rawls and deliberative democratic notions of legitimacy about which Mouffe is fiercely scathing (Mouffe, 2005a: 29-30).

Whilst Mouffe’s relinquishing of essential reference points disconcerts those who feel her approach is “ill-suited to the adjudicative task of deciding between difference” (Kapoor, 2002: 473) and cannot safeguard particular values or principles by which we might want to organise our social life (Benhabib cited in Kapoor, 2002: 474), she emphasises the relinquishing of essential categories as necessary to the recognition and protection of value plurality – which is foundational to her post-structural project.

“Only in the context of a political theory that takes account of the critique of essentialism... it is possible to formulate the axioms of a radical democratic politics in a way that makes room for the contemporary proliferation of political spaces and the multiplicity of democratic demands” (Mouffe, 2005a: 17).

In disrupting the naturalised claim to legitimacy of particular discourses Mouffe opens up the possibility of challenge beyond that made possible by those who accept hegemony as securing closure. Mouffe’s conceptualisation of legitimacy, not as a resource from which natural, moral or rational claims can be made, but instead as a political process of construction through power, that both disguises its own contingent political status and sets the terms of its own definition, is a highly sophisticated contribution to understanding legitimacy from which the field of STS and science -policy would benefit. It is precisely the role of boundary work as a process of legitimation in reproducing claims to social objectivity that become the focus of this thesis. The work of reinforcing hegemony these processes perform need to be interrogated within science policy debates if the politics of boundary work are to be better understood.

2.6.4 Passions

Mouffe's concept of passions is a final concept that will be drawn upon in chapter 7. Throughout her work, Mouffe emphasised the centrality of passions to "the creation of collective political identities" as "the moving force in the field of politics" (Mouffe in Martin, 2013: 185). For Mouffe passions arise at the level of political identity formation and are neither personal nor expendable, but collective and necessary (Tambakaki, 2014: 6). Passions are affects "mobilized in the political domain in the form of we/they identification" (Mouffe, 2014: 155). Passions are collective and distinguished from more individualist 'emotions' based on allowing greater emphasis on conflict and confrontation between collective political identities (Mouffe, 2014: 149). Like argumentative scholars Mouffe understands power not as "an external relation taking place between two pre-constituted identities, but rather as constituting the identities themselves" (Mouffe, 2000: 14; Jones, 2014: 20). Power is therefore "constitutive of social relations" (Mouffe, 2000: 13) and political identities come into being through power. Passions, Mouffe argues are not something to be suppressed but instead provide the very energy of politics that "keeps individuals motivated and enables political action" (Mihai, 2014: 32).

One reading of Mouffe's use of the term values is as discursive claims to meaning that become contingently fixed through relations of power, around which passions identify. This is not the same as saying that values are essential but rather that they are forms of stabilisation, and therefore political in nature. Mouffe is interested in passions as an important route to addressing questions about how collective forms of identification are created or sustained (Mouffe, 2014: 155). The ability to mobilise them is essential to the construction of new collectives needed for counter hegemonic projects (Tambakaki, 2014: 7). Her foregrounding of passions provides another component of her critique of the rational focus of deliberative democratists, this time not on the impossibility of rational resolution but on the inadequate conception of the subject and how they act politically (Mouffe, 2014: 155). Mouffe's notion of passion is used in Chapter 7 to explain both why things matter to people and the expression of agency through alternative political voices and forms of boundary work.

2.6.5 Integrating Mouffe with science-policy thinking on climate change

Mouffe's work has begun to be recognized as an important addition to thinking about climate change through the work of Amanda Machin (2013) Mike Hulme (2015) and Gert Goemminne (2012). Machin in particular provides an important connection between Mouffe's political theory and possible models for climate change politics. Speaking from political theory, Machin focuses on why a radical democratic political approach in responding to climate change is preferable to techno-economic, ethical individual, green republican and green deliberative democratic approaches. In doing so she outlines what a radical democratic approach to valuing disagreement in climate change, rather than consensus, might look like. Rather than focusing on macro-political systems as Machin does, this thesis explores the applicability of Mouffe's work to the micro-processes of boundary operation between science and policy and to the intricate practices through which alternatives to hegemonic discursive value framings become written out. In examining the way in which particular discursive value framings are constructed, reconstructed, legitimated, and thereby enabled to circulate over others, application of Mouffe's thinking to boundary work develops a complementary way in which Mouffe's theorizing might be relevant to the politics of climate change.

The argumentative turn was in large part a challenge to the idea that policy could be value free technical process (Fischer and Gottweiss, 2012). However, the theoretical development of the argumentative turn has been strongly informed by Habermasian engagement (Fischer and Gottweiss, 2012) and shows some internal division between later Foucauldian inspired argumentative theorists (Hajer, 1995; Litfin, 1994) and those who draw more distinctly from Habermasian notions of rational deliberation (Fischer and Gottweiss, 2012: 9). Further, Rein and Shon and Healey all turn to rational deliberation to reconcile discourse conflicts (Schön and Rein, 1995: 48-49; Healey, 1993). STS responses to the legitimation crisis also turn to participatory deliberation and consensus. Mouffe is adamant that reliance on rational deliberation denies pluralism (Mouffe, 2005a: 6) and just as antagonism cannot be dissolved through rational debate, so too political questions cannot be adjudicated by standing outside of values. The tension between Habermas on one hand and Foucault/Mouffe on the other is described as "an essential tension in modernity... the tension between consensus and conflict" (Flyvbjerg, 1998: 211) with Habermas defending reason, legitimacy, justice, universality and Mouffe defending antagonism, pluralism and contingency (Kapoor, 2002: 465). There seems to

be an appetite within Latourian STS for more critical engagement with political questions, with Chilvers indicating that there is a need to open up participatory models to “diversity, difference, antagonism and uncertainties/indeterminacies” (Chilvers, 2008: 155), and Blok using Mouffe’s notion of ‘agonistic cosmopolitics’ to explore “how STS can be fruitfully informed by political theory” (Blok, 2011: 74-75). This resonates with earlier STS attention to the way that “representations, or inscriptions, contain at every stage the traces of multiple viewpoints, translations and incomplete battles” (Star and Griesemer, 1989).

Mouffe’s potential resonance with STS is perhaps strongest in the work of Jasanoff who pays particular attention to politics in boundary work (Li Vigni, 2013: 2) and explicitly provokes need for greater criticality within STS (Willems, 2014). Both Jasanoff and Mouffe criticise hegemonic practice and embrace a plurality of values, forms of legitimation and operations of power. For both Jasanoff and Mouffe “political questions are not mere technical issues to be solved by experts” (Mouffe, 2005b: 10) but the opening up of new states of being (Jasanoff, 2012b: 276) and new spaces and subjectivities for hegemonic contestation (Mouffe, 2000: 10). For Jasanoff, expertise is bound up with questions of democracy (2003a) and consensus is always a product of demarcation (Jasanoff, 2003a). Like Mouffe, the point for Jasanoff is “revealing alternatives, and liberating the democratic imagination to soar above the constraints of the immediately possible” (Jasanoff, 2012b: 20). An area of greater tension in bringing Mouffe and Jasanoff’s work into dialogue is over the role of rationality and reason in legitimation. Where Mouffe adamantly problematizes rational deliberation, Jasanoff emphasizes increased participation, deliberation and a strong role for public reasoning. This is discussed further in Chapter 8.

2.6.6 Critiques of Mouffe

While Mouffe’s approach is considered helpful, it is not unproblematic and has generated a proliferation of critiques, some of which are easier to address than others. One area of confusion in Mouffe’s work is that she appears to hold some things, described as “ethico-political principles” (Mouffe, 2000: 15) as fixed in an essentialist sense. These include for example the permanent potentiality of antagonism (Crowder, 2006: 15), conflict (Crowder, 2006: 20), democracy liberty, equality or pluralism (Jones, 2014: 15). Further, while she is against rational consensus, she relies on “*a certain amount of consensus*” (Mouffe, 2000: 15) for example in agreeing the frameworks

through which legitimacy is assessed at any one time (Mouffe, 2008: 463; Mouffe in Bayard and Clark, 1996: 135; Mouffe, 2009: 551-552). Mouffe's critics point to these as inconsistencies in her approach.

These critiques can be addressed through foregrounding Mouffe's emphasis on the acceptance of certain values and forms of partial closure as a political choice, not a necessity (Mouffe, 2000: 19). Accepting the pluralism of values is to envisage a plurality in possible systems - "different legitimate solutions to the problem of human coexistence" (Mouffe in Bayard and Clark, 1996: 139) - but to recognise that pragmatically these cannot all be realized at once. Similarly, Mouffe suggests there cannot practically be pluralism in the frameworks for legitimacy, and so any social order will involve a hegemonic relationship that both establishes claims to the bounds of legitimacy and specifies which values are foregrounded. Crucially, however, these bounds should be recognized as political not essential, and therefore always open to contestation. Mouffe's "ethico-political values" are therefore not essentialist categories, but rather political categories actively chosen. These limits to pluralism are inescapable for Mouffe (Mouffe, 2014: 151; Mouffe in Bayard and Clark, 1996: 136; Mouffe, 2000: 15) and arise because political relations are always drawn through an 'us-them' relation. She suggests:

"I do not believe it is possible to avoid excluding some points of view. No state or political order...can exist without some form of exclusion. My point is a different one. I want to argue that it is very important to recognize these forms of exclusion for what they are and the violence they signify, instead on concealing them under the veil of rationality" (Mouffe, 1993: 145).

Her emphasis on the contingency of any hegemonic order as a political achievement leaves open possibility for contestation. This applies as much to democracy as to any other political system, but in Mouffe's view democracy should be our political choice. To suggest Mouffe considers such values in an essential sense is to misunderstand her political project for radical democracy which seeks not just to disarticulate but also to rearticulate in a way that leaves open the door of contingency and political agonism. It is in this emphasis on contingency that Mouffe argues for an understanding of values not based in morality or other essentialist identities (Mouffe, 2002: 11) that preclude the possibility of disagreement (Mouffe, 2005b: 122).

Mouffe's approach has also attracted critiques that focus on practical objections to implementation. Jones suggests it is precisely in societies beset by disagreement and difference that the democratic agonistic framework might be difficult to adopt. He argues "it is not clear why the parties involved should accept the premise of an agonistic democratic framework....Mouffe does not provide us with a sufficiently robust explanation as to how this shift from enemy to adversary will come about." (Jones, 2014: 26) (2014:26). Deveaux further suggests that "agonistic democrats have so far little to say about citizens who may refuse to co-operate with other citizens, or about groups that have an entrenched interest in having a conflict continue unresolved" (1999: 5) and Rowan suggests it is the very democratic institutions over which hegemonic struggle allegedly takes place that must not be questioned (2011: 146). These raise questions around how basic agreement on the terms of engagement are set and a lack of specification in Mouffe's work over practical application of her work. Further, Kapoor draws from Benhabib to question how "freedom and justice, respect for human rights of citizens as equal and free being" might be safeguarded (Kapoor, 2002: 474). Without essentialist 'buck-stops' to debate, agonistic theorists cannot protect these values in an absolutist way but rely on a vibrant political process that attends to processes of re-articulation in ways that support democratic values. In this sense Mouffe's approach could be fairly accused of placing too much trust in the political process.

Crowder criticises Mouffe for a Foucauldian reduction of values to power (2006: 2) and suggests that "legitimacy on this view is simply 'successful power'" (2006: 9). Although this misrepresents Mouffe's own distinction between the three terms which are not able to be read interchangeably in her work, it does point to a lack of clear definition over key terms which are often left to be interpreted through her usage rather than clear specification. While many of Crowder's criticisms may be understood as disagreement with Mouffe's anti-essentialist approach, one particular critique provides a powerful challenge. Crowder suggests:

"If our values are no more than expressions of dominant power formations, then even the most radical normative alternatives we could imagine must be in some way complicit with existing structures. On this reading, the hegemonic approach, far from enabling a more radical questioning of the status quo, actually imprisons us within it" (Crowder, 2006: 12).

According to Mouffe, spaces and subjectivities for challenge are not ready made, but need to be constructed against the sedimentation of a non-neutral playing field of discursive relations – hence the political struggle. However, further attention is needed to assess whether attempts to open up spaces and subjectivities beyond dominant power formations remain entrained in dominant ways of thinking. This is considered further in Chapter 7.

Finally, several critics argue that Mouffe’s version of politics demands more rational deliberation (Karppinen *et al.*, 2008) and participation (Kapoor, 2002) not less. Karppinen suggests Mouffe’s reading of Habermas is oversimplified, citing Dryzek and Niemeyer (2006) as examples of later deliberative democrats who move away from a consensual model of the public sphere to argue for deliberation between people who accept each other’s colliding positions as legitimate (Karppinen *et al.*, 2008: 10). Crowder also suggests “deliberation does not involve the ‘elimination’ of the passions, or of passionate attachments to collective identifications. It involves only the critical questioning of those attachments and the assumptions they generate” (Crowder, 2006: 25). While, as discussed in section 2.6.5, Mouffe is not suggesting that politics should not be open to participation; in her attack on rationality she does overlook wider forms of reasoning and this is where dialogue with Jasanoff and with Sayer (2011) would benefit Mouffe’s approach.

There are clearly some difficult questions that are not finally resolved in Mouffe’s work. However, in foregrounding post-structural approaches to values and legitimacy it is suggested that Mouffe’s thinking offers potential to further support and develop Jasanoff’s contribute to thinking about the crisis of legitimacy within science–policy studies and to further address suggestions that STS as a discipline is unable to critique hegemonic neo-liberal frameworks of science–policy interaction (Hess, 2013).

2.7 Theoretical framework for the thesis

The review of argumentative theorizing and boundary work presented in sections 2.1-2.5 highlights a two-part difficulty for a study of values and legitimacy in science–policy boundary work. Firstly, the need to think about values non-essentially and, secondly, the need for greater attention to relations between legitimation and hegemonic power. This

thesis looks to the work of Chantal Mouffe to explore its potential to respond to these concerns.

2.7.1 Working theory of values

With values decentred but not eradicated either from science–policy debates or everyday interactions, there is a need to attend politically to the value commitments of discourses, frames, storylines and narratives and to the way in which boundary practices enable particular discursive value framings to circulate. In this task, further attention is required to theorising values post-structurally if they are not once more to be evoked as explanatory causal moments of closure to political debate. This is especially important given a revival of references to values within recent science–policy literatures. This thesis seeks to explore a critical politics of values that contests their naturalised status. Recognizing that while values are *not* essentialist, static, pre-existent or discretely held by autonomous individuals, the way in which certain values both fix, and become fixed, however contingently, requires critical attention. This brings into focus which claims are being positioned as values and which are naturalized as value-neutral.

Discussing values more relationally and in connection with practices of boundary working and hegemonic power, as suggested in section 1.3, involves starting less from a clear notion of value as a bounded object but more from an intimation towards the way in which things come to matter, the effects of that mattering on the science–policy boundary interactions under study, and the politics around what is enabled and precluded from being valued. Proctor argues that geography as a discipline is well placed to contribute to theorising questions of value³ because of its embodiment of tension and paradox – avoiding simplistic resolutions (1998: 236). It is from the starting point of paradox that this thesis seeks to explore questions of value at the science–policy interface, recognizing both the importance and difficulty in their post-structural conceptualization.

This thesis argues that it is possible to see values as achieved discursive categories in the same way that categories of race, gender, sex came to be understood post-structurally as discursive categories rather than essential qualities. Like these discursive categories, values are developed relationally, collectively, and emergently through everyday

³ Whilst Proctor conflates values and ethics, this PhD thesis seeks to maintain a separation between these two terms on account of Mouffe’s movement of values away from morality towards politics.

interactions, are fractured and contradictory, not coherent. Drawing from Mouffe's post-structural approach, values are considered relationally and politically – and are emergent through discourse and practice, sedimented but not stable. Questions of values and their relation with legitimacy and hegemonic power are brought into focus, through attention to boundary strategies through which normative commitments become sedimented and reproduced. The notion of sedimentation (Laclau and Mouffe, 1985; Sayer, 2011; Barad, 2007) is useful in conceptualising how values both emerge relationally and become sticky – mattering between interactions.

In rethinking values in this way, the thesis in many ways returns to Wynne's distinction in 1982 between two ways of thinking about values. In his view, there is an

“alternative tradition, which I have accepted, [in which] people's values and goals are held to be often vague, conflicting, unstable and open to persuasion. Political events and language, including technical analysis, can tacitly guide people into seeing the world in certain ways, influencing what is regarded as an acceptable value, and what is inevitable, possible, and desirable, or at least tolerable. Such processes are not merely instrumental, in the sense of conveying pre-existing ideas, but they create new cognitions and bring concrete values into public existence” (Wynne, 1982: 160, emphasis added).

Hajer suggests that Wynne's account of the Windscale enquiry highlighted the way in which rationalism and objective science facilitated the formulation of some beliefs and values, while defining others as irrelevant (Wynne 1982, in Hajer, 1995: 72). While the argumentative turn responded to Wynne's work by turning to discourse, in foregrounding discourse the emphasis moved away from these direct questions over value politics. In the revival of interest in the language of values it is important to develop this attention to values from Wynne's second understanding of values – that is itself in many ways post-structural. The notion of 'discursive value framing' provides a temporary measure, to avoid any problematic confusion with traditional understandings, instead emphasising the value implications of discourse, whilst distancing the discussion of values from an essentialist lineage.

2.7.2 Processes of legitimation

STS accounts of legitimacy as an outcome of boundary work (Jasanoff, 1990) and spatially contingent (Jasanoff, 2005) are foundational for thinking about boundary work as a process of legitimation that politically enables or restricts circulation of particular

discursive value framings. Focussing on legitimation foregrounds the processes through which legitimacy is constructed. In this thesis, attention focuses on processes of knowledge legitimation.

With increasing attention to legitimacy defined in policy terms (Cash *et al.*, 2002) and demand driven science (Sarewitz and Pielke, 2007) Mouffe's foregrounding of the relation between rationality, legitimacy and hegemony provides one possibility to take this thinking about processes of constructing legitimacy forward, and through which, science–policy's critical edge might be renewed. Although there is emerging interest in Mouffe's work in relation to climate change, little empirical work has tested its application and in this sense the conversation between the two disciplines offers productive possibilities on both sides. Responding to Jasanoff's call to focus on questions of legitimacy further (Lanzarotta, 2009) and Lister's suggestion that the 'inherent vagueness' of the term 'legitimacy' has been important in stabilising and securing particular value systems as natural and neutral (Lister, 2003: 176), this thesis attends to the specific processes through which legitimacy for knowledge becomes constructed at the science–policy interface in Scotland.

2.7.3 Translation

Translation is an important concept within the empirical narratives of the thesis, but it is being used with a specific political focus to prioritise policy meanings. Theoretically, the notion of translation is complex and contested, referring within STS to the establishing of connections between dichotomies of science/policy, culture/nature created through the work of purification. Translation is both essential to the maintenance of these narratives of separation and demanded through the work of purification itself to stabilise social order. STS narratives highlight both a tension between similarity and difference between these domains, and stability and change of meaning during the act of translation, such that the work of difference creates displacements, betrayals and treason, as well as gaining new meanings within new relational networks.

STS accounts also point to politics of translation in doing this work of difference, emphasising that such processes are on-going struggles for legitimacy that do not just describe, but bring particular knowledges and values into existence. But what is this 'work of difference' that is being performed at the climate science–policy interface? Exactly how are differences negotiated through the boundary processes, what 'work' is

undertaken, what is excluded, what is betrayed and what gained in translation? How do the processes of translation relate to questions of values and of legitimation?

Both inside and outside geography, there appears to be interest in exploring the process of translation further. Gambier encourages more empirical studies of translation from any context (2010: 240), whilst Schaffner and Bassnett suggest that

“we do not yet know that much about the actual translation practice in political institutions... What exactly happens in the complex processes of re-contextualisation” (2010: 1).

Where Latour draws attention to the importance of features not names in translation – focusing on process and practises to find commonality rather than what something is nominally called (Latour, 2013a), Fazey *et al* (2014) suggest that naming has important discursive implications. Reflections from a close examination and shadowing of the processes of translation performed through ClimateXChange aims to contribute towards better understanding the contested nature and implications of translation as a concept and the discursive work it performs. This theoretical approach involves an emphasis on the relation between micro-practice and macro understandings of hegemonic power. To this end, the empirical chapters of the thesis examine processes of science–policy boundary work in more detail focusing specifically on processes of translation and legitimation to explore the way in which practices of boundary work enable or disable the circulation of particular discursive value framings. Here a distinction is introduced between the generic theoretical understanding translation within all boundary work and the particular usage of the concept as it is being deployed within the empirical context. To further introduce these empirical narratives the next chapter discusses how the theoretical approaches outlined in this chapter have influenced the methodological research undertaken.

Chapter 3.

Researching Boundaries, Values and Legitimacy Methodologically

“Just as politics and policy are about values, so too is research. Research is always directed. Simply by the questions we choose to pursue and how we choose to work... the stories we believe need to be told, and what we consider to be a social injustice”
(Mayan and Daum, 2014: 74)

If research is a journey (Brew, 2010: 279) this chapter charts several journeys: journeys that trace knowledge circulation at the science policy interface; through theoretical literatures, to Scotland to conduct fieldwork, the journey of producing the thesis and my own journey back to academia. This chapter presents a selection of narratives that bring the myriad of choices producing this thesis into view – conceptual, pragmatic and logistical. Taking a post-positivist approach to values, constructing legitimacy, and boundary work, involves acknowledging partial, multiple, contingent and relational interpretations of knowledge and recognising that certain forms of knowledge are able to be produced through specific relationships between the researcher and the researched. This demands reflexivity over the frames, assumptions, politics and tensions that have influenced the development of questions posed and possibilities for participant responses to ensure rigor (Guillemin and Gillam, 2004: 275 citing Finlay, 1998; Koch and Harrington, 1998; Rice and Ezzy, 1999). Empirical research comes from fieldwork conducted in Scotland between 2012 and 2013, however, research design began in 2010 from within a professional context.

3.1 A place from which to start: Origins of the research

While working in climate change policy for local government in the north of England, my colleagues and I often became frustrated by an inability to generate significant policy

change despite clarity of scientific message, formal policy commitments and persistent efforts by individuals at many different levels to induce change. Practitioner conversations demonstrated recurrent frustration at endlessly coming up against the same barriers: around what was considered acceptable and what was not, what became valued, what re-framing was necessary and what discursive compromises had to be made to achieve the smallest policy 'hook'. Lack of manoeuvrability around hegemonic discursive values generated a burning sense of injustice (Sayer, 2011: 21) that particular framings were not open to debate, driving the impetus for doctoral research. During spare moments I struggled with what exactly was the nature of these barriers; what was at stake and why was the relationship with science considered important? With science appearing as a tool in both arguments for, and resistance to, policy change, struggles over values were understood at this stage to be 'played out' through science-policy interactions.

Boundary organisations and other forms of science-policy intermediaries were understood to be an important site of science-policy interaction for whom "the ability... to frame and interpret scientific knowledge is a substantial source of political power" (Litfin, 1994: 4). Where practitioner colleagues put resistance to change down to entrenched interests and ideology, both interests and ideology were considered to rest on differences in what is being valued, and both appearing to black box such questions, presenting them as end points of explanation that discourage further enquiry. This stimulated research into a more critical approach to values. At this stage, like Friedman who describes being troubled by the position of women but not knowing what to call it (1964), there was a problem of terminology. Although this thesis has been written from a clearly defined interest in values, difficulties in terminology have beset the research. Consideration journeyed between values, beliefs and worldviews with each perceived as problematic in some way, causing unrelenting challenges in framing the research.

3.1.1 Why Scotland?

Like much research, my proposal began with a hunch (Bennett, 2002: 141) and hope that academia would help me explore these questions further. In the early stages, my experiences in North-East England remained a reference point, and the research journey offered at least in part, a hope that as T.S Elliot captures:

“the end of all our exploring
Will be to arrive where we started
And know the place for the first time”

T.S. Eliot -- "Little Gidding" (the last of his *Four Quartets*)

Yet, whilst offering ease of access and depth of existing knowledge, unlike Crang (1994), I felt strongly that the mire of sticky professional relations would compromise any ability to gain perspective and clarity, and so was adamant not to conduct the research in the context of my previous employment. On the one hand, I felt I knew too much outside of research relations, making it difficult to renegotiate an identity as a researcher. On the other, I felt I did not know enough – understood in too little analytical depth, and risked falling back on shared discourses and simplistic interpretations that would prevent making strange and interrogating the voices and concepts encountered. More than this, it would be difficult for me to come to know myself as a researcher not as a practitioner in this context.

Discussions with Scottish academics and practitioners between Jan 2010 and March 2011 stimulated interest in Scotland as a case study based on the Scottish Government’s globally ambitious carbon reduction targets and changes to the process for engaging with climate science. The Climate Change Scotland Act 2009 had enshrined in legislation the most ambitious Carbon Reduction Targets by 2020 globally, and the proposed Scottish Government restructuring of interaction with climate science made the science–policy interface in Scotland an interesting research focus. Personal experiences and those of former colleagues affected the design of the research, the way that methods were used and combined, and the shape and direction of the narrative that emerged, yet these experiences have been constantly challenged at every stage of the research process and have been contradicted, as well as supported by accounts from Scotland. As Guillemin and Guillam emphasise, this relationship between researchers and research is bi-directional:

“Our research interests and the research questions we pose, as well as the questions we discard, reveal something about who we are. Our choice of research design, the research methodology, and the theoretical framework that informs our research are governed by our values and reciprocally, help to shape these values” (2004: 274).

This reflexive narrative is important to the production of the thesis for as Cook and Crang describe, some stories just don't always make the best sense told in an abstract detached way (1995: 170). Transitions in positionality, and reflexivity over the research process are further discussed in section 3.4.5.

3.2 Theoretical frameworks for methodology

Three areas of literature – STS boundary work, feminist methodologies and post-structural discourse theory – were particularly influential methodologically as well as conceptually.

3.2.1 STS boundary work

Science–policy literatures emphasise the non-linear relationship between science and policy (Jasanoff, 1990; Sarewitz, 2004; Yearley, 2009; Owens, 2010; Pielke, 2007) and the way in which the categories of science and policy are themselves understood as outcomes of boundary work not pre-existent (Star and Griesemer, 1989; Guston, 2001; Jasanoff, 1987). This re-ignited my previous interest in Latour (undergraduate dissertation 2003) and meant methodologically starting in the middle with hybrid relationships (Latour, 1993: 2) rather than presuming any fixed view over what comprised science or policy.

3.2.2 Feminist methodologies and sensitive research

Inspiration was also drawn from feminist research methodologies which problematise the politics of knowledge, public-private divisions (Nelson and Seager, 2008: 1,4), stable categories (Nelson and Seager, 2008: 4), myths of value free enquiry (Cook and Fonow, 1984; Reinharz and Davidman, 1992) and the possibility of objectivity (Edwards, 1993; Moss and Al-Hindi, 2008: 46). Feminist research instead emphasises performance, reflexivity, and multiplicity (Nelson and Seager, 2008: 4-7; McDowell, 1992) knowledge as situated and embodied (Haraway, 1991) and closer reflexive scrutiny of methods (Bergen, 1993). Feminist research has made important methodological contributions to researching 'sensitive' topics. In rejecting separation between researcher and researched feminist approaches emphasise "that we can know the world because we are connected

with it” (Hayles, 1995: 48, cited in Whatmore 2002: 1), openly acknowledge assumptions, beliefs, sympathies and biases (Renzetti and Lee, 1993: 177) explore specificity of power differences (Moss, 2007) and emphasise sharing of self during research to show solidarity (Oakley and Roberts, 1981). Research on values intersects with four areas that Renzetti and Lee suggest make research sensitive:

“a) where research intrudes into the private sphere... b) where the study is concerned with deviance and social control c) where it impinges on the vested interests of powerful persons ...and d) where it deals with things sacred to those being studied that they do not wish profaned” (1993: 6).

Sensitivity should not discourage research (Renzetti and Lee, 1993), for “shying away from controversial topics, simply because they are controversial, is also an avoidance of responsibility” (Sieber and Stanley, 1988: 55). However, identification of the sensitivity of research brings with it a heightened responsibility over reflexivity and ethical conduct discussed further in sections 3.3.3 and 3.5.

3.2.3 Post-structural discourse theory

The third important influence is post-structuralist discourse theory. As Chapter 2 articulated, this thesis adopts a discursive approach to the study of values. Analysis of discourse has arisen within a number of traditions from structuralist, Marxist, hermeneutic and post-structural social science, each with different methodological implications (Howarth, 2000; Jorgensen and Phillips, 2002: 2). Whilst linguistic traditions focus on written and spoken forms of communication through exegesis of written texts (Fairclough, 2003), Foucault shifted attention in the production of meaning from language to discourse and onto the historically situated “rules and practices that produced meaningful statements” (Hall, 1997: 44). Although Laclau and Mouffe build on Foucault’s foundations, and broadly utilise a similar notion of power and agency⁴ (Jorgensen and Phillips, 2002: 14) there are specific points of difference between the two. Laclau and Mouffe define discourse as “the structured totality resulting from the articulatory practice” (Laclau and Mouffe, 1985: 105). Building on, but in many ways going further than Foucault, Laclau and Mouffe suggest that discourse is extended to “all social practices and relations”(Howarth, 2000: 101) and all meaning is constituted

⁴ Jorgensen and Phillips position Laclau and Mouffe’s approach closer to that of Foucault than does Howarth (2000), who distinguishes a more significant point of departure, including greater emphasis on subjectivity and scope for resistance.

discursively (Howarth, 2000: 104). Taking a Mouffian approach to discourse implies that discursive meaning may be analysed through many forms of linguistic and non-linguistic activity, entailing analysis beyond spoken and written texts to also consider practices, behaviours and organisational arrangements.

Previous boundary research both emphasises language in boundary definitions (Jasanoff, 1987: 199) and diverse practices of boundary work that understand the signification of meaning beyond language (Jasanoff, 2003a; Jasanoff, 2006; Miller, 2001a). The three empirical chapters of this thesis draw from material that takes a linguistic form (speeches, interviews, reports, visual images, documents and electronic materials and observations from participation events) and non-linguistic forms (practices of boundary work, organisational and institutional arrangements, body languages and statistical or other tools of analysis such as MAC Curves) that were also considered important in “the process of analysing signifying practices as discursive forms” (Howarth, 2000: 10).

In Laclau and Mouffe’s discourse theory, meaning is never permanently fixed, and discursive struggles focusing on exclusion are strong features (Jorgensen and Phillips, 2002: 6). Howarth argues Laclau and Mouffe’s emphasis on hegemony provides an important connection between Foucault’s emphasis on the micropolitics of power and social structure (Howarth, 2010: 317) and enables greater explanation of expressions of resistance and agency (Howarth, 2010: 314). The purpose of their discourse theory is neither pure description nor to uncover deep causal logics but to analyse “the way in which political forces and social actors construct meaning within incomplete and undecidable social structures” (Howarth, 2000: 129). Laclau and Mouffe’s approach to discourse is suited to examining processes through which hegemonic claims to discourse are maintained or disrupted, how partial closure is claimed and the contingency and partiality of such claims overlooked. Consequentially, interviews were envisaged as situations through which to explore a plurality of discursive value framings.

3.2.4 Joining practitioner and theoretical influences together

Theoretical interest in exploring relations between hegemonic and counter-hegemonic discourses, and a practitioner approach to knowing the world through immersion (through professional experience of having to rapidly adapt to new policy roles, develop working knowledges and integrate into new practitioner communities) influenced research design in two important ways. Firstly, it led to an iterative and mixed methods

approach to research, which was responsive to openings and emerging emphases in the process of research. Analytical themes (such as notions of translation, evidence, expert opinion legitimacy and the distinction between the personal and professional domains) increasingly became the focus for research attention. Secondly, both theoretical interest in, and practitioner experience of, the multiple narratives involved in science–policy exchange led to attentiveness to differences between formal/informal narratives. Methods focussing on ethnographic and discursive analysis were selected and interview approaches experimented with the atmospheres and possibilities of relational interaction to try to explore these further. While different methods held their own strength, interaction between interviews, participation, discourse analysis, drawings and self-identification exercises enabled investigation to deepen beyond formal narratives and to explore discourses outside formal and official narrative accounts, as will be described in section 3.3.

3.3 Designing and conducting research

This section considers specific decisions in the planning and conduct of research – over organisational focus, research questions and methods – and discusses experiences of working with particular methods and managing positionality.

3.3.1 Choice of organisations and processes

Empirical research in Scotland centred on the work of ClimateXChange (CXC), understood as a boundary organisation (Guston, 1999), funded by The Scottish Government to facilitate engagement between climate policy makers and climate science. CXC’s work is set in a broader context of networks and forums through which science–policy interaction take place, including Parliamentary Committee hearings, policy stakeholder forums for policy preparation, Climate 2020 private sector forum, SEPA’s Environment Web, the Climsave Project, the Met Office and Sniffer (an independent charitable boundary organisation see section 4.4.2). The decision to focus on CXC came from its dedicated functionality and a future-looking mode of operation in Scotland. Nevertheless research took a situated view of CXC’s work within these wider networks and attendance at events and interviews extended beyond CXC. Science policy literatures emphasised that “interessement... cannot be understood from a single viewpoint” (Star and

Griesemer, 1989). To understand CXC it was necessary to understand CXC within a broader context.

3.3.2 Choice of methods

Participant observation, interviewing and documentary analysis were combined in the research. In reflecting on this choice of methods, this section discusses their offer or limitation to the research, and specific experiences of utilising and adapting approaches in the context of values research.

Documentary analysis

Research was to begin with a systematic documentary analysis of grey literature produced by CXC, The Scottish Government and CXC research providers. Assessing the value implications of formal written discourses aimed to understand the Scottish context and provide a springboard for more intensive interviewing and participant observation. However, initial plans for baseline documentary analysis were quickly overtaken by an invitation to be involved in CXC's first Policy Awareness Workshop in May 2012. This provided an entry point to begin empirical research through participant observation from which the research subsequently snowballed. Instead a basic review of Scottish Government policy documents, CXC and Sniffer documentation and websites of major actors was undertaken alongside initial interviews, providing a knowledge platform to inform interview conversations. More detailed documentary analysis was undertaken later in the research of a smaller set of Scottish Government policy documents and CXC briefing notes, interview transcripts participation notes and email exchanges selected for their centrality and relevance to examples profiled (see Appendix A for a listing of documents used in the final writing process).

Documentary analysis followed a broad understanding of 'text' that included written, visual (maps charts graphs graphics and pictures) and electronic based materials (Barnes and Duncan, 1992: 5; Shurmer-Smith, 2002: 123). I was initially interested in the power of visual climate change information – as characteristic of scientific activity (Lynch, 1985: 37) saturating climate change understanding (Trumbo, 1999; Trumbo, 2000) – to do work, to make present and to naturalise (Wood and Fels, 1992). Growing theoretical interest in how images and graphics of science mix facts and value judgements and communicate a scientist's objectivity (Robbins, 1992) makes it "more important than

ever to ask questions about what and how... images of science communicate" (Trumbo, 2000: 380). However during empirical research there was more focus on textual and spoken communications within the particular channels of exchange being studied. The thesis focused more on written and spoken forms of exchange, although visual methodologies were still utilised creatively as part of interviewing.

Analysis took the form of coding texts and performing basic discourse analysis, as described in section 3.5.2, and recognised that meaning is produced between texts and within the context of their circulation – through 'intertextuality' (Barnes and Duncan, 1992: 2; Shurmer-Smith, 2002: 127; Eagleton, 1983). A text always has multiple meanings and "escapes its author" (Barthes, cited in Barnes and Duncan, 1992: 6; see also Shurmer-Smith, 2002: 124). 'Intersubjectivity' or the implied 'we' and 'they' of texts, was also considered important in circumscribing political agency and involvement (Barnes and Duncan, 1992).

Participant observation

Participant observation was important on two levels: in a broad sense attending climate science–policy events across Scotland and in a more focussed way through shadowing CXC. Although a feature of all research (Atkinson and Hammersley, 1994), with degrees of participation in which distinctions between observation and participation are often ambiguous, participant observation offers possibilities to analyse interactions that are not staged by the researcher and fall outside what people might choose to emphasise during interview or written documentation (Herbert, 2000: 552). Far from an unmediated reality, participant observation knowledge is no less constructed than that of interviews (Crang and Cook, 2007: 30), but does allow research to "get beyond forcing answers to questions framed by a particular knowledge" (Bennett, 2002: 139). This was important given my eagerness to get beyond front stage narratives and explore everyday processes whose interest and significance might not be able to be explored through interviews alone.

Broad scale participatory-observation involved attending 23 climate change related policy events in Scotland, largely between May 2012 and March 2013 (Appendix A). Selection of these events was largely opportunist and dependant on advance notification – through practitioner information networks (Holyrood e-magazine, CXC and Sniffer newsletters, Sustainable Scotland Network among others) online searching or word of

mouth. In some cases, I managed to negotiate attendance at events in exchange for voluntary administrative support – welcoming delegates and issuing name-badges was a good way to become familiar with faces with whom I could strike up discussions during networking breaks. These events enabled observation of discursive value framings in practice, and of informal conversations that were often revisited in later formal interviews. Participant observation also gleaned snippets of knowledge and insights into processes that were able to be further explored during interviews. Events provided a useful way of establishing who were the influential and recurrent voices in science–policy exchange and how others perceived such discourses. They were also an opportunity to observe less censored conversations and discussions that occur on the hoof, in corridors, between sessions and the arguments and tensions that break out during round table discussions. Finally deploying an immersive approach brought familiarity of the holistic picture of actors, organisations and science–policy interactions and gained me familiarity and acceptance within the context of study that became important both in accessing events and securing interviews but also in gaining trust with participants during interview.

Guiding this early, extensive stage was a desire to become familiar with the organisational landscape and scope of science–policy interactions taking place. A database of key organisations/departments and named individuals was drafted from internet research that guided my focus, sharpening attention at events enabling scanning of attendance lists for key figures with whom to engage in conversation, and seek to arrange interviews. As expected, these events attracted particular policy actors over others, and more senior Scottish Government officers could not be approached in this way. Instead particular actors became incredibly generous gatekeepers (Dowler, 2001), providing recommended introductions and facilitating invitations to meetings. The mass of organisational information assimilated was organised and interpreted through construction of the following diagram, showing the organisations that constitute the climate science–policy landscape in Scotland and their interrelations (Figure 3.1). This was used in combination with the contacts database to target interviews and select particular processes of interaction to study in more depth.

An early invitation to participate in the first ‘policy awareness’ workshop organised by ClimateXChange in May 2012 began a sustained relationship with the ClimateXChange secretariat. This event provided a rapid introduction to science–policy interaction in Scotland through presentations by CXC staff and anecdotal discussion by researchers and

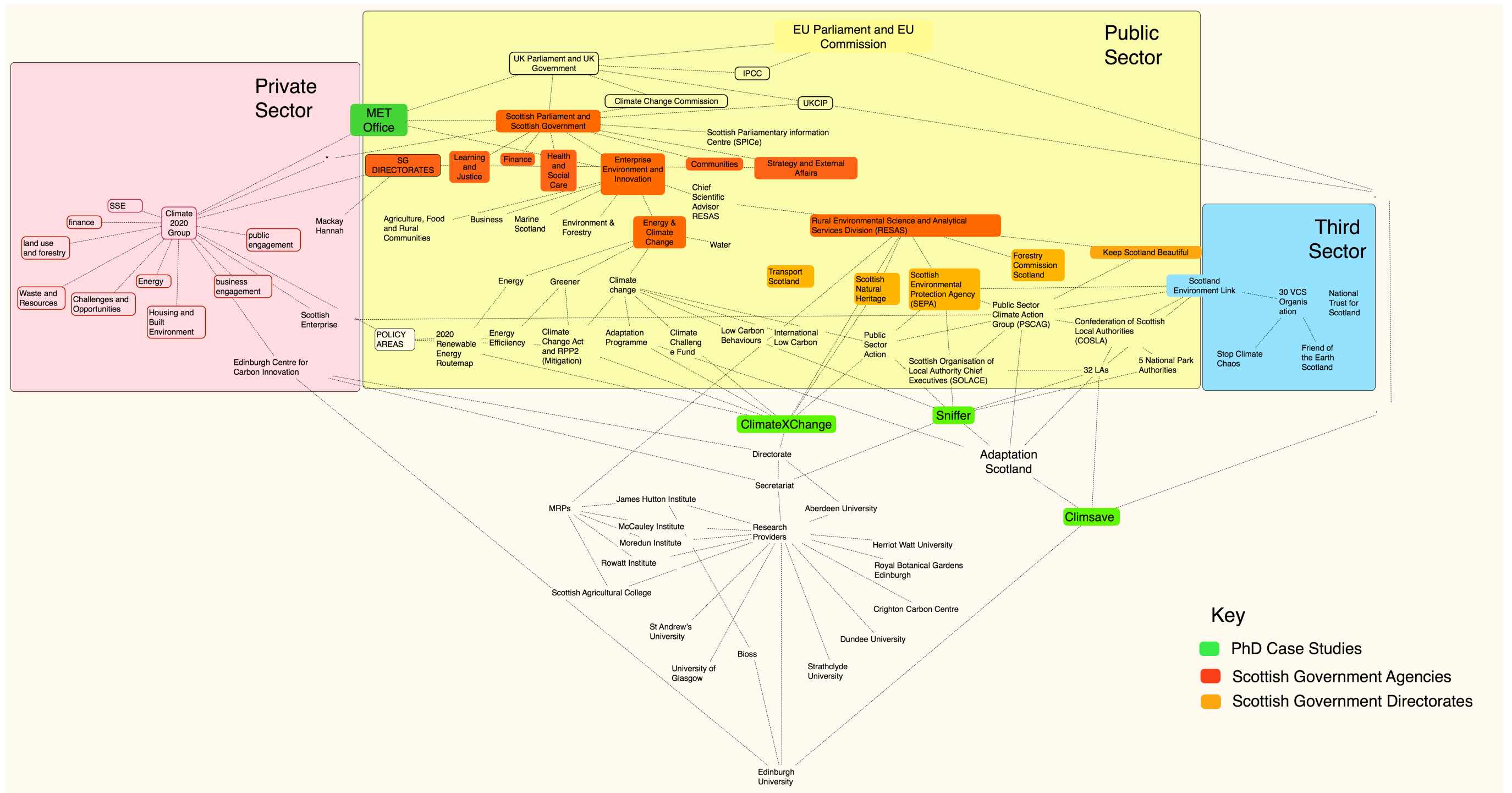


Figure 3.1: Representation of the organizational landscape of climate policy in Scotland.

This page left intentionally blank

also allowed introduction to CXC scientists. The opportunity enabled observation of one important strand of CXC's work – the training of scientists in policy 'needs' as discussed in chapter five. Participant observation was also possible during other CXC events, such as the CXC Woodlands Adaptation Workshop and the CXC Uncertainty Workshop that brought scientists and policy makers face-to-face. CXC granted me unrestricted access to many of their team meetings including 'away-days', annual general meetings and training events. The only exclusion was the Directorate meetings.

More detailed participant observation with CXC in particular, enabled a strong rapport to be developed over time recognising that access is not an initial phase of entry but a continuing process of negotiation and renegotiation (Renzetti and Lee, 1993: 102). In studying CXC's Call-Down work - the production of demand responsive briefings for the Scottish Government - participant observation of meetings between the Scottish Government and CXC secretariat were important in studying translation processes in greater depth. It was unfortunately not possible to follow call-downs from start to finish partially due to time and partly because many exchanges were done through email. In a few specific cases, I was generously provided access to email chains and draft iterations of the material produced in order to examine the negotiations over language and phrasing which goes some way to ensuring this continuity between communications was achieved. At the time of writing CXC has responded to 55 call-down briefing responses on an extensive range of topics (04/11/14 CXC website), although only 22 had been initiated during the initial fieldwork period between May 2012 and May 2013. Opportunities arose for six to be the subject of more detailed analysis either through shadowing, interviewing or access to email exchanges. The chance of shadowing and then analysing CXC call-down requests was a fantastic opportunity, and a strong sense of needing to study further the chosen examples, and more was strong, however advice over when to stop here was paramount (Kitchin and Tate, 2013: 271).

The tension between being participant as observer or observer as participant (Burns, 2000) varied depending on the situation and context of involvement. At times I was present as a silent observer (and under the Chatham House Rule), at others a full participant. During conversations at events I sought always to be clear about my status as a researcher, although the boundaries of consent were more difficult to ascertain than for those formally interviewed. Where specific conversations held at events were likely to be used in the research then a formal interview was requested to follow up the conversation in a more formalised setting of consent. Participant observation records

were captured through extensive note-taking, usually performed explicitly during conferences and or meetings, sometimes via notes taken immediately afterwards or voice recordings captured in private. Selection, interpretation and phrasing of events and descriptions in the research diaries were of course influenced by my own perspectives, but care was taken to distinguish directly captured quotes by participants and the more general paraphrasing and description in order to retain clarity over whose voice was being recorded. Although a longer period of participant observation was planned and agreed, this was unable to be undertaken for personal logistical reasons. Although a shorter period of more targeted observation means that researcher presence is often more obvious and intrusive (Judd *et al.*, 1991) a period of continuous immersion would have presented its own specific challenges. Incomplete transition in my own subjectivity – from understanding myself as a practitioner to as a researcher – could have meant it was too easy to slip back into a practitioner role, jeopardising the ability to develop a necessary tension between insider and outsider subjectivity (Crang and Cook, 2007: 37). Retaining distance through non-immersion may have helped keep a more analytical relationship with the research context. These questions of positionality are discussed in more depth in section 3.4.4.

Interviews

Interviews offered three advantages. Firstly they provided an opportunity to discuss multiple discursive value framings both formal and informal directly with actors. This built on Litfin's experience that "interviews were crucial in determining the beliefs and discursive orientations of the participants, information that is not readily accessible through publications and documents" (1994: 9). Secondly, interviews provided an opportunity to explore observations from participation or documentary sources in greater detail – such as the use of a presentation style that focussed on personalisation (Chapter 7) or the reasons why particular discursive framings are chosen (Chapter 6). Thirdly, interviews provided a chance to explore differences, contradictions and complexities in experiences (Bennett, 2002), particularly how those active in science–policy interaction "experience and make sense" of their interactions (Longhurst, 2010: 108). This function was important for understanding tacit experiences over acceptability of discursive value framings – in different settings and through different organisations – that provided clues to how legitimacy comes to be discursively and relationally constructed.

Atkinson and Silverman highlight the risk of normalising interviews as a qualitative method without critical attention to their particular epistemological commitments (1997). This serves as a reminder that interviews are not neutral (Ratcliffe, 2002: 20) and that interviews focus attention on atomised individual responses, for which “we must think of ourselves as discrete individuals with personal experiences and goals” (Silverman, 2013: 51). Quoting selectively from interview transcripts may further underplay the discursive and sequential constitution of speech acts in relation to the interviewer, the question, and the context (Silverman, 2013: 54). These assumptions pose difficulties for post-structural research where subjectivity is understood in less bounded ways. Transcribing interviews in full, interpreting interviews responses within a broader participation context and probing reflexive elaboration on specific claims and remaining alert to multiple narratives, were a few ways in which these concerns around interviewing were methodologically addressed. While the demands of writing imposed strict editing and selection of quotations, analysis focused more holistically on the wider passages of text and the way in which such quotations were always constructed through relational dialogue. In using interviews to explore wider discourses and situated subjectivities it was particularly helpful to attend to Cook and Crang’s emphasis that

“the stories they are telling are often not simply made up on the spur of the moment. Many will have been told, retold and refined on a number of occasions, in a number of places and with a number of different audiences. Therefore, instead of taking them at face value, it is important to ask questions that encourage their elaboration” (2007: 70).

Many of the interviews planned were elite interviews with professional actors in positions of power. However, traditional elite actor interview approaches tend to reify elite actors as powerful and holders of specialist knowledge (Dexter, 1970). Elite actors also operate through everyday and personal knowledges and in many cases are also disempowered in their discursive participation, having to work through constructing legitimacy, like any other actor. This knowledge and these barriers are also worthy of research. Inspiration for interviewing was therefore drawn from a number of approaches including Ratcliffe’s distinction between active interview, strategic interview and creative interview approaches (2002: 21-24) and Kezar’s theoretical review of elite interviewing, feminist interviewing and narrative enquiry (2003), which was particularly influential. Instead of seeing the researcher as separate from the researched Kezar seeks to bring feminist and narrative enquiry approaches into elite actor interviews to explore more

relational, committed, mutual, reflexive and egalitarian interaction (2003: 400-401). This provided inspiration in designing the interviews in this research with an emphasis on establishing two way relationships and trust, reflexive questions, developing mutual reflexivity, employing self-disclosure, empathetic listening and allowing the focus of the interview to be set by the interviewee as well as the interviewer (Kezar, 2003: 406-407).

In total, forty-one interviews were conducted with actors from climate science, climate policy and boundary organisations in Scotland. A full list by professional title is included in Appendix B, but can be summarised as follows:

Category	Number of Participants
Scottish Government	6
Scottish Government Agency	4
CXC Directorate and Secretariat	5
CXC Researchers	12
Sniffer (2 counted as CXC secretariat)	4
Other (non-CXC scientists, NGO, Private Sector)	10

Interview participants were selected partly from desk-based identification as key actors associated with CXC and partly through prominence of particular figures during the empirical encounter. I tried to first meet participants at events or work through personal referrals. This style of approach was considered important, as the type of interview discussion sought was one that relied on a degree of trust and openness between interviewer and participant, more likely to be achieved on a second or third meeting. Ensuring the interview was not the first face-to-face engagement went some way to enabling more familiar professional interaction. Snowballing was used at the end of many interviews in which participants were asked for recommendations of people with whom to speak. Interviews were conducted either at participants’ workplaces or in coffee shops, as chosen by participants. Given the sensitive nature of some of the discussions, I was keen that participants felt as comfortable as possible, and there are advantages and disadvantages to being on/off site. Interviews were recorded and later transcribed. Participants were not offered confidentiality although it was suggested that the aim of the research was not to name people personally, participants were made aware that their organisation would likely be identifiable and sometimes their role specified.

Semi-structured approaches were chosen offering a balance between strategic direction and flexibility to respond to participant narratives (Burns, 2000; Longhurst, 2010: 107). Rather than a list of questions, a one-page mind-map was preferred as an interview prompt, which was designed personally for each participant in advance of the interview. Although there were common themes, no two interviews were identical, but were conceived more as a strategic conversation than a predefined set of questions to be explored systematically (as demonstrated by the two example interview schedule mind maps provided in Appendix C).

Generating this mind map involved desk-based participant research in advance of the interview. This drew from 'strategic conversation' interviewing methods, which emphasise the importance of substantial research prior to interviews (Ratcliffe, 2002). Prior research was not 'substantial', but basic desk based research of professional and personal, policy or scientific involvements did provide a number of advantages, encouraging participants to provide more sustained and detailed answers, in ways moving at least part way towards peer conversations. While skimming over such basics may have risked missing participant's own accounts of basic roles or leave either their or the researcher's assumptions unpacked, this risk was ameliorated by referring to such knowledge during the interview in ways that opened up the possibility for elaboration or correction by the participant. Similarly concepts that participants used habitually and often recurrently – such as notions of 'translation' and 'evidence' – were also noted during the interview and returned to for further questioning later in the interview process.

Background research also created snippets of information that were useful in stimulating more engaged discussions during the interviews. In one instance discussion of a personal interest in systems thinking from one participant's LinkedIn page opened up a conversation about policy officer bias that other interviewing strategies had not engaged (Interview SG4). In another instance decisions over the style of presentation approach developed an exceedingly valuable conversation about personalisation that is detailed in Chapter 7. As Schoenberger notes familiarity with the context of operation also allowed contradictions or differences in the interviewee narrative to be spotted and further explored (1991). Interviews can only "scratch the surface of an interviewee's life" (Crang and Cook, 2007: 73), so Kitchin and Tate recommend that interviews are situated within a longer period of engagement (2013: 234). Timing interviews with central actors towards the end of a period of participation made atmospheres more familiar and

allowed discussion of events from the longer period of participant observation. Follow up informal interviews (not recorded) with key staff also helped to situate the interview within a broader frame and longer sequences of interaction.

3.3.3 Exploring values and legitimacy construction – problems and strategies

Direct discussions of values was expected to be difficult because of the sensitive nature of the questions being asked, the departure from everyday modes of thinking and perceived importance of neutrality to scientific, policy and boundary actors. Fischer and Forester suggest the importance of storytelling and narrative description from which values can be later interpreted (1993) and so participant narratives were encouraged through asking about life histories, frustrations, challenges and using familiar tropes such as “what keeps you awake at night” (Ratcliffe, 2002: 25). Participants were also asked to talk through examples in their work and give accounts and descriptions of processes that might appear mundane. This approach was useful in exploring questions of value for as Forester suggests:

“If we listen closely, not to the portrayals of fact in these stories but to their claims of value and significance, we discover an infrastructure of ethics, an ethical substructure of practice, a finely woven tapestry of value being woven sentence by sentence” (Forester, 1993: 199-200).

Kaplan argues that such “stories remind us of what matters and what is at stake” (Fischer and Forester, 1993: 12). Discursive values that were excluded from mainstream narratives also often became manifest in personal narratives. This is not to suggest that such values are personally or discretely held but rather that, in their exclusion from public discourse, the personal domain was one place in which alternative values became apparent. Exploring personal dimensions therefore often helped to get at instances of exclusion or differences from the mainstream discursive values that could then lead to further delicate questioning.

One challenge of using life histories and stories is that people tend to make sense of their lives through specific events (Davies, 1999: 64) and do not easily vocalise the effects of discourse (Antonesa *et al.*, 2006). However, such narratives can also “show how people actively (and sometimes knowingly) take up positions in certain discourses, and how they are (interactively) positioned by other people, and by social structures and discursive

practices” (Antonesa *et al.*, 2006: 24). Forester describes the way in which attention to such narratives is helpful in exploring values, but moreover questions of constraint and possibility:

“The challenge we face... is to do more: to listen carefully to practice stories and to understand who is attempting what, why and how, in what situation, and what really matters in all that. That challenge is not just about words but about our cares and constraints, our real opportunities and our actions, our own practice, what we really can, and should, do now” (Forester, 1993: 202).

However, this delicate questioning demanded from the interview a relatively high level of openness by the interviewee, around issues such as where the boundaries of acceptability lay, the type of legitimacy at play and the role of values in science and in policy – at moments where neutrality was often publically foregrounded. In some ways, the relative anonymity of the researcher from outside the Scottish context may have provided an easier context to discuss these issues than someone closely involved, but on the other, a level of familiarity is often required for interpersonal trust to develop. Early interviews remained quite stilted and formal and it was difficult to get participants to relax and speak more informally in conversations beyond the official organisational narratives. Direct questioning in some cases was difficult due to exhibited discomfort of participants. Such discomfort may have been due to a number of reasons: unfamiliarity with talking about values, lack of reflexive awareness over discursive values, lack of clear or strong values or difficulty identifying them, perceived concerns over acceptability of expressing values in a professional or personal capacity, or doubt in their own authority to comment on professional positions.

Despite attention to fostering trust, a few early failures to open up conversations prompted inclusion of a number of techniques during interviews to try to create an atmosphere more conducive to frank and informal discussion. This drew from what Ratcliffe refers to as creative interviewing to move past formal accounts (2002: 22) and relied on understanding interaction with participants through notions of front stage and back stage narratives (Goffman, 1959). Recognising front and back stage narratives takes seriously the plurality of discursive constructions with which we operate in our day-to-day lives. Rather than any sense of a ‘real story’, neither is more ‘true’ than the other, but each operates in different spaces of conversation. The challenge was to open up spaces during interview that were able to bring backstage narratives centre-stage.

Recognising plurality of narratives is important for opening up questions of discursive participation and framing and understanding how certain discourses are made visible and others remain hidden. Three techniques were incorporated into interviews with the intention of allowing conversations around values to be staged.

Using drawing as an interview methodology

Introducing a drawing exercise was one way to change the atmosphere of the engagement. During interviews participants were asked to visually represent 'what climate change means to you' and to talk through their drawing as part of the interview. This drew from a number of studies that have explored questions of value and views of the world through drawings both with adults (Bendelow, 1993: 215; Longhurst, 2010: 107; Tolia-Kelly, 2007) and often with children (Matthews, 1992; Barraza, 1999; Owens, 2000). Drawing offered a way of exploring more spontaneous forms of association with climate change, and in many interviews succeeded in opening up conversations around discursive values in a relaxed non-threatening manner. Stanczak drew attention to the methodological contribution of visual methods "deepening rapport can unlock what otherwise might be closed off" (2007: 13). Although sometimes brief, participants were usually willing to elaborate on their drawing and such discussions highlighted discursive understandings of climate change, which had not otherwise been engaged in conversation. Understood as no more real than front stage accounts, these other discursive understandings of climate change were also understood as no less real in their effects on science policy interaction.

The use of drawing took inspiration from Pink's use of images within broader ethnographic practice (Pink, 2001: 11) which is part of a post-positivist revival in visual methodologies during the 2000s (Pink, 2001; Rose, 2001; Stanczak, 2007) and contrasts with previous uses within education and psychology research, where drawings are produced for the purposes of psychological interpretation using Jungian visual methodologies (Prosser, 1996). Drawing during interview practice was used for its influence on the atmosphere of interview discussion rather than as a product from which interpretation could be drawn. Drawing offered a way of opening up discursive space for engaging with dimensions of discursive understanding not otherwise being profiled (Stanczak, 2007). This developed "a richer relationship with views, politics and experiences beyond the restraint of written and oral practices" (Tolia-Kelly, 2007: 132). At first the exercise was introduced at the end of the interview, however I noticed that

participants became more talkative, engaged and open after the exercise, so began to experiment with increasingly introducing the exercise sooner in the interview process. The effect of drawing on the interview relationship is noticeable within the interview transcripts with participants talking much more intensely, much more personally afterwards and in one case the experience of drawing had quite an emotional effect on one participant (see section 3.6 on ethics).

Self-identification statements

A second exercise introduced into interviews was a self-identification exercise in which participants were asked to select up to ten from thirty discursive statements on climate change most significant for them. I had been subjected to this method in Shaw and Maythorne's research on resilience (2012) and found it an effective, interesting and non-threatening method for prompting reflection on terms. Thirty statements taking particular discursive framings of climate change were generated from academic, grey and activist literatures with a wide range of intentionally value rich connotations. Very quickly, a scientist asked 'do you want me to do this in a personal or professional capacity' which alerted me to the division in subjectivity between a personal and professional. That this scientist was uncomfortable about not having had this clearly defined, alerted me to the significance of this division among the scientific community as discussed in Chapter 7. In a wavering moment of indecision, immediately understanding their dilemma, I asked them to do it for both and hastily amended the form to include two boxes. This began a more detailed examination of the perceived importance of a personal and professional division and the differences in discursive framings of each that had not been possible through the method of drawing. The exercise was, like drawing, designed as a qualitative aid to discussion, not a questionnaire for quantitative analysis. However, there are distinct patterns in the selection of discourses that are expressed personally and those expressed professionally. Whilst any form of quantitative interpretation of these patterns would not be statistically robust and so has not been included in the thesis, this indicates an interesting avenue for future research around how and why differences between personal and professional discursive framing occurs.

Pushing boundaries

In order to prompt conversations over acceptability and legitimacy, which are often tacit or semi-conscious, it was necessary to scope out where the boundaries to acceptability lay. One way to do this was to play devil's advocate or to find moments of discomfort in narratives. As well as strategies to put people at ease and open up I therefore also found myself trying to find these moments of discomfort that indicated the boundaries of discursive acceptability. Body language was useful in identifying where boundaries of comfort/discomfort lay and note-taking during interviews or recording verbal reflections afterwards helped to note when changes were observed.

This strategy arose spontaneously from an experience early in the research, which resulted in an interview termination. It was the first interview of the research, and bravely I had requested to interview a scientist who had not been afraid to sustain a pronounced objection at the first CXC Policy Awareness Workshop about the extent to which the session ignored the role of 'evidence'. I was interested in his antagonistic stance and forthright position against the direction that CXC were advocating. Half an hour into the interview I happened to ask innocuously whether his decision not to do communication of science was mere pragmatics or whether he felt uncomfortable in adopting this role. Unfortunately, the interview broke down at this point and was terminated as his request as he suggested he was "not prepared to discuss feelings" and had actually become "quite uncomfortable by the whole conversation" (Interview CXC-R1). After endlessly replaying the recording and agonising over my error, I concluded the discomfort told me more about his boundaries of comfort than any fault in my questioning. This event taught me about perceived legitimacy and boundaries for as Nairn et al have highlighted, failures in interviews help us to find out more about who we are in relation to the people we research (Nairn *et al.*, 2005: 4). His apparently quite extreme sensitivity about notions of detached and neutral science created a very different boundary from mine, and it was my lack of sensitivity to where his boundary lay that had been at fault. Whilst he gave little warning, I carelessly walked into the disaster quite unaware. The experience taught me sensitivity to differences in boundary drawing practices and these became incorporated into research. Gradually as my interest in boundaries and constructions of legitimacy developed, and confidence had been recovered from this first interview experience, I began to gently experiment with the boundaries of comfort to explore where the boundaries over acceptability lay.

This builds from a number of similar approaches in which researchers deliberately do the wrong thing to understand intricacies of situations (Crang and Cook, 2007: 73, citing Fusco, 1994, Garfinkel, 1984 and Giddens, 1984, 1991), and highlight that blurting out accidental and misphrased questions might not be a disaster but lead to interesting responses (Crang and Cook, 2007: 72). Rein and Shon's encourage that "phenomena that hamper an empirical epistemology of policy discourse must become objects of study in themselves" (Rein and Shon, 1993: 153). The original feeling that had indicated where my own learnt boundaries lay remained important, not in naturalising the boundary location (as previously), but in allowing a gentle probing without trampling unknowingly into unacceptable terrain. Increasingly questions were carefully woven into the second half of the interview that became playful in pushing these boundaries of discursive space to test for where limits to legitimacy lay, whilst still maintaining a dialogue not an interrogation (Valantine, 1997: 111). A delicate balance was needed in exploring both an opening up through trust and a testing of boundaries within the same interview, as each strategy potentially works against the other. In practice however they often worked together in an amicable way, allowing greater scope for boundary testing where there was greater ease in the relationship (although this of course affected the interpretation of where boundaries lay).

Experimenting with these three strategies provided reflective learning about the flexibility of discursive space that an interview can explore and the importance of interpersonal delicacy in affecting the possibility of some types of conversation over others. In practice experimentation sometimes worked better than others and if the research was conducted again, repeat interviews would enable a greater level of trust to be built up over time that may reduce the pressure and risk of such attempts during a first encounter. These experiences of interviewing and the necessary adaptations to the methods employed generated reflexive learning around the use of interviews to explore sensitive subjects.

3.3.4 Positionality

Questions of positionality are always important (Skelton, 2001), however my positionality as a researcher was particularly foregrounded by immersion in a research context when transition from a professional to an academic subjectivity was still incomplete. Transitioning identity from practitioner to researcher illustrates Cook and Crang's observations that: "research is an embodied activity that draws in our whole

physical person, along with all its inescapable identities. What we bring to the research affects what we get” (Crang and Cook, 2007: 9). My background as a professional practitioner in climate change policy has shaped the process of doctoral enquiry in both positive and negative ways. During early stages of research I still understood myself as a practitioner. With experiences of policy interaction fresh in my mind, research encounters felt starkly superficial. Whilst it was recognised that a fully insider position would never be possible (Dowler, 2001: 153) these feelings drove a focus on becoming integrated in the Scottish policy events circuit, to try and establish trust and overcome perceptions of being a ‘student’ outsider just doing a ‘project’, which were perceived to stand in the way of serious professional conversations. Yet, at the same time, I was trying to develop and embody a critical approach, denaturalising past assumptions and challenging experienced connections that enabled different forms of knowing not possible as an entrenched insider. This required distancing and an outsider perspective. Balancing these two demands generated tensions in subjectivity that played out in often-conflicting ways in the research.

Positionality also involves the research participant’s view of the researcher (Edwards, 1993: 184). Striving to be accepted within the Scottish science–policy community in fact worked very well. I became recognised and greeted from meeting to meeting, and within CXC was even given access to parts of their project management systems via the TeamworkPM software. At meetings CXC staff were keen to play down my status as a researcher often presenting me as a member of CXC staff (presumably to minimise my intrusive involvement at sessions). This presented distinct research challenges as I struggled to avoid covert research and be clear about where boundaries of permissions lay, without jeopardising the relationship with CXC. CXC were also keen to draw on my outsider perspective – asking me to help facilitate, as well as to observe, the first policy awareness workshop and to get my professional response by way of feedback afterwards.

Feminist researchers have challenged Merton’s insider vs. outsider distinction (1972), by emphasising instead a plethora of relationships with participants which often dissolve clear boundaries between researcher and researched (Chase, 1996: 49). Just as membership of groups does not complete similarity so difference does not apply in all respects (Dwyer and Buckle, 2009: 60) and so some ‘lines of identification’ will come in and out of focus for some participants over others (Crang and Cook, 2007). Mies (1999) advocates for ‘conscious partiality’ of identification with participants. Where, initially

trust was perceived to be secured through becoming as much of an insider as possible (Dwyer and Buckle, 2009: 58), in hindsight, these assumptions were problematic and it was recognised that trust can be earned in many ways during research, including through the role of an impartial outsider. Trust is also not a one-off agreement but is continually negotiated (Brewer, 1993). From seeking to be a pseudo-insider, I travelled a journey that challenged my assuredness that being an insider was either possible or desirable, and came to value my position between insider and outside perspectives (Dwyer and Buckle, 2009).

During interviews, subjectivity and disclosure were managed dynamically and relationally, playing up or down different facets of experience (Bennett, 2002). Sometimes experiences were shared to foster connection and other times downplaying to prompt participant explanation. During one interview with a policy official who made reference to mainstreaming, I used my previous work experience and new research role in combination to caveat what might otherwise seem too basic a question – asking “okay so this idea of mainstreaming then, I mean that’s something I’ve come across in the work that I used to do but can you, can you elaborate a bit on what that means here” (Interview SG1). Silverman raises concerns that an interview “demands subjects who are happy to confess their innermost thoughts and emotions” (2013: 51). I was acutely aware of the demands I was making and this led to the decision to sometimes reciprocate and share my own experiences during appropriate moments to make participants feel more comfortable. For example, toward the end of an interview in which the participant began talking about why she was passionate about climate change and the difficulty of pinpointing where such attachments came from, I shared a story about my own childhood and early ambitions that offered a parallel example. The interview continued offering a relaxed discussion of values in the interpretation of evidence, and the role of experts in drawing conclusions, that was arguably facilitated by establishing this common ground (Interview CXC-S1). This recognised that interviews are staged products of personal interaction between two people and set a tone of sharing rather than extraction. However, I was careful not to let my own experiences be the starting point for conversations, but rather to play only a supporting role for the discussion of participant contexts.

Kezar suggests that although self-disclosure is often understood as a strategy to lower the status of the researcher to find common ground with their participant, it may also be used to raise the status of the researcher to be seen as a professional equal (Kezar, 2003:

406). Interviews as “strategic conversations”(Ratcliffe, 2002: 19; see also Van der Heijden, 1996) employ mutual respect and understanding to generate conversation among peers (Ratcliffe, 2002: 24). Without trying to overstep my limited experiences (and certainly peer status was not possible with more senior figures), some interviews demonstrated evidence of peer exchange. For example, one policy officer included references to my previous work – “well you’ve worked in policy...” and “you’ll know this from your previous job” (Interview SG1). Whilst reciprocation may have enabled a particular type of conversation to take place, explicit attention was given to making sure the participant’s position was fully elaborated and not automatically equated. In the delicate balance of establishing shared ground, in order to foster trust, it was also important not to assume false shared ground where no such common experience existed. Although I tried to be vigilant, participants did at times challenge assumptions. Luckily because of the inverse power dynamics, participants felt comfortable in quickly correcting me where my assumptions were misplaced.

While post-positivist approaches value the researcher’s “life experiences, values and ways of viewing the world” (Antonesa *et al.*, 2006: 37) these need to find a conscious balance in the research to prevent these perspectives overpowering the research. Too much reliance on previous experience can mean researchers have “difficulty separating it from that of the participants” or worse, enthusiasm can prevent consideration of certain aspects (Dwyer and Buckle, 2009: 58; see also Kanuha, 2000). Throughout the research, it has been important to find a balance between utilising the advantages of prior experience to negotiate access, in interpersonal interaction and interpretation of events without assumptions being misplaced. This has required constant attentiveness to difference, drawing from Skelton’s suggestion that

“to acknowledge, respect and work with difference means that you first have to recognise the many differences that exist between yourself as researcher and those you want to work with, reflect upon what they might mean, and then think through how you... make them part of the research” (2001: 90).

Dwyer and Buckle conclude that “the core ingredient is not insider or outsider status but an ability to be open, authentic, honest, deeply interested in the experience of one’s research participants, and committed to accurately and adequately representing their experience” (2009: 59). Strong personal investment in the research required constant attentiveness that research was not merely used to voice my position through the voices of others and the implications of omitting personal disclosure were kept in balance with

their inclusion. Given the difficulty involved in exploring perspectives that were traditionally off limits, there was a need to construct what Stoudt has referred to as 'safe spaces' (2007). To demand disclosure without mutual reciprocation in these instances felt unethical. Although personal experiences were shared, it was considered important to keep any expression of personal values out of interview conversations to avoid setting a particular framework for what might be perceived as legitimate within the interview conversation, or artificially encouraging participants to express or withhold particular positions. By being reflexive and challenging tacit knowledge (Polanyi, 1958), these experiences have sought to be employed to enable stories from Scotland to be given greater not less chance of being heard.

3.3.5 Disclosure and transparency

During introductions and formal interview requests partial disclosure was adopted, balancing an ethical commitment to transparency with a desire to explore if, where and how values were important without pre-informing participant responses. Research was therefore framed in terms of the science policy interface, rather than the role of values, unless questions of values had already arisen in previous conversations. If and when questions of values were raised I made clear that these were areas that interested me in order to further enable informed and focussed discussion. In contrast I offered full disclosure about myself and my own previous experience, partly in compensation for only partial transparency in the research and partly in an attempt to approach the status of peer conversations.

3.4 Analysis and producing the thesis

Often described as an art the journey between 'data' and 'narrative' was attempted through processes of description, classification and making connections (Kitchin and Tate, 2013: 229, 231). Interviews were transcribed and coded with NVivo – twenty two were selected for full transcription using full annotation (Poland and Pederson, 1998), the remainder selectively transcribed. Nine of twenty participation events were also selected for close analysis and manually coded in paper format. Finally discourse analysis was performed on selected documentary sources, transcripts and email records as described in section 3.5.2 below. The self-identification and drawing exercises underwent specific coding and analysis though this data was little used in the write up.

The intention of coding is to “make analysis more systematic”, minimise cherry-picking and “build up interpretation through a series of stages” (Jackson, 2002: 202). A mixed approach to coding was used in which both emic and etic nodes were ascribed. This created a diverse and dense set of nodes, reflecting both a strong sense of concepts important to research participants and concepts already decided to be important by the researcher (Kitchin and Tate, 2013: 239). A bottom-up emic approach to coding was useful in assessing the relative importance of concepts within the research setting. However, this was both time consuming and created an overly complex node-hierarchy that became quite overwhelming. Several revisions of coding in which codes were condensed and node hierarchies strengthened to aid clarity took place, but future coding would take a more emic approach to speed up and create greater focus and manageability. NVivo codes “break up the data into constituent parts and then place them into similar categories or classes” (Kitchin and Tate, 2013). This encouraged attentiveness to the different ways in which terms were being used, but there was a growing dissatisfaction with the way that such categories “fractured the field of experience” (Crang and Cook, 2007: 148). In most cases the quotes had to be retraced to their original transcription context for analysis. NVivo served more as a useful data management tool. Connections between codes, interpretation of meanings and exploration of contradictions and fractures in the narrative emerged more through the process of writing with corroboration between the emerging narrative and data (Kitchin and Tate, 2013: 253) which is always dialogic (Crang and Cook, 2007: 152).

3.4.1 Analysing discourse

Laclau and Mouffe discourse theory offers few specific methodological tools for analysis (Jorgensen and Phillips, 2002: 24; Richardson, 1996: 224; Howarth, 2000: 112, 316). Howarth goes some way to interpreting what a Laclau-Mouffe discourse theoretic methodology might involve suggesting their approach to discourse is based on a notion of articulatory practice (Howarth, 2000: 102) in which meaning is always only partially fixed through ‘nodal points’ (Laclau and Mouffe, 1985: 113). With fixation only ever partial, and a surplus of meaning that enables articulations to be always contingent within systems of meaning that are never closed, Howarth emphasises the need to “delineate the historically specific rules and conventions that structure the production of meanings in particular historical contexts” (Howarth, 2000: 128) and examine how fixations of meaning “endeavour to impose order” (2000: 102-103). The purpose of

discourse analysis is then to examine “how, under what conditions, and for what reasons, discourses are constructed, contested and change” (Howarth, 2000: 131) and requires attention to what is left out but “might have a claim for inclusion” (Shurmer-Smith, 2002: 134). In showing that all social meaning is contingent, contextual and relational (Howarth, 2000: 113) Laclau and Mouffe’s discourse theory opens up the possibilities for denaturalising meanings and disrupting claims to objectivity. Howarth suggests that two specific cases call for special attention in discourse theory – “formation and dissolution of political identities and the analysis of hegemonic practices” (Howarth, 2000: 136).

Analysis of the texts and practices from empirical research broadly followed this discourse theoretic approach. Although awareness of Howarth’s interpretations of Laclau and Mouffe’s method came only during the writing stage, many of the intentions for analysis and specific modes of analysis Howarth suggests resonated with the analysis undertaken. Textual documents such as grey literature, project reports, briefing notes, email exchanges and transcripts as well as non-linguistic practices such as practices of boundary work were examined for points of antagonism that might “reveal the boundaries or political frontiers of a social formation” (Howarth, 2000: 106) and pinpoint struggles over meaning (Jorgensen and Phillips, 2002: 29). Analysis focused on different ways in which climate change was problematized, different articulations of proposed solutions, questioning which discourses were reproduced or challenged and what value commitments were privileged. Moments in which misunderstandings or changes in meaning occurred became a focus for analysis to explore shifts in meaning and instances of contention or reframing. Recognition of the non-natural connection between signs and signifiers (Barnes and Duncan, 1992: 8) enabled attention to ways in which claims for meaning were established, maintained or disrupted (Laclau and Mouffe, 1985: 113). Although the language of “nodal points”, “chains of equivalence” and “logics of equivalence and difference” were not the terms used in coding, the objectives of analysis are consistent.

It was only through writing that certain forms of analysis came together. As interpretations came to fit or jar, the narrative was forged, revised or abandoned accordingly. In framing a narrative, this writing process is no less subject to norms governing acceptability among its audience than the science–policy processes being researched. The theoretical concepts that informed the research have informed ordering and sense-making of the material as much as the empirical enquiry itself. This has

provided tools for disrupting certain narratives, but has also meant conforming to particular ontological and epistemological framings and approved ways of producing accounts.

3.5 Ethics and representation

In seeking to make questions of values visible that are often intentionally concealed, there are potential consequences for participants in their professional role – both from personal and professional disclosures. Guillemin and Gillam suggest that reflexivity is key to understanding and developing ethical practice and ensuring the researcher remains actively responsible for ethical questions during the whole process of research (2004: 273). Consent for interviews was agreed formally through a form which specified secure and confidential storage of recordings, transcripts, drawings and questionnaires and participant's right to withdraw consent at any stage (Longhurst, 2010: 111). No promise for confidentiality was given, although participants were assured that the research did not seek to name individuals it was suggested that identity might be deduced through organisational position, especially for senior figures. Personal beliefs and values are formally categorised as sensitive data, which means that procedural measures over storage and limiting access to data in compliance with the Data Protection Act are required to restrict circulation of this information in a personally identifiable form. Although the research focus was collective values, personal and public values were difficult to separate and so these measures were followed as a precautionary measure. During participant observation, my presence as researcher was made known. As no formal consent was obtained, any reference made to participants who were not later interviewed (and therefore covered by consent) were discussed anonymously.

Participants might have felt uncomfortable during questioning around personal and or perceived taboo subjects like values in science. With exactly where, when and how individuals drew their boundary of comfort in acute attention during interviews questioning sought to find an ethical balance between making contact with this boundary and not unduly stressing participants or making them feel uncomfortable. In this process I tried to be sensitive over when to back off and not push too hard,

becoming alert to expression of concern about research intent often expressed through jokes and humour (Brewer, 1993: 135).

How the researcher responds in 'ethically important moments' (Guillemin and Gillam, 2004: 264) was a key learning point in the interview experience. When lines of questioning or the drawing exercise actually succeeded in opening up tender and vulnerable moments of disclosure by participants, I was not always prepared for the new interpersonal terrain that opened up. During one drawing exercise a participant's voice became shaky and he discussed an existential crisis he'd had that reframed his career choices, in another line of interview questioning, a scientist showed signs of anxiety as he discussed his passion and frustration that 'the government' was not doing enough to protect people and countries more vulnerable to the effects of climate change than Scotland. In such instances I felt emotionally unprepared and transcripts revealed that my own sense of awkwardness led to changing the subject onto a more comfortable topic with easier more factual responses, rather than having the confidence to pursue such lines of enquiry further. As well as a missed research opening, this disrupted traditional ideas of elite actors not usually understood as 'vulnerable adults' in research, and shied away from the responsibility that my questioning demanded in failing to provide the necessary safe and comfortable space for participants to discuss their positions. Ethical consideration needs to be given to opening up such spaces through the exercises presented in 3.4.3 without being sufficiently prepared to support participants through their subsequent experiences or the confidence to stick with the atmospheres that opened up. As Adamson and Holloway have highlighted sometimes the role of the researcher is to provide support "often in silence, just by being present" (2012: 7394). Greater foresight and engagement with the challenges that ethical practice might entail at the procedural stage would have helped situations to be dealt with less reactively. Suitable responses are often difficult to make without forethought and consideration (Guillemin and Gillam, 2004: 277) but might have enabled these sensitive conversations to become part of the research.

There are always politics to the stories of research. Voices that come to be profiled, particularly in Chapter 7 became salient in the research because of resonance with the type of questions the research was keen to explore. Fielding emphasises that it is easier to show empathy and to interpret the actions of those with whom we share sympathies, than those with whom we disagree (Fielding, 1993: 148). Attention was paid to ensuring fair representation of the range of voices encountered and no active downplaying of

contrary positions occurred. Effort was made to explore diverse views with equal enthusiasm and curiosity regardless of personal sympathies and to remain impartial to the types of alternative openings of politics that might be encountered. Often the narratives profiled generated unexpected conclusions and changed the direction of the research narrative and the thesis narrative sought to remain open and flexible to such retelling.

During the research process I felt a huge gratitude and debt to my hosts at CXC and was eager to offer them something back for their time and openness to my research. Although no exchange of favours was demanded, the need for “immediate reciprocation” (Gillan and Pickerill, 2012) was felt – demonstrating the impossibility of a detached researcher (Bennett, 2002: 160) and a protracted sense of researcher guilt (Bennett, 2002: 147) based on the inability to rapidly produce consultancy-type reports on findings to share. Bennett recognised “inevitably, though, participant observation does not end when ‘the field’ is left and ‘lives’ with the researcher as s/he stays in touch with her informants, sometimes returning” (2002: 140).

Productive and encouraging discussions remain on going with CXC (see section 8.4). Whilst the research creates a particular politics of knowledge, with which not everyone in the research context might agree, Cook and Crang emphasise that research is inherently political, and this should be tackled head on (2007: 17). Rather than hope that my narrative would be hidden in the archives, I developed an on-going dialogue with the closest participants for whom I provided minutes of meetings, reports, a reflections paper based on their selection from a shortlist of emerging research themes and also presented the research in full at the CXC Annual General Meeting 2015. Kezar emphasises that research transforms both parties as a result of the encounter (2003: 402). Although deeply transformed myself by the process of research, at no point in the research did I attempt, or even aspire, to transform anything about CXC’s practice. Given agreements to disagree, I was surprised to find that CXC had become reflexive over the political implications of their own practice as a result of these discussions. This demonstrates the effects of interaction which Rose describes remain ever uncertain and incomplete (1997: 316).

In writing up the research I increasingly wished to be critical of the way in which neoliberal modes of policy making were reinforced in science–policy exchange and the way in which changing science–policy configurations in Scotland were being geared

towards compliance with policy, yet I did not wish to be personally critical of the individuals with whom I had engaged, and held professional empathy. This was relatively easy, as the thesis does not place individual agency at stake. Yet, with the luxury of a detached academic narrative told from outside the practitioner context, it is acknowledged that the narrative is not necessarily a desirable one for all involved, and wider circulation within Scotland could adversely affect the organisations studied. The narrative is necessarily partial, and one of a number of narratives that could have been drawn from the research. Discussing sources of difference with CXC has strengthened my account and given a depth of understanding to the research that a more isolated narrative would not have captured.

Chapter 4.

Mapping the Climate Science–policy Landscape in Scotland

During the period 2009-2015, climate science–policy interaction became the subject of focussed attention in Scotland, through the establishment of the Climate Change Scotland Act (2009) and a Centre for Expertise on Climate Change - ClimateXChange. Focusing on these science–policy boundary configurations, the aims of this chapter are both contextual and empirical. Firstly, the chapter explains the research context, situating Scottish climate policy in relation to UK and European policy whilst also discussing wider discursive influences on the development of Scottish public policy more broadly. This draws attention to particular discursive value framings that become established in rhetorical circulation into which public policy and climate knowledge is required to speak. This opens an argument, developed throughout the thesis, that these framings are significant in the processes of constructing and legitimating knowledge. The chapter also describes how and why science is brought into climate policy-making, discussing changes in science–policy interaction initiated by the Scottish Government, introducing the specific organisational actors studied and situating the work of ClimateXChange within a wider science–policy landscape.

Secondly, the chapter provides an initial analytical engagement with the constitution of the science–policy boundary. Empirical practitioner narratives suggest the science–policy interface is a singular gap to be bridged and boundary work is a neutral activity. These accounts are problematised through drawing on empirical observations of a plurality of micro-level distinctions at the science–policy interface. The science–policy boundary is instead conceptualised as multiple and cumulative, and the value-free nature of boundary work is contested. This empirical analysis provides a foundation for more detailed analysis of the processes of boundary work that make up the following three empirical chapters, and which consider the politics of science–policy interaction in more detail.

4.1 History and development of climate change policy in Scotland

Scotland was chosen as a research focus because of the Scottish Government's globally ambitious carbon reduction targets and changes to the process for engaging with climate science. In both senses Scotland might be seen to be taking a bold stance in its approach to climate change. This section explores the climate change policy context in Scotland in relation to that of the UK (and internationally), beginning with an outline of key UK and Scottish Climate Policy Developments (Table 4.1).

4.1.1 Scottish climate change policy in the context of UK and international policy frameworks

International agreement on tackling climate change, first established through the UNFCCC in 1992, *encouraged* industrialised countries to reduce their emissions. In 1997, this framework was strengthened through the Kyoto Protocol to *legally bind* signatory developed countries to emission reduction targets of 5% (based on 1990 levels) by 2012 (UNFCCC). The UK established a leading role in these negotiations, committing to 12.5% reduction and achieving 27% (Climate Change Commission, 2015). The UK Energy White Paper (2003) established an intended policy commitment prior to legislation of 60% reduction in carbon emissions by 2050 with "significant progress" by 2020. The 60% target was based on advice by the UK Royal Commission of Environmental Pollution that global adoption of a 60% reduction would maintain global CO₂ at 550ppm – the figure thought to limit global temperature rise to 2°C established through the IPCC Second Assessment Report (RCEP, 2000). The Climate Change and Sustainable Energy Act (2006) introduced targets for renewable energy micro-generation and encouraged a culture of reporting, but it wasn't until the UK Climate Change Act (2008) that legally binding emissions reductions targets for the UK were established. At this stage, scientific, NGO and media attention focussed on suggestions that the 550ppm figure would be exceeded, implying that a 60% reduction was insufficient. In the final stages of hearing the Act in late 2008, the figure of 60% was increased to 80% based on formal recommendation from the Climate Change Commission, an independent scientific advisory body for the UK Government and its devolved administrations (Scotland, Wales and Northern Ireland), which was simultaneously initiated through the 2008 Act. This made the UK the first country with a long-term legally binding target for reducing

	2000	2003	2006	2008	2009	2011	2012	2013	2014
UK POLICY AND LEGISLATION (IN BOLD)	UK Programme On Climate Change 2000	Energy White Paper 2003	Climate Change and Sustainable Energy Act 2006	Climate Change Act 2008		Carbon Plan 2011	UKCCC - Climate Change Risk Assessment (CCRA)	UK National Climate Change Adaptation Programme report	
SCOTTISH POLICY AND LEGISLATION (IN BOLD)	Scottish climate Change Programme 2000		Changing our ways Scotland's climate change programme 2006		Climate Change (Scotland) Act 2009	Scottish Government's First Report on Proposals and Policies (RPP1)	UKCCC CCRA for Scotland	Low Carbon Scotland: Meeting our Emissions Reduction Targets 2013-2027. The Second Report on Proposals and Policies (RPP2)	Scottish Climate Change Adaptation Programme
					Scotland's Climate Change Adaptation Framework (+ sector action plans)	Public Sector Bodies Climate Change Duties (Part 4 of the Climate Change Act 2008) comes into force	CCC's first annual progress report: Reducing emissions in Scotland	CCC's second annual progress report: Reducing emissions in Scotland	CCC's third annual progress report: Reducing emissions in Scotland
									Scottish Government Cabinet Sub-Committee (Climate Change) established

Table 4.1: Key policy and legislature events in Scottish and UK climate policy (legislation in bold).

This page left intentionally blank

greenhouse gas emissions by 80% by 2050 (1990 baseline) and included an interim target of 36% by 2020. The Climate Change Act 2008 also established the UK Climate Change Adaptation Programme.

In June 2009 the Scottish Parliament passed the Climate Change (Scotland) Act 2009 – matching the 80% by 2050 reduction target in Scotland, but setting a higher interim target. Up until 2007 Scotland had followed the UK's leadership in climate policy, mirroring the UK policy moves (Table 4.1) with 'Changing our ways: Scotland's Climate Change Programme' (2006) quantifying a 'Scottish share' towards UK climate change commitments. However, in 2007 Scotland's position diverged by pushing for higher targets. This can be understood in relation to SNP's weak political victory in 2007. SNP had won only one seat over Labour to form a minority Government, and initial coalition talks with Liberal Democrats failed (over Independence). However, SNP formed a 'co-operation agreement' (not full coalition) with the Scottish Green Party, in return for "early legislation to reduce climate-change pollution" as well as opposition to nuclear power and appointment of a Green Party MSP as a subject Committee Chair (Lester and Gay, 2007: 3). SNP delivered this promise by matching the UK's 80% target and setting an interim 42% by 2020 target with annual reporting – compared to the UK's 36% interim target with 5 year reporting. Like the UK, the Climate Change Scotland Act (2009) also developed an Adaptation Framework, building on the 'Climate Change Commission - UK Climate Change Risk Assessment'.

The circumstances of setting a 42% target were narrated by several actors during interviews as the result of a coalition between Stop Climate Chaos and the Chief Executive of Scottish and Southern Energy (SSE), who jointly wrote a letter to the Scottish Government pushing them to achieve the higher target. The Scottish Government policy teams were preparing a number of options for the interim target to be put before the Parliamentary Committees – 34%, 36% 38% and 42% (Interview CXC-D1):

“... right near the end the NGOs got together, and they're very effective – the Stop Climate Chaos Coalition [they]... wrote a letter with [X the Chief Executive of SSE]... the biggest listed company in Scotland... the week before the third reading...which would turn it into an Act from a Bill... saying 'go for the biggest target and we will try and deliver it' and that gave the politicians a huge amount of cover because it wasn't about a bunch of weirdy lefty NGOs... it was actually somebody signing it from the biggest most successful company in Scotland saying, 'go for it'... that really helped in political terms” (Interview CXC-D1)

Whilst the preferred target was always greater than 34% because “SNP, were passionate about doing a bit more than Westminster” (Interview CXC-D1) the commitment from SSE built confidence and legitimacy for a higher early target. SSE, governed by UK OFGEM’s decarbonisation strategy were seeking a stable policy framework for their strategy for investment in renewable energy over nuclear (Interview C2020-3). Their support enabled the SNP Government to demonstrate greater ambition than the UK, mobilising a discourse around the “reindustrialisation of Scotland through renewables” (Scottish Government 2011f) and fulfilling their obligations with the Green Party. However, the 42% target was made contrary to current advice over deliverability unless the EU set a 30% instead of 20% target (Interview CXC-D1).

Having set the target, the Scottish Government initiated the first Report on Policies and Proposals (2011e) – RPP1 in which policies for achieving emissions reduction were outlined. This document was being refreshed during the empirical research period through development of the ‘Second Report on Policies and Proposals’ (2013) – hereafter RPP2. While the target of 46% reduction in carbon dioxide by 2020 is one of the highest commitments in Europe (most other European countries working towards 20% by 2020 and 40% by 2030 (European Commission, 2015)), at the time of writing Scotland had missed all four annual targets. As Patrick Harvie, MSP for Glasgow reminds Parliament: “It is not at all challenging to set a target; it is challenging to meet that target” (Scottish Government 2012: online).

4.1.2 Climate change governance in Scotland

At Parliamentary level, climate change is managed by a ‘Junior Minister for Environment and Climate Change’ who reports to the ‘Cabinet Secretary for Rural Affairs and Environment’, who represents the portfolio within the Scottish Government Cabinet and the ‘Rural Affairs Climate Change and the Environment Parliamentary Committee’ (RACCE). In the devolved Scottish Parliament, Parliamentary Committees hold a more powerful role than in UK Government by being able to initiate as well as scrutinise policy (Maclean, 2012: 228).

The Scottish Government operates through a cross-sectoral governance approach to climate policy with two small climate strategy co-ordination teams responsible for designing and co-ordinating delivery plans for mitigation (RPP2) and adaptation (the Scotland Adaptation Programme). These teams work with thematic policy sector lead

officers in areas such as transport, housing, land use planning etc. to *encourage them* to develop proposals for either reducing emissions or adapting to projected climatic changes. Both teams work within the Energy and Climate Change Directorate and report to the Minister for Environment and Climate Change⁵. There is a subtle balance in this role between encouraging and challenging sector leads to increase performance against climate goals, while respecting delegated authority and expertise of sector Directors and Heads of Service, all of whom report to their own respective Ministers and are ultimately responsible for delivery. This form of cross-sectoral governance ensures an integrated approach to policymaking and ensures climate policies also serve respective Ministerial portfolio priorities. As a result it often involves compromises and framing of actions that deliver against broader objectives beyond those typically driving climate change policy goals (such as economic growth, health, fuel poverty, or infrastructure resilience).

Many literatures have pointed towards climate governance being as much a private as a public sector affair (Bulkeley and Schroeder, 2012) and increasingly critiques have alluded to the increasing difficulty in distinguishing between public and private sector either in policy development or in service delivery (Raco, 2013; Raco, 2014). In Scotland, climate policy making is a distributed activity, and an endless circular chain of re(de)feral was evident during interviews in which policy was always made ‘elsewhere’ – “it sort of like comes out of the walls almost” (Interview SG6). Ministerial priorities, existing Government policy, Parliamentary Committee enquiries, Government Agencies informal drafting, formal and informal consultation with private sector industry groups, forums, business leadership groups, representations from NGOs, interest and campaigning groups, industrial lobbies, public sector partnerships, crafting by policy officials, public consultations and constant media commentary all play a role in policy development (Interviews: SG1, SG3, SG4). Public-private blurring was strongly evident particularly though relations with the C2020 Group – a private sector partnership of business leaders who hold an important influence in climate change policy development, and industry stakeholder leadership forums played a central role, for

⁵ In addition to the main mitigation and adaptation programmes, there were also a number of other policy teams responsible for ‘transition to a low carbon economy’, ‘low carbon behaviours research programme’, administering the ‘climate challenge fund’, work on international climate change and climate justice, and the ‘Public Bodies Duties Team’ who support and facilitate delivery by Scottish local authorities and other public bodies and partnerships. Since 2014, there has been some consolidation of policy responsibility into a new Climate Change Unit.

“increasingly it’s recognised that if you don't take industry with you you're not actually going to get your policy implemented anyway so, you might as well cut to the quick and get them involved... where you end up is going to be a compromise, I mean it’s got to be because Government is responsible for the economies” (Interview SG6).

With such broad engagement, there is a perceived risk that particular interests can and do dominate policy making. As a result, policy makers emphasise that no single view predominates but rather policy emerges from an amalgam of views. In the case of the involvement of C2020 in target setting it was suggested:

“I don't think you can say that anybody is key because Government can't say that one group is key over another ... there was a lot of discussion with stakeholders ...but Government has to take the responsibility. It can't, sort of say, this policy was developed with these stakeholders. So, I mean they had an input, but...” (Interview SG6).

Such plurality of perspectives establishes a claim to neutrality in which interest-laden bias is seen to be cancelled out, establishing a neutral middle ground for policy. Plurality of influences in climate policy making in Scotland also exemplifies public private sector boundary working, which is further discussed in section 4.5.

4.2 Scottish policy discursive value framings

Within Scottish policy there are four particularly strong influences on public policy discourse: Scottish independence, outcomes orientated policy, sustainable economic growth, and a tradition of left-leaning politics. These influences, which are not unique to Scotland nor always coherent, can be seen as discursive value framings that influence the making of climate policy in Scotland. This section considers each of these influences in turn, particularly their shaping of climate science–policy debates.

4.2.1 Scotland the brave? The politics of a sub-nation and trajectories towards independence

Scotland is a sub-nation within the United Kingdom which, until the Union of the Parliaments in 1707 had sovereignty (Young, 1970: 6). This has created long-standing tension over independence in Scottish Politics with strong feeling on both sides. Demands for re-establishing a Scottish Parliament were resurgent during the early 20thC leading to formation of the Scottish National Party in 1934 (Young, 1970: 16). Election of

the UK Labour Party in 1997 initiated a referendum over devolution of powers to Scotland (delivering a Labour manifesto commitment) and a Scottish Parliament and Executive was established in 1999 (Ross, 1998). Passions for Scottish Independence were mobilised with election of the Scottish National Party to minority Government in 2007 and majority Government in 2011, leading to a narrowly defeated referendum in 2014.

The target setting and political commitment on climate change in Scotland are recurrently described by Scottish Ministers and Government Officials as world leading (McGregor *et al.*, 2011; McEwen, 2010: 18) and discourses of leadership were recurrently rehearsed in both science and policy narratives during the period of research. The higher targets have been considered a 'race for the top' (Pataki *et al.*, 2011: 5:17) in relation to the UK's leadership within Europe. As one boundary actor described:

"Scotland wants to be better than England and Wales, which is partly tied up with the sort of growing, belief of itself as a country that happened after the devolution of '98" (Interview CXC-D1).

Wendt argues that practices and processes of international negotiation produce and reproduce state identities (1999: 28) and are a way of "*states producing and reproducing their identities*" (Paterson, 1996: 133). In the context of The Scottish SNP Government's striving for independence, Scotland may be seen to be reflexively constructing its identity, folding climate policy into a larger project of nation building both internationally and domestically.

Internationally, Scotland has attended Conference of Parties meetings both in Copenhagen (2009) and Durban (2011) and the World Future Energy Summit 2012 in Abu Dhabi was one among many examples of Alex Salmond (then First Minister) presenting Scotland as an international actor:

"We are also world leaders in the transition to a low carbon economy and in particular the renewables revolution. It is only fitting that we should be part of the foremost annual meeting committed to finding solutions to the energy needs of the future" (2012).

The ambitious carbon targets give Scotland informal recognition in the international arena supporting its claims for sovereignty by setting its own course separate to the UK. The targets also contribute to constructing a national persona as a Government with ambition and commitment to deliver change that offers an opportunity for Scottish nationalism to be retold. This is exemplified in the RPP2:

“It would have been far easier to set targets that ignored climate science or showed little ambition, so that they would be straightforward to meet. Scotland does not lack ambition and as a nation we can take pride in that” (RRP2 2013: iii Ministerial Forward).

Demonstrating leadership in important policy arenas is therefore one way in which a sub-nation can establish an imaginary of itself as independent. The circumstances of the SGP- SNP collaboration agreement provide insight into why climate change became one such policy area in 2009. However, division between ‘devolved’ and ‘reserved’ powers in the current Scottish Devolution Settlement is also important in making this both possible and desirable. The UK Government *reserves* power over areas of strategic interest: energy infrastructure, immigration, international affairs and foreign policy, defence, employment, trade and industry and fiscal arrangements such as benefits and social security. The main areas of *devolved* power are health and social services, education and training, housing, law, local government (including land use planning), tourism and economic development, transport, sport, arts and environment, agriculture, forestry and fisheries. Historically Health and Education are key policy areas in which Scotland has been able to express policy difference from the UK, contributing to their high profile status in Scotland.

In comparison to health and education, climate change policy is less high profile as reflected in its significantly smaller budget allocation (Interview SG2) – sitting within the Environment and Rural Affairs Directorate budget of £559.2 million compared to a budget of £12.2 billion for Health, £3 Billion for Education and £3 billion for Finance, Employment and Sustainable Growth (Scottish Government, 2014). Climate policy has been able to develop a higher profile than might have otherwise have been achieved through simultaneously delivering against policy objectives on economic growth, particularly through development of the renewable energy industry and ‘Low Carbon Economy’ (Scottish Government, 2011f). With strong renewable energy generation potential and transferable skills from the oil and gas sectors, renewable energy is considered an opportunity for the reindustrialisation of Scotland (Scottish Government, 2011f). As one boundary actor commented, Scotland’s interest in renewable energy goes far beyond climate change:

“It wasn’t actually just about being nice to the environment; it was also because it was tied up with global markets, job opportunities talent at the universities and you actually had that coalition all coming together” (Interview CXC-D1).

Renewable energy is positioned as an economic opportunity for Scotland. In fact, the lead policy officer for the Mitigation Policy – RPP2 stated that because of the way that energy generation is counted within the ETS, “the investment in renewables is fundamental for the growth strategy and for the long-term [carbon] targets but does nothing for the short term [carbon] targets” (Interview SG4). This indicates the extent of the opportunistic framing climate policy offers for pursuing economic growth.

The ambitious carbon mitigation targets within the Climate Change Scotland Act (2009) also provide a strong foothold to exercise bargaining muscle with the UK Government over devolved powers vis-a-vis energy infrastructure. Renewable energy policy is a contentious policy area in the relationship with the UK Government, as energy infrastructure remains a reserved power, but both local planning and environmental decisions are devolved, making the boundaries of decision making for energy generation unclear. Over nuclear power in particular, Scotland has expressed a clear negative stance - counter to UK policy - which affects the securing of planning consent (Swenden *et al.*, 2009). Further, the UK is reliant on Scottish renewable generation capacity in hydro, wind, biomass and tidal resources to meet the UK commitments on renewable energy provision as Scotland holds an estimated 25% of Europe's tidal and offshore wind potential (Scottish Government).

Discursive embedding within other policy ambitions is central to the foothold of climate policy in Scotland, and the lead policy officer for the Mitigation Policy described how “most of the climate change policies and proposal don't stand alone so they have other benefits” (Interview SG4). Like elsewhere, climate change policy is therefore pursued through discourses of co-benefits and multiple drivers. Climate change policy with explicit emphasis on renewable energy, is one arena in which the Scottish Government can define itself internationally, secure greater powers within sub-national negotiations and strengthen Scottish economic performance - particularly important given the enduring sense of economic dependency on England (Simpson, 1970: 121). The push by the Scottish Green Party, Stop Climate Chaos and Scottish and Southern Energy presented an opportunity for climate policy to become another area in which leadership could be established. Understanding this moment of decision-making in these terms goes beyond Swenden *et al.*'s (2009: 8) assessment that setting a more rather than less ambitious carbon reduction target was Scotland's only acceptable option for asserting autonomy.

4.2.2 Evidenced based – outcomes orientated politics

Since the UK Government White Paper ‘Modernisation in Government’ (1999) and subsequent Cabinet Office publication ‘Better Policy Making’ (2001) the discourse of ‘evidence-based-policy’ (EBP) has become naturalised in UK policy across scales, with its benefits often considered self-evident (Trinder, 2003). Although Solesbury suggests that the UK particularly has seen a turn toward evidence based policy (Solesbury, 2001) similar movements in both the USA and Europe as part of new public management (Owens *et al.*, 2006: 635) suggest that “the evidence movement is an international affair” (Hansen, 2010: 87). In Scotland EBP takes the form of ‘outcome orientated policy’ (Sanderson, 2011: 62-64; also Interview SG1). This focus on outcomes, Sanderson argues, seeks to “redefine the problem of Government from one of micro-managing delivery... to one of improving performance in terms of outcomes... [and] implies the strengthening of an evidence based learning approach to the tasks of Government” (2011: 64-65). In 2007 this outcomes approach was structured through the National Performance Framework (NPF) that replaced a suite of very specific performance targets with a single overarching goal or purpose of government underpinned by five strategic objectives, seven purpose targets, sixteen national outcomes and fifty national indicators (Interview SG2) (Figure 4.1).

This National Performance Framework established Scottish Government’s priorities and the measures through which performance is assessed (Sanderson, 2011). All policy formed through the Scottish Parliament and Government has to demonstrate delivery in accordance with this performance framework, both formally, and, as one policy official suggests within Scottish Government organisational culture:

“Scottish Government... communicated what matters to them, what they value... these are things which do I think drive our Ministers and because of that drive the way that we need to go about our work” (Interview SG1).

This supports identification of institutions as expressions of shared ideas and norms (Litfin, 1994: 3) and whilst most policy seeks to deliver on several outcomes, there are various practical senses of priority felt within the Scottish Government particularly on health and economic growth (Interviews: SG1, SG2, SG4).

Scholars have drawn attention to the popularisation and increased emphasis on evidence during the period of UK New Labour policy (Sanderson, 2002; Nutley *et al.*, 2002; Parsons, 2002). However, despite changes in both UK and Scottish Governments since

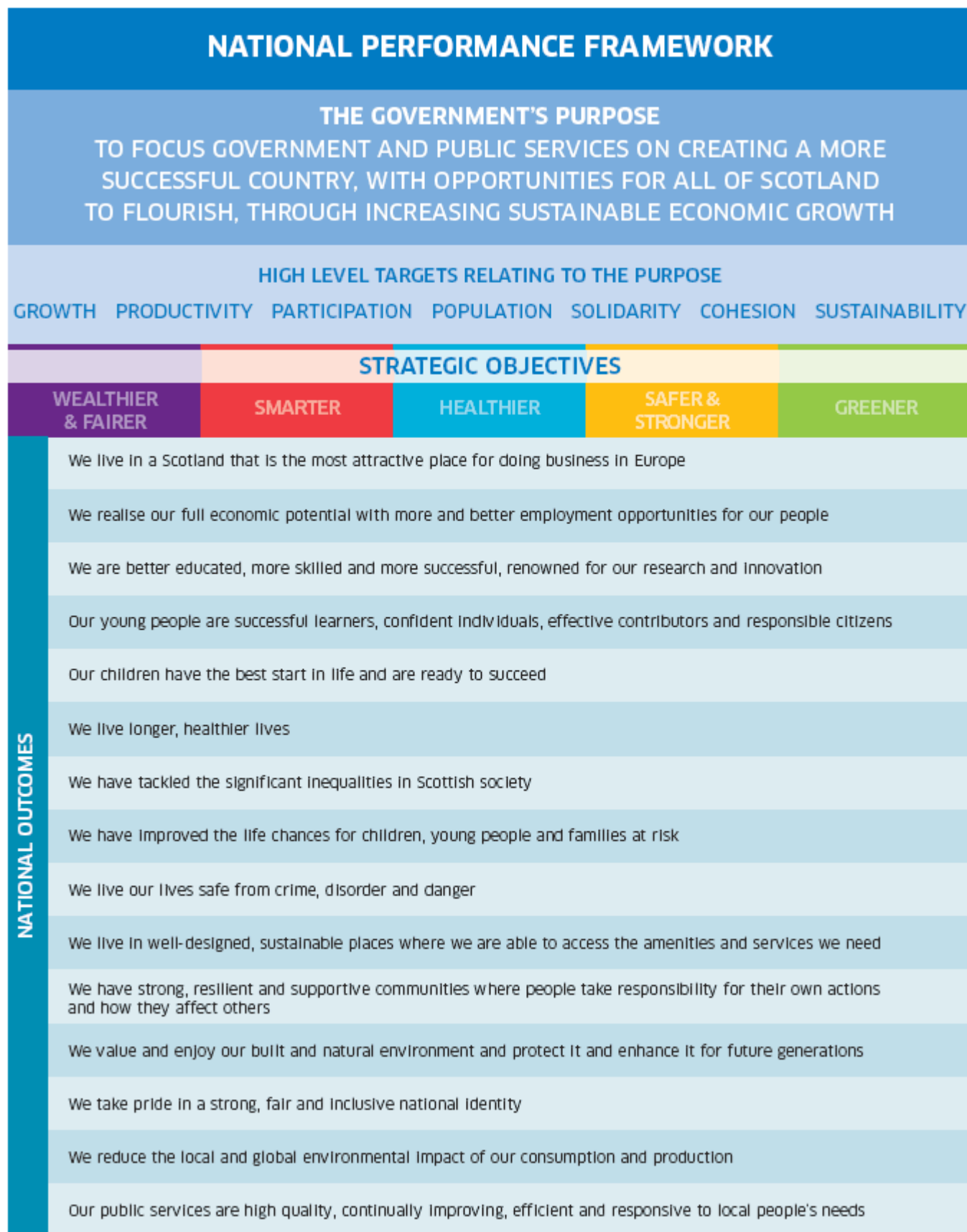


Figure 4.1: Scottish Government National Performance Framework 2011.

This page left intentionally blank

the New Labour era, there appears to be no decline in interest in evidence in Scotland, suggesting that EBP is surviving the political cycle. Continued emphasis on evidence may in part be related to the governing of the SNP in minority (2007-2011), which places additional focus on strength of evidenced argumentation to gain policy support from other political parties. In his acceptance speech Salmond suggested that “the nature and composition of this Parliament makes it imperative that this government will rely on its strength of argumentation in parliament, and not the argument of parliamentary strength” (Salmond, 2007). However, upon being elected in majority in 2011, Salmond further famously suggested that although SNP had a majority of seats it did not have a ‘monopoly on wisdom’ (Maclean, 2012: 241) further increasing the focus on outward sourcing of knowledge and evidence in policy making. Outcomes orientated policy provides an emphasis on evidence in terms of what works, and in producing strong argumentation under what is a very consensual model of politics (Interview SG1). Although evidence within policy relates not just to science but also to political know how and practical and professional practitioner experiences (Sanderson, 2011; Head, 2008), this focus on outward sourcing of knowledge and evidence in policy making may help to explain and situate the research investment in the three centres for expertise detailed in section 4.3 of which ClimateXChange is one.

In constructing new climate policy, approval by stakeholders (usually business leaders, professional bodies and NGO representatives) is an important part of the policy process. Increasingly with the participatory turn in policy-making, suggestions and consultation responses from sectorial thematic forums, stakeholder consultations and expert panels all contribute knowledge as ‘evidence’ into the mix (Interview SG4). A triangle of legitimacy was described in which policy needed to be seen as legitimate by three communities simultaneously: government policy, business and civil society (RN: CXC-PAW3)⁶. Scottish Government requires support for proposed policy from the business community as well as civic support from the electorate (Interview Met Office). The private sector holds strong discursive power in the way that legitimate actions are framed. The C2020 is one particularly important forum through business and Government interact over climate change. During one group meeting, legitimization of community actors was made through references that they are no longer hugging trees but being ‘entrepreneurial’ (RN: C2020-M) and during the same meeting a Chief

⁶ RN refers to ‘Research Notes’ associated to policy events attended, as listed in Appendix A.

Executive of one local authority strove to legitimate public sector organisations through championing the uphill struggle to combat public sector culture in Scotland (RN: C2020-M). These examples demonstrate the way that public and private sectors alike are framing legitimate actors and forms of approach in business terms. Many policy makers referred to the use of such stakeholder forums for providing evidence for policy development – as one climate policy officer remarked:

“We thought it was better to run some stakeholder workshops... targeted at particular stakeholders and within particular themes... *testing* the things being identified as policies and proposals... it just generally will allow us to take the temperature of how stakeholders feel about this, so we'll know whether the things that could go forward in the programme are likely to be well received in a public consultation” (Interview SG3, original emphasis).

This evidence appeared to consist of evidence over deliverability assessed through acceptability of proposed actions to the private sector as well as their knowledge of practical constraints.

4.2.3 Sustainable economic growth

The ‘single purpose of government’ that provides the overarching single outcome for the Scottish Government, and all policy developed, is a commitment to sustainable economic growth:

“... to focus Government and public services on creating a more successful country, with opportunities for all of Scotland to flourish, through increasing sustainable economic growth” (Scottish Government, 2007b: online)

Two policy documents are important in taking forwards this headline goal (to which all policy is required to align): the National Performance Framework (mentioned in the previous pages) and Scotland’s Economic Strategy. The latter forms the strategic plan for all future Scottish Government policy (2015: 11). The 2007 Economic Strategy emphasised “accelerating sustainable economic growth” and deployed a narrative of a Scotland lagging behind a naturalised state of growth; the Ministerial Forward emphasized:

“Scotland has suffered because our economy has been locked into a low growth cycle. Successive economic strategies... failed to lift Scotland’s economic performance to where it should be... Scotland has lagged behind” (Scottish Government, 2007a: v).

To many practitioners, the mention of ‘sustainable’ alongside economic growth has little effect on the conception of economic growth, and equates to business as usual. The way that climate change is presented becomes an opportunity for further economic growth and private sector innovation (Interviews: NGO 1, CXC Directorate 1). Aspirations for transitioning to a ‘low carbon economy’ are an important strand of the Economic strategy (2007a) and described as an integral way to secure sustainable economic growth that is pursued through a ‘Low Carbon Economic Strategy’ (2010: 7). The key purpose of the Low Carbon Economic Strategy is to “strengthen business confidence in exploiting low carbon opportunities” by focussing attention on global economic opportunities, barriers and the role of government and wider public sector in supporting business to overcome these barriers (2010: 7). This positioning of a low carbon economy offering opportunities for growth, far from unique to Scotland, was emphasised by one policy officer responding to the question of whether short-term economic growth was ever compromised for long term social or environmental benefit:

“There's been no compromise and *I can't* imagine under the current administration that that would happen” (Interview SG4; original emphasis).

Another responded:

“that compromises growth, No! Not to my knowledge... the main reason is because of the renewables agenda... reindustrialisation of Scotland and that's through renewables... so the First Minister would say, we would say, that the effort on renewables is also driving growth” (Interview SG1).

Public policy discourses on climate change are not only being required to align with broader discourses of economic growth but are also being positioned as key to delivering such growth. During participant observations of CXC practice, there were constant reminders of this discursive economic growth context. For example, it was emphasised that any focus on adaptation had to produce a strong business case, as illustrated by the words of a prominent UK science–policy advisor speaking at the 2013 CXC Annual General Meeting: “if it’s not associated with economic growth and jobs, there’s no money for it” (RN: CXC-AGM 2013).

4.2.4 A Socialist tradition

In the updated Economic Strategy (2015: 22), continued economic growth is still paramount, but is nuanced by an emphasis on inclusive growth, strengthening questions of equity and making direct reference to Stiglitz's critique of rapid growth (2012). This emphasis was part of a (highly successful) strategic positioning of the SNP in opposition to austerity politics in the run up to the 2015 UK General Election in which the SNP sought to contrast the austerity politics of the Conservative-Liberal Democrat Coalition in Westminster with Scotland's focus on "ensuring that growth is shared and sustainable"(2015: 5). The new Economic Strategy suggested that "increasing growth and tackling inequality are mutually supportive"(2015: 8) and that "ensuring that the benefits of economic growth are shared more equally across society is just as important as boosting overall growth" (2015: 21). This strategic refresh of the 2007 Economic Strategy however drew on a longer heritage of left leaning politics within Scotland, from Keir Hardy's formation of the Labour party in Scotland in 1888 (Young, 1970: 9) to a long standing anti-tory majority (Ross, 1998: 18; Maclean, 2012: 225). Scottish policy has historically seen strong public investment in health and education, drawing on a tradition of widely accessible education dating from the sixteenth century (Ross, 1998) and the strength of resistance to hegemonic rule seen in the rumblings of "strong radical strain in Scottish thought" (Ross, 1998: 268). In the National Performance Framework (2007) there was clear emphasis on cohesion and social solidarity – through "opportunities for all of Scotland to flourish" (Scottish Government, 2007b). There is some evidence that this leftist orientation in Scotland tempers neoliberal policy trajectories:

"... while the British Prime Minister Tony Blair was driving through reforms of English hospitals and schools, introducing more competition and private enterprise, Scotland continued to keep faith with state ownership and management of health and education... tuition fees were abolished for Scottish students... free care for the elderly" (Maclean, 2012: 235).

Although strong in other areas of public policy, left leaning influences are less apparent in climate policy in Scotland. However, they can be seen to a limited degree in opportunities for debating questions of climate justice, social equity and distributional impacts of climate policies - within Scotland as well as internationally, in the distributional equity proofing of the mitigation policies (Interviews: CXC-R6, CXC-S3), and questioning of the model of growth being pursued throughout the UK as "an economic model that has exacerbated inequalities" (Scottish Government 2015: 21).

This social democratic angle is not just the result of a historical legacy, but also influenced by active campaigning by third sector organisations and coalitions of NGO actors. An example of this is the partnership coalition Environment Link who, among others, challenges the continued measurement of economic performance through traditional measures of GDP, GVA and their unproblematic indirect inference of wellbeing (Interview NGO1). Environment Link is stimulating wider debate through a commissioned report about the notion of flourishing, which although central to the Scottish Government's single purpose is, in their view, overshadowed by attention to economic growth (Interview NGO1). The focus of campaigning is not the present Government but manifesto writers for the next election with whom strategic discursive alignment – finding common ground between different discursive positions – relies on the hope of shifting core aims long-term. Such opening offers encouragement to alternative forms of thinking about economic prosperity. However, it is important not to overstate their purchase and the package of indicators that the UK Sustainable Development Commission (SDC) and Carnegie Trust had proposed to measure success differently were lost with abolishing of the SDC (Interview NGO1).

4.2.5 Summarising discursive value frameworks and the scope for opening up political debate

Bridging these four discursive influences together indicates the discursive framework within which policy making in Scotland operates. These discourses can be seen as discursive value framings that influence the framing of climate knowledge. The lateral resonance required between policy documentation for cohesive and 'joined up' public policy, means that policy documentation cross-references other strategies and identified actions are echoed between documents. This sets a discursive policy culture into which new policy is required to 'fit', and through which, particular discourses are reproduced. Climate policy commitments can be seen to both align with and re-produce these discourses. Where at times evidence is argued to be essential, at other times grounding in evidence is less important - as the adoption of the 42% mitigation target suggests. When and where science is drafted in, to provide evidence and the work of legitimisation this performs, requires further attention.

In some senses Scotland's political passion for independence is creating a 'can do attitude' at the science-policy interface. Many scientists, boundary actors and policy makers alike commented that Scotland's small size and shorter vertical networks to

Ministers, give opportunities to meet and communicate directly with senior decision makers, making it easier to have influence or make things happen (Interviews: CXC- D1, CXC-R4, RN: CXC-AGM 2013) and Scotland's rich natural energy resources encourage the possibility of ambitious action. This comes across in the words of one boundary actor, when comparing working in climate policy in Scotland to England:

“... there's no doubt that... coming back up to Scotland having worked down in southern England has been really refreshing in the sense that that you do have a coalition of business groups... saying 'let's go for it!'. Local authorities, a lot of them, not all... are saying 'let's go for it'...we may not hit the targets, we may fail spectacularly at certain times, but actually there is a genuine belief that we can do something good here, whereas I had no sense of that whatsoever in southern England – it was just absolutely no, it wasn't even on the agenda it was just irrelevant... And that is so, so, refreshing” (Interview CXC-D1).

While historical and contemporary socialist influences allow Scottish policy to provide potential openings in which alternatives to traditional economic growth might become considered, the example of Environment Link shows this is strongly reliant on achieving discursive synergy with existing policy commitments. Where Scottish politics are perhaps slightly more favourable to weaker forms of neoliberal governance through emphasis on social concerns, this is constantly held in tension with a focus on economic growth, particularly as the strength of the Scottish economy is a key stake in Independence.

Overall, there is a strong normative meta-narrative about an acceptable role for policy (and state involvement). Key actors spoke of the need not to tell people what to do, and of taking both the private sector and civic Scotland along with them in their policy decisions (Interview Met Office). This can be read in the context of Harvey's definition of neoliberal policy:

“... a theory of political economic practices that proposes that human well-being can best be advanced by liberating individual entrepreneurial freedoms and skills within an institutional framework characterized by strong private property rights, free markets and free trade...” (2005: 2).

Under a neoliberal approach, Harvey argues, only specific functions of the state are seen as legitimate – to guarantee “the quality and integrity of money”, “secure private property rights” and “the proper functioning of markets” including creating new markets as a form of governance “but beyond these tasks the state should not venture” (Harvey, 2005: 2). Many contemporary climate politics scholars point to the way in which policy responses to climate change are adopting strongly neoliberal forms (Bailey, 2007; Bailey

et al., 2011; Oels, 2005; Parr, 2014) often through the discourse of ecological modernization (Beck, 2010; Mol and Sonnenfeld, 2000; Jänicke, 2008). However, much of what has been discussed for Scotland is not unique but part of a wider neoliberal policy discourse in which the UK as a whole participates. Harvey suggests that “neoliberalism has, in short, become hegemonic as a mode of discourse” (Harvey, 2005: 3) although others have pointed to the diversity within neoliberalist approaches (Larner, 2003; Peck, 2004). Following argumentative theorizing against the unfolding of grand narratives, a plurality of neo-liberalisms are recognized here, in which local manifestations develop common themes and commonalities among difference are present (Peck, 2004: 403). Scotland’s policy context (including its socialist tradition) helps shape one such specific manifestation of neoliberalism and creates a specific ‘civic epistemology’ through which legitimacy for scientific knowledge is conferred (Jasanoff, 2005).

4.3 Bringing science into climate policy making in Scotland

Having drawn attention to the demand for science in evidenced based approaches to policy, this section outlines the multitude of processes and points of engagement through which Scottish policy interacts with climate science and describes the recent changes implemented by the Scottish Government to rationalise, streamline and re-orientate processes of engagement through ClimateXChange as a single point of reference for Government. Climate science–policy networks may be understood as a shared space or boundary zone (Star, 2010; Galison, 1999) in which many actors hold multiple roles. Many natural scientists perform policy engagement and some policy officials are scientifically trained making any clear categorisation as ‘science’ or as ‘policy’ (and any clear science–policy boundary) difficult to maintain. Up until 2011 the Scottish Government and its Government Agencies had many potential sources of advice on climate change including research undertaken within the fifteen Scottish universities; six Research Institutes funded through the Scottish Government ‘Strategic Research Programme’ as ‘Main Research Providers’ (MRPs) for agricultural, biological and environmental research; and several smaller centres of research. These are all highly networked academic institutions with research networks throughout the UK and globally. Mapping of main science–policy actors in early stages of the research (Figure 3.1) provided a wide, though non-exhaustive picture of science–policy actors, in relation to which CXC activity may be understood. In balancing a strong culture of evidence-based

policy with delegated policy responsibility, and recognition that science is only ever one among many elements of decision-making (Interview SG1), the type of information sourced is left to sector leads (Interview SG4). This promotes many points of science–policy interaction. Although some topics (such as nuclear energy) are designated off limits by Ministers, greater flexibility and freedom in policy-making without interference was alluded to than in UK Government Departments (Interview SG6). As well as evidence based policy advice from civil servants; Ministers also encounter scientific information from a variety of sources – from popular science, campaigning organisations, private sector businesses commissioning their own research and the Met Office (who regularly submit written and verbal scientific knowledge directly to Parliamentary Committees).

4.3.1 A changing framework for climate science–policy interaction in Scotland

In 2011, RESAS (the Scottish Government department for Rural Environmental Science and Analytical Services responsible for publically funded environmental research) established a new process for engaging with climate related research. The new arrangement involved top slicing funding from the Strategic Research Programme with the MRPs and establishing ClimateXChange as one of three centres for expertise in “areas of high policy importance” (Scottish Government, 2011c: online). The intention was that ClimateXChange became a single point for knowledge exchange around climate change in Scotland providing policy teams with tailored scientific knowledge drawn from across the specialist teams within Scottish universities and research institutes as well as wider sources UK and worldwide. Nevertheless, given the broader science–policy landscape outlined in Figure 3.1, multiple sources of science–policy engagement continue. CXC as a single simplified point of engagement remains an on-going ambition, requiring constant attempts to stimulate and co-ordinate knowledge requests by policy teams to CXC and making policy teams aware of what CXC could provide (Interview SG2).

These changes in how policy engages scientific knowledge responded partly to the need to develop evidence based policy implementation of the Climate Change (Scotland) Act 2009 but also drew from wider science–policy concerns beyond climate policy. In 2009, the Scottish Government had established a Coordinated Agenda for Marine, Environment and Rural Affairs Science initiative (CAMERAS) as a mechanism to simplify portals of information for civil servants and Ministers. Establishment of ClimateXChange sat within this wider move to simplify sources of expertise for Ministers and Civil

Servants. There was also some discomfort that research institutes were receiving public funding through their Strategic Research allocation but were not necessarily demonstrating value for money in terms of policy goals (Interview SG6). This reflects an outcomes-orientated approach to evaluation, which is at least partially behind the push for ClimateXChange to be driven by policy needs. Finally, there was a desire to establish better communication channels with, and make better use of, ‘Scottish’ science’ (Interview SG6). On the one hand, this exhibited nationalist feeling, establishing a Scottish centred source of scientific advice on climate change above and beyond that provided through the UK Climate Change Commission – which was established to provide scientific advice to the UK Government and devolved administrations. On the other hand, it also reflected broader dissatisfaction with a distanced relationship of science from policy in Scotland and demonstrated interest in the need to “translate policy context into scientific questions” (Walker, 2010). Research institutes were seen to have become complacent about their on-going funding from the Scottish Government (Interview SG6). Tensions can be seen in accounts of an early, science led, Centre for Expertise created in 2006 for research on animal disease (EPIC) whose research had achieved serendipitous policy relevance during the 2007 Foot and Mouth Outbreak, but after the crisis passed, scientists “went off and did their own thing and they became much more sort of strategic” (Interview SG6). Scottish universities (funded separately) were also not seen to connect with Scottish policy needs and, other than a few key people, were generally not considered good at bridging the science and policy divide (Interview SG6). To address this situation, the Scottish Government created a new position of Chief Scientific Advisor for RESAS that combined budget responsibility for the research institutes, a scientific advisory function to government, and redesigning the process of science–policy engagement (Interview SG6).

In line with wider UK science–policy culture, the new framework explicitly foregrounded policy relevance and usefulness of scientific research and sought to establish greater steer towards policy requirements. The drive to assert the demands of policy had two faces. Instead of the centres for expertise being a flagship of expanding investment in Scottish scientific research, the new policy led model of interaction emerged in a context of questions over whether the Scottish Government should continue funding the Research Institutes (Interview SG6). The Chief Scientific Advisor for Rural Affairs and the Environment appointed in 2006 was a former director of one of the research institutes who both sought to retain funding for the research institutes but also understood the

Government interest in demonstrating value for money (Interview SG6). There was an urge to protect the research institutes from losing their funding or being forced into privatisation as had occurred in England (Interview SG6). Higher education research councils cannot fund research institutes so any redirection of funding, would mean survival of research institutes would rely on either merging with universities or privatisation (Interview SG6). Science had to be seen to deliver on the policy agenda or there was a risk that research institutes would lose direct Scottish Government funding:

“What I *really* wanted to achieve was a closer relationship between the policy and the science, partly because I believe that policy was going to benefit, but also because I thought we wouldn't keep the science budget unless we, showed that we were a bit more willing to listen... it was to decrease the distance, the gap, between the science community and the [policy] community” (Interview SG6, original emphasis).

As “poacher turned gamekeeper”, the RESAS Chief Scientific Advisor stated “I hadn't understood a lot of things when I was outside” (Interview SG6), emphasising the arrogance of scientists in the research institutes and perceived complacency in expecting to continue to be given funding to do what they wanted: “they needed to learn how to operate in the real world and be more competitive” (Interview SG6). This need to be accountable was justified on the grounds of ‘public money’:

“... they wanted to be the ones to say how they changed... the scientists just went and put up their own agendas regardless of what policy said, so you know, they had a chance... they're not listening so phew... they blew it!... to them it's still their money, well it's *not* their money it's the taxpayers' money and they need to be much more responsible” (Interview SG6).

Narrowing the gap between science and policy became about decreasing the independence of science from policy goals in the face of wider neoliberal financial pressures on the funding of science. It was argued that science “should be driven by the needs of policy colleagues and not scientists given a free hand to decide what they wanted to do” (Interview SG6). Here the need of policy teams to demonstrate their own value for money is being pushed outwards to scientists to define their worth, in policy terms. Assertion of policy as the agenda setter and in the driving seat was recurrent through conversations with the former Chief Scientific Advisor of RESAS and in this sense establishment of CXC responds to a widespread perception that the scientific community as a whole is insufficiently sensitive to policy needs (Owens *et al.*, 2006). The ambition for scientists to focus on policy led demands for knowledge also extended to learning to

work better with the grain of government. As well as being more responsive to policy needs, scientists were called to accept Government's ways of working and not objecting to government staff changes or short timeframes (Interview SG6). Responses among scientists have been mixed with some who want their research to influence policy eagerly, accepting these demands as necessary. Others (often older scientists) resisted these changes in the science–policy relationship (Interview CXC-S3). The next two sections introduce the key organisations on which the research focussed, starting with CXC.

4.3.2 ClimateXChange

Of the three centres for expertise, CXC was established with the highest level of resource investment – £4.1m out of the total £6.6m originally invested between 2011 and 2014. With this greater investment, ClimateXChange also appeared to carry greater expectation to demonstrate international significance with expectations “To create a *world-renowned* centre of expertise to deliver objective, independent, integrated and authoritative evidence” (Scottish Government, 2011b: online, emphasis added) standing in contrast to the other two centres, for both of which the aim is “to provide *the best available scientific* advice to inform government policy” (Scottish Government, 2011d: online, emphasis added; see also Scottish Government, 2011a: online). Such international expectation supports suggestions that climate change is being used in Scotland to establish recognition on the global stage (Swenden *et al.*, 2009: 16). There is also a striking difference in the type of evidence required. Climate change evidence will not simply be “the best available”; rather, it will be produced by a world renowned scientific authority and characterised by being “objective, independent, integrated and authoritative” (Scottish Government 2011b: online). Such higher stakes place high demands on climate science, both reflecting the controversial status of climate science post-climate-gate in the UK and also presenting particular challenges to an area of science already beset with post-normal challenges of high stakes, high uncertainty, urgency and public value based controversy (Funtowicz and Ravetz, 1993b).

ClimateXChange as a ‘virtual centre’ (Scottish Government, 2011c) comprises a directorate, a secretariat, and around 80 affiliated research scientists drawn from Scottish universities and research institutes, employing around six specifically appointed post-doctoral researchers hosted within the aforementioned institutions. Leadership of the organisation is shared between Edinburgh Centre for Carbon Innovation (who host

the CXC offices and whose Managing Director is the Policy Director for CXC), Aberdeen University (who provide the science director), the research brokers Sniffer (who host two members of the secretariat) and JHI (who provide the third director of CXC responsible for the relationship with the research institutes). These blurry and overlapping boundaries point to the relevance of not considering CXC as an organisation in isolation. Significant sharing of staff membership between organisations in the case of Sniffer and CXC brought benefits to both organisations alongside access to different funding, assets and datasets which can be used to the advantage of both parties (RN: CXC Away-Day 2013). However, this also generated tension over the distinctiveness of roles especially between CXC and Adaptation Scotland (a programme of Sniffer) requiring discussion of how to manage the division, avoid duplication and ensure unique audiences in the eyes of their common joint funder (RN: CXC Away-Day 2013; Interview Climsave 1).

Formation of CXC

The initial concept for a Centre for Expertise on Climate Change emerged in conversations between the Head of Scottish Government's Research and Science division and the Chief Scientific Advisor for Rural and Environmental Affairs. A 'sandpit' event was then organised by RESAS (the Scottish Government Rural Environmental Science and Analytical Services Division), to which representatives from the six research institutes, fifteen universities and (after some appealing) several other smaller research centres were invited. The purpose of the event was to generate a bottom up approach (led by research scientists) to organisational design, membership, structure and work-planning, to encourage greater buy-in to the process of change by the various research organisations involved (Interview SG6). Originally research scientists proposed four work streams, on 'Mitigation', 'Adaptation', 'Significance Risk and Uncertainty' and a fourth work social science workstream dedicated to 'Knowledge Transfer and Communication'. However RESAS rejected this model, requesting that Knowledge Transfer and Communication be integrated across the other three workstreams (Interview CXC-R9). This reflected emphasis on all research being policy relevant. Widening research partners to include universities and smaller research centres was an attempt to expand the types of expertise being engaged to social as well as natural science (Interview SG6), however this was at first met by strong resistance from some research institutes:

“[x research institute] pilloried me in the press when I suggested that perhaps they needed to work with social scientists. I was destroying science” (Interview SG6).

From RESAS’s perspective, desirable social scientists appeared to be those from an economic or behaviourist background that were responsive to policy. An example was given of one responsive scientist who was “much more of an applied person... and therefore he was closer to policy where economists got involved... the sort of guy that would listen to what policy people were asking for! And make the effort, to deliver what they wanted” (Interview SG6). Broadening of expertise has continued to be a challenge for CXC as further discussed below.

Reformulation

During its first three years of operation, CXC has undergone several rounds of organisational structural change. Like other Government departments, RESAS had to show financial savings, which for CXC, offered opportunities for organisational reform and self-definition. However, some scientists expressed a desire for a period of stability “to see through achievements on what we’ve been planning so far” (Interview CXC-R9); this stability at the interface with rapidly changing world of policy appears unlikely. Observations of the everyday interactions of CXC demonstrated a constant focus on demonstrating value for money (Interview SG2; RN: CXC-AGM 2013) added value, and return on investment (RN: CXC-AGM 2013). In 2013 the SRU work-stream was folded into Adaptation and Mitigation, leaving only two work-streams, and funding was reduced for long-term projects (which would have to be negotiated under the respective Institutes Strategic Research Programme funding) (RN: CXC-AGM 2013). Initial membership of 120 research scientists with time allocations of as little as 5-10% was also reduced to around 80 with 50% or more time costed to CXC (RN: CXC-AGM 2013, RN: CXC Away-Day 2013).

Everyday Practice

CXC defines itself as a translation organisation with a clear focus on serving policy: “it’s very explicit, it’s not to improve the science; it’s to improve the policy making” (Interview CXC-D1). Provision of knowledge drawn from the broader Scottish Government Strategic Research Programme and CXC’s wider contacts involves provision of knowledge to policy teams and Government Agencies (who are themselves often scientists within policy roles). At the 2013 CXC AGM a diverse list of policy areas with whom CXC had worked

were presented (RN: CXC-AGM 2013). In responding, CXC activity comprises three main areas: call-down service, co-developed planned projects and proactive support and facilitated conversations (Figure 4.2).



Figure 4.2: Main areas of CXC activity; Source: CXC Director presentation at the 2013 AGM of CXC (RN: CXC-AGM 2013).

The call-down service is a responsive service provided to policy teams within the Scottish Government, and is perhaps the defining characteristic of CXC’s knowledge exchange. The service is premised around the expectation that policy makers will face difficulties in making climate policy that require scientific knowledge. In such instances, policy teams are invited to get in contact with the CXC secretariat and request scientific knowledge to help address this challenge. The secretariat will meet with the policy practitioners, often face-to-face, to refine the definition of the problem into one which can be addressed by science, and will source a team of CXC researchers (or external consultants in the absence of relevant CXC expertise) to produce a short policy briefing for the policy team. As the policy director describes,

“a policy maker can pick up the phone and say ‘help’... can you help... we sit down with the... policy team and work out what evidence they could do with and how we can help. And then we go and negotiate with the

researchers and essentially create an ad-hoc project that we can take forward to support that” (Interview CXC-D1).

Advice is provided in the form of a briefing report – usually no more than 2 to 3 pages – that undergoes iterative rewriting, until the scientists are happy that the scientific message is accurate and the secretariat is happy that the response answers the policy need. Each briefing report is signed off by the CXC science and policy directors before being released to the policy team and placed on the CXC Public website. This establishes a ‘pull model’, drawing science into policy in ways determined by policy teams and contrasts with ‘push models’ where the emphasis is on pushing scientifically defined relevant knowledge out to policy teams. ClimateXChange is “the hub that pulls the information across from policy or from research” (Interview CXC-D1). The intricacies of the call-down process are subject to closer attention in Chapter 6.

The lack of social science within CXC has been a continuing struggle for the organisation in responding to call-down requests, with much less call for physical and natural environmental science knowledge and more demand for social research (Interview CXC-D1). The Policy Director described the way in which climate change had turned “from a scientific problem into a management problem, which is exactly what it should do, which is the point we’re trying to get to, where it becomes something that people manage on a day to day basis” (Interview CXC-D1). In terms of the effect on the demand for science he suggested:

“We are starting to see a very different framing for the science now, people are quite frankly not interested in another statement about what the world might be like in a hundred years’ time... Scotland’s got it’s legally binding target, its working its backside off to try and deliver on it... the policy teams are not interested in more physical science... the problem is how do you get behaviour change or perceptions to change or how do you shape the way that communities operate... that’s not about the physical science” (Interview CXC-D1).

Scottish Government continually emphasised the need to broaden the basis of expertise within CXC in order to reduce the need to commission externally (RN: CXC-AGM 2013). In practice it is also “not just Scottish expertise but UK expertise that’s being brought to bear” (RN: CXC-AGM 2013). There was a need to work strategically, both with the UK Living with Environmental Change Program and international linkages to demonstrate that the science was ‘world renown’ (RN: CXC Away-Day).

The other two areas of CXC's work - facilitated conversations and co-planned projects focus on early and continual policy engagement such that the types of questions posed to CXC should be shaped and planned together and any planned work should be aligned to policy needs (RN: CXC-AGM 2013). These interactions rely heavily on face-to-face and telephone interaction building trust and rapport (Interviews: CXC-D1, CXC-S3). CXC's performance in close working with policy was reported to be broadly successful at the 2013 CXC AGM, although RESAS expressed difficulty in getting policy teams across the Scottish government to turn to CXC for advice (Interview SG2). Hence, the push continues from the RESAS that CXC should be more about responding to stakeholder needs, developing closer interpersonal engagement and awareness of policy deadlines and pressures (RN: CXC-AGM 2013). In many senses RESAS is less of a client for CXC than a marketing agency in which happy policy customers are the best marketing you have (RN: CXC Away-Day).

4.3.3 Other organisations studied

The analysis of CXC's boundary work in the thesis is complemented by comparison with other forms of science-policy interaction – by Sniffer, the Met Office and more ad hoc forms of boundary work performed by research scientists in policy facing roles. This section provides specific organisational context to these organisations as parallel forms of science-policy interaction.

Sniffer

Sniffer, who host part of the CXC secretariat, is a charitable organisation with a recurrent presence in networks of climate science-policy interaction in Scotland. Sniffer often appears as a connecting chain and glue within these networks. Originally the name 'Sniffer' represented an Acronym: 'Scotland and Northern Ireland Forum For Environmental Research'. However, in 2011 the organisation refocused to concentrate only in Scotland, keeping the name but dropping the acronym. Sniffer is the vision of the founding, and still current, managing director who described it as "a change maker for a more climate resilient Scotland. So our focus is on climate resilience and making change" (Interview Sniffer 1). She described the original idea for Sniffer developing from informal conversations in 1989 while working for an environmental consultancy and then for SEPA

over how to make the most of pooling the many small funding sources available for environmental and water related research (Interview Sniffer 1). From being a part time project, Sniffer became a company in 1994. This created a strategic and agile organisation able to navigate and utilise many sources of funding for environmental based activity. In refocusing on Scotland only, no overt connection was made with potential Scottish Independence; however this could be considered a strategic move positioning Sniffer in a funding climate that could have increasingly emphasised Scottish activity.

Sniffer describes itself as a knowledge broker who simplifies and better communicates science to a wide range of public sector, business and community audiences: “we are very much working with decision makers, to help them be better informed” (Interview Sniffer 1). Central to this function is application of science in a risk-based approach to thinking through adaptation in terms of resilience. The organisation focuses less on mitigation or energy and more on adaptation and triple bottom line sustainability (a focus that has evolved from early framing through water land and soil) (Interview Sniffer 1). For the Managing Director, Sniffer’s role is about empowering people “about feeling that you can do something about *it*, whatever the ‘it’ is... what we can do [is] be a catalyst” (Interview Sniffer 1, original emphasis). Partnership working has been an important focus for Sniffer historically:

“Sniffer was a *mechanism* to actually deliver things in partnership... that's been at the heart of what we do, and still is... we don't do consultancy work... we work in partnership” (Interview Sniffer 1, original emphasis).

Sniffer was repeatedly constructed as ‘just a mechanism’ to define collective priorities and deliver projects. Sniffer hosts several projects and programmes under their umbrella including the work of Adaptation Scotland which works with local authorities, businesses and communities on climate adaptation (equivalent to the regional climate change partnerships across England, now formally part of ClimateUK) and two members of the secretariat of CXC.

Met Office

The Met Office is the UK’s principal Government funded scientific meteorological research and public information institute. First established in 1854 as an experimental government department, the organization today comprises a Public Weather Service,

National Severe Weather Warning Service, a series of specialist environmental monitoring services funded through UK Government (MET Office, 2015), a commercial forecasting service for aviation, energy sector defence etc., and a research programme into long term climate change modelling through the Hadley Centre. The Hadley Centre, based in Exeter has a remit for monitoring climate variability and change, understanding processes of change and developing computer modelling such as *HadCU4* to model projected future climate (Interview Met Office). In Scotland, the Met Office have a chief scientific advisor who specifically serves the Scotland and Northern Ireland devolved administrations, provide commercial forecasting services from Aberdeen and an archive of historic weather data in Edinburgh as well as a specific public weather forecasting service and extreme weather support service to the Scottish Government Resilience Group comprising Ministers, junior executives and emergency response teams from all, from the required agencies that are scrambled during an event (Interview Met Office). The Met Office holds an authoritative voice on climate science in Scotland and regularly provides advice to the Scottish Parliament and Government.

Ad hoc science–policy exchange

As indicated in section 4.2, there are also plethora of other routes for science–policy exchange including through Government Agencies who all commission and produce scientific knowledge and whose staff are often scientifically trained, perform boundary work and become the voice of science within policy debates. Specific instances will be discussed in Chapter 7.

4.4 Problematising models of science–policy interaction in Scotland

Before examining the specific differences in the processes and politics of boundary work between CXC, Sniffer, the Met Office, this short empirical section attends to the way in which the science–policy interface is being envisaged and narrated by practitioners. The section begins with a discussion of when and why science–policy actors look to science and then discusses the type of science–policy interface conjured through such reasoning. Most practitioner narratives imply a singular boundary between science and policy and describe boundary work as a value neutral. Drawing from boundary literatures

introduced in Chapter 2 and empirical findings, this section problematizes these characteristics to suggest that the science–policy boundary in Scotland is made up of multiple micro-sites of boundary work that cumulatively construct the idea of a macro science–policy interface. Further, while narratives may emphasise the neutrality of boundary work, observations suggest that value neutrality was carefully constructed in the process of boundary work itself.

4.4.1 Roles for science and associated science–policy models

Climate policy-making processes engage with science at a number of different stages, from preparation of the draft Climate Change Bill, Parliamentary Committee ‘Calls for Evidence’ or action planning for implementation (Interviews: Met Office, SG 1, SG4, SG3). The types of knowledge also varies from natural scientific evidence of the need for a policy response (in the early stages of a bill) to a greater emphasis on socioeconomic evidence of what works in terms of policy response in later stages of implementation (Interview CXC-D1). It is important to recognise the diverse ways in which science enters the policy making process and the limited role that it plays in policy development for as Irwin et al have demonstrated whilst influential – in many cases science itself effectively disappears (Irwin *et al.*, 1996).

In exploring *why* science is looked to by policy makers, research interviews revealed a vast number of roles for science. From the search for information to a desire to reduce debate, policy makers and CXC staff expressed multiple viewpoints in their explanations for turning to science in generating a policy response to climate change (Table 4.2).

For information	To scope possible policy responses/ implications	In justification of policy	As an arbitrator	To Problem Solve	To generate Debate/ action	To reduce debate
To provide information (Interview Met Office)	To provide policy options and likely consequences (Interview CXC-D2)	To provide a rationale for policy development (Interview SGA 2)	To provide guidance (Interview CXC R11)	To generate innovation (Interview SG6)	To lay out options especially where there's a moral debate to be had (Interview SGA4)	To close down discussion (Interview CXC-S2)
To understand a system in order to manage it (Interview CXC-D2)	To forecast results of a policy - likely outcomes (Interview SG6)	To verify that policy approaches will work (Interview SG6)	To provide a quality filter on the vast amount of information out there (Interview CXC-R11)	To offer solutions to problems (even if not 100% evidenced) (Interview SG2)	To provide long-term vision and join -up temporal and lateral fragmentation within policy (Interview CXC - R11)	
To understand likely impacts (Interview SG3)	To provide scenarios (Interview Climsave 1)	To justify a policy decision (Interview SG2)	To provide an independent view (Interview SG2)		To prompt choices beyond science (Interview CXC-R11)	
To fill knowledge gaps (Interview CXC-S3)	To provide foresighting (Interview SG4)	To establish an informed view (Interview SG2)			To prompt action (Interview SGA4)	
To provide indicators of change (Interview SGA 2)	To suggest what should be done (Interview CXC-S2)				To encourage and generate debate (Interview SGA4)	

Table 4.2: Reasons suggested for turning to science.

These reasons for turning to science influence the way that science–policy interaction is envisaged. Information provision, for example, assumes a very different model of science–policy interaction than does providing policy options or suggesting what should be done. Where Pielke’s models of honest broker, issue advocate, arbitrator and pure scientist (2007) are perceptible, the role of science as a problem solver, to justify policy and to close down debate, are familiar functions that escape Pielke’s classification. As well as complicating Pielke’s model, this set of reasons for turning to science offers conflicting demands, in which science is asked to perform a variety of different roles - some of which imply a clear demarcation of science and policy and others that contradict such demarcation. This generates many perspectives on what the science–policy boundary should look like and the kind of responsibility held by each party – creating a highly contested space of interaction.

Despite these complex and conflicting perspectives on the science–policy boundary, and explicit engagement with academic literatures on boundary organisations (Interview SG6) a rather singular narrative of science and policy as “two different worlds” that “speak a different language” and “have a different culture” (Interview SG6) is often told. Those seeking to change modes of science–policy interaction in particular, describe a gap between science and policy that needs to be overcome (Interviews: SG6, SG2, CXC-D1). The former Chief Scientific Advisor of RESAS described:

“What was obvious was the big gap between, science and policy and I had done... reading up about that... I have what’s called Maggie’s pipeline diagram which was basically, trying to show that you’ve got a huge bulk of academia and you’ve got a community of policymakers, and actually... the institutes were sort of moving knowledge along that pipeline in 2 directions... so that you needed a broker. There’s a lot of stuff in the literature about boundary organisations... what we were basically saying was that the Institutes were almost like boundary organisations” (Interview SG6).

Here, science and policy are seen as separate bodies, with a gap between them requiring bridging. Exchange is conceptualised in a linear, if bidirectional, way with research institutes and later ClimateXChange as boundary organisations – understood with functionality to better move knowledge from A to B. Owens *et al.* (2006) suggest that problems of communicating research findings are a familiar explanation for a science policy gap and this positioning of science and policy as pre-existent and separate domains provides justification for boundary organisations, like CXC, through the belief that these “two groups [science and policy] don’t go naturally together” (RN: CXC Away-Day). Yet differences between science and policy are however not just constructed but ‘felt’ through experiential difference. One fascinating but lengthy account by a Scottish Government policy official (provided in Appendix D) details an instance in which scientists presented a model to policy for predicting the needs of migrating species under a changing climate. The policy actor described with frustration and incredulity the scientist’s interest in the micro-scale intricacies of better predicting the behaviour of a hypothetical animal in a virtual model without any attention to what that tells us about what needs to be done, the wider scale of implications or financial considerations around investment options as a result of what they were exploring (Interview SG2). Frustration was particularly expressed around the limited scale of conclusions that could be drawn: “what does it tell us on a larger scale?... So you know something about this moth. Is there something bigger we can say?... not even another insect... if this is only applicable to that

moth and nothing else. Actually pffff it it's irrelevant for me!" (Interview SG2). This difference in scale is one among many differences in focus which create the experience of difference between science and policy. Hearing accounts of one world through the lens of another enables what Knorr Cetina has termed comparative optics (1999) to highlighting differences. Where Miller (2001a) describes very real differences in social practice and organization that exist between the two settings, these are understood not as ontologically different but produced through boundary work (Latour, 1993; Jasanoff, 1990; Miller, 2001a).

4.4.2 Problematising a single macro science–policy boundary

This proliferation of sites of boundary work suggests it is important not to overemphasise two simple homogeneous worlds of science and policy with a singular gap between them. During interviews, actors demonstrated an almost countless number of 'worlds' configured through demarcation of similarity and difference in which different norms, ways of knowing, languages (Interview CXC-R4), epistemic commitments (Interviews: Climsave 1, CXC R-4), focuses of interest, scales and networks of operation (Interview CXC-R3) and writing styles (Interview CXC-R4) were described as frontiers through which similarity and difference were demarcated within disciplines, policy areas, scientific teams, organisations, epistemic cultures (Knorr-Cetina, 1999) and civic epistemologies (Jasanoff, 2005). This suggests that differences *within* the heterogeneous communities of science and policy may be almost as significant as those *between* science and policy. Actors often held multiple roles which facilitated boundary working – for example one scientist described the way he uses his split affiliation between two scientific organisations to share knowledge to the benefit of both – acting as “a kind of bridge between the two” (Interview CXC-R4). Actors also often changed roles over the duration of their working life and rather than being fixed, boundaries appear to be hardened through monitoring practices that emphasise clear demarcations of responsibility and accountability (Interview SGA4). As a result boundary work was also configured not only between science and policy but for example also between public and private sectors, with frequent blurring and simultaneous reassertion of a public-private boundary in policy making to defend against any one group holding too strong a sway over public decision making (Interview SG4). This can be understood in terms of a construction of legitimacy (see Chapter 7).

It is perhaps more helpful to consider the perceived macro differences between science and policy instead as constructed cumulatively through specific micro-scale boundaries of similarity and difference. In extensive coding of interview transcripts, science and policy are often distinguished from one another through small scale conceptual distinctions: through being neutral vs. political (Interviews: CXC-R3, CXC-R4; RN: CXC-UW), impartial vs. with vested interest (Interviews: CXC-S3, CXC-D1, CXC-S1, Climsave 1) through simply providing information vs. advocating/actively campaigning (Interviews: CXC-S3, CXC-S1, CXC-D1, CXC-R1, Climsave 1) through being specific rather than general (Interviews: CXC-D1, CXC-S1, CXC-S3, CXC-R11, SGA4, SG2, SG3, SG6, Sniffer 1, Climsave 1, Met Office), through being technical rather than applied (Interviews: CXC-S1, CXC-S3). They are also distinguished by being or not being a decision maker – or even a decision support tool (Interviews: Climsave 1, Climsave 2), being an expert vs. lay, (Interviews: CXC-R10, Climsave 1) and dealing with evidence vs. dealing with values or opinions (Interviews: CXC-S2, CXC-R3, CXC-R4). In some cases science and policy are also distinguished through scales of interest, in others over processes of constructing legitimacy, customary norms in writing, or the importance of financial considerations. None of these are themselves chasms but small differences that become cumulative and mutually reinforcing when mobilised collectively. Multiple boundaries found in the small-scale everyday conceptual distinctions discursively employed, create difference that is felt at a larger scale, without any clear divide or linear continuum being locatable.

As well as being fragmented and multiple, such boundaries are often contradictory. Boundaries do not neatly align to make a seamless locatable boundary, but rather make simultaneous claims and counterclaims that render any single boundary difficult to locate. In many cases, both scientists and policy makers were simultaneously aware of contradictions in their narratives. As early as 1983 Gieryn drew attention to a collection of science characteristics variously drawn to demarcate scientific endeavour and noted that these characteristics are often contradictory and not mutually compatible (Gieryn, 1983). Boundary literatures since have drawn attention to boundary objects holding different meaning for different actors simultaneously that were intentionally ambiguous (Star and Griesemer, 1989) and to the role of boundary work in concealing such contradictions (Miller, 2001a). Gieryn's account drew attention to the different characteristics that were foregrounded in different combinations at different times and in different situations – in effect there are many boundaries of science advocated, which whilst related, do not form a coherent whole that could be located as a singular

boundary of science. Empirical findings in Scotland suggest multiple boundaries between science and policy, consisting of micro distinctions that cumulatively contribute to a macro level distinction through which a large-scale science–policy interface comes to be known, but none of which can claim to represent the science policy boundary as a whole. These fragmented multiple boundaries are however networked, such that small scale distinctions interrelate and reinforce each other in complex ways to allow diversity and accommodating contradictory claims. This argument is further developed in Chapter 7.

It is precisely the everyday trivial activities of boundary workers, their small scale decisions, conceptual distinctions, mundane actions and enlisting of actors that make up these multiple, distributed, fragmented yet networked boundary practices. Taking this position therefore disagrees with Guston’s need to focus on the “crucial (rather than trivial) activities of boundary workers” (1999: 88) and instead, following STS approaches, argues that tracing micro-scale processes of *simultaneous* processes of translation and separation (Latour, 1993) and attending to the infinite number of passing points (Star and Griesemer, 1989) are important in exploring the micro-scale boundary work that effects a broader science–policy boundary. As Jasanoff argues,

“making sense of public reason as a social and cultural achievement dissolves the boundaries between micro and macro, by showing that the grand abstractions of reason, such as expertise and objectivity, are constructed and reconstructed through small mundane actions and inactions” (2012a: 20).

4.4.3 Problematising value-free boundary work

While science may be used to open up or to close down political debate, the claims of science themselves are often positioned as value neutral. In the reasons for turning to science (Table 4.2) science is in many cases being valued through a claim to being values free – as information, as an arbitrator, to scope out possible policy responses or implications, or to solve problems. Science’s value free claim is also utilised when science is used in justification of policy, to prompt debate by others, or to reduce debate albeit with greater reflexive acknowledgement of the problematic nature of this claim. Chapters 5, 6 and 7 problematise such claims to value neutrality, by drawing on the hybridity of boundary work and empirically analysing the value circulations at stake in science–policy boundary work.

Accepting STS attention to the hybrid nature of knowledge (as mixtures of fact-value claims) means attending to the value as well as the fact dimension of knowledge. Critiques to EBP introduced in Chapter 2 are a central thread in this thesis in demonstrating that the role of boundary work is not neutral. Recurrently research scientists and policy practitioners corrected any references to evidence-based-policy suggesting instead ‘evidence-informed-policy’ in acknowledgement of the limited role science plays in policy decisions (Interview SG1). In many cases the policy goal “often comes before scientific and research evidence rather than the other way round” (Owens *et al.*, 2006: 637) and “scientific findings do not fall on blank minds that get made up as a result. Science engages with busy minds that have strong views about how things are and ought to be” (2004). One policy maker passionately emphasised:

“The way we tend to do things in Government is just think we just give people the evidence ((laughing)) and of course they'll believe it but... no they won't if they don't like it, it's like telling me to read a newspaper that I don't believe in, I just won't, *I won't do it!* And I don't think we take that into account in Government and we should, we really, really should...this stuff is sub-conscious in the end...and it's not a bad thing it's just... hhh yeah. I'm very aware of it” (Interview SG4, original emphasis)

This ‘evidence-proofing’ allows “only certain kinds of ‘evidence’ to be noted” (Head, 2008: 5). Another Government Agency official suggested “if they don't want to hear it, [they] just exclude it from their thinking” (Interview SGA2). While narratives may emphasise neutrality of boundary work, value neutrality was observed to be carefully constructed in the process of boundary work itself as will be outlined in chapters 5 to 7 enabling contestation of these claims to neutrality and rational foundations to policy making.

The circulation of fact-value hybrids as ‘evidence’ within political debates establishes a black box in which the circumstances and conditions of knowledge generation become masked and knowledge is rendered fixed, independently produced, un-questionable and apolitical. Referral to ‘evidence’ tends to cleave out a value neutral claim for decisions in which authority and therefore responsibility is relocated from the political sphere to science (or other sources of knowledge). Evidence thus has potential to serve as a channel through which responsibility for decision-making is deferred to the impersonal processes of science, removing the responsibility for decision making from policy and thus rendering decision making non-contestable. It is this that prompts one boundary actor to reject the use of evidence:

“I deliberately don’t use it, I don’t like the word evidence because... for me it is not truth and if it is not truth, what is it?... knowledge is more, always more impartial. You know what is truth for one person is not true for another... So evidence isn't fixed and therefore I think it can be misleading... I think knowledge is important” (Interview Sniffer 1).

With the Scottish Government establishing a model of science–policy interaction through the three centres for expertise in which the objective for ClimateXChange to deliver “objective, independent, integrated and authoritative evidence” (Scottish Government, 2011b), it is both timely and important to be attentive to both these earlier and newer critiques of EBP and to examine how value debates and knowledge interact at the science–policy interface.

4.5 A summary and looking forward

This chapter has considered the history and development of climate change policy in Scotland, and the complex landscape of organisations and networks of interaction through which science is drawn into policy making. The chapter has aimed to map a number of important influences on public policy discourse that reflect wider UK science–policy culture and/or shape science–policy boundary practices, including: Scottish Independence, outcomes-orientated policy, sustainable economic growth and a historical tendency towards socialist politics. It suggests that these discursive frameworks involve clear value orientations, which have important effects on the way in which science is drawn into policy making and on the processes of science–policy interaction discussed in chapters 5, 6 and 7. However, the influence of these discursive value frameworks is not straightforward and struggles over balance of power between science and policy in agenda setting and discursive framing of climate change do not reach closure but remain on-going in processes through which organisational actors find different degrees of scope for resistance (see Chapter 7).

By sketching out the organisational background, history and context of ClimateXChange and other key organisations, this chapter has established the context of science-policy boundary working in Scotland within which the detailed analysis undertaken in the following chapters takes place. The model of a singular science policy boundary and the understanding of science and of boundary work as value neutral have both been problematized, suggesting instead the hybrid nature of boundary work around multiple micro-sites that mutually construct a macro understanding of science and policy as two

separate worlds. Understanding the science policy boundary as involving multiple distributed sites of boundary work which mutually interact, also helps to open up a more realistic understanding for the role of agency within boundary work and to understand the robustness of any science–policy boundary to critique.

The period of research was a time of intensified attention to questions of Scottish Independence in the run up to the 2014 Referendum. Although not the focus of research, the possibility for independence has provided an inevitable context within which the research took place. This has probably over-emphasised the rhetoric of the significance of Scotland’s activity and the importance of nationalism in policy-making. However, the possibility of independence has also provided an atmosphere of ambition and possibility that facilitated ambitious climate change policy to develop, and configured climate change as an avenue to construct a progressive national identity.

Beyond the hype of the ambitious targets, Scotland is implementing a new model of science–policy interaction that is attracting attention beyond its borders (RN: CXC-AGM 2013; Interview SG6) and sits within a wider move towards demand rather than supply driven science–policy interaction (Sarewitz and Pielke, 2007). This thesis suggests that this ‘pull’ model of science–policy, which reconfigures the science–policy relationship by establishing policy in the driving seat and science in the service of policy, merits greater attention than the globally reaching mitigation targets. Amidst a language of translation and of co-production, each itself evoking particular interpretations of meaning, CXC are seeking to establish a more useful supply of science to Scottish Government policy teams to facilitate stronger delivery against climate policy goals, and the CXC secretariat are navigating and negotiating a new discursive ordering of science–policy interaction. Yet in the success of responding to these demands, the politics involved in the changing model of interaction are receiving insufficient attention. With abolition of SDC, which acted as an (often vocal) critical friend to the Scottish Government (Interview CXC-S1), and the establishment of CXC as a translation organisation, the Scottish Government has institutionalised a very different relation with policy in which there is little scope for policy critique.

The theme of the changing science–policy relationship being initiated through CXC is explored in each of the following chapters through closer attention to the practices and processes of boundary work. Through this more detailed attention it is argued that there are political questions in the configuration of the relationship between science and

policy, which should be the subject of reflexive debate. Questions that climate change provokes for policy are not just scientific questions, and cannot be resolved through application of science in ways that deny value pluralism. Concerns over the way in which science is being enrolled within climate politics frames this need for greater attentiveness to the politics of boundary work. In the next chapter I examine the significance of practitioners terming the work of CXC 'translation' in terms of what associations are evoked by considering interaction in this way and make the argument that this terming performs discursive work that serves the objectives of putting policy in the driving seat of establishing the meaning of climate change.

Chapter 5.

Struggles for Meaning at the Science Policy Interface: CXC as a Translation Organisation

ClimateXChange (CXC) defines itself as a translation organisation, or as one director described “a knowledge translation business” (Interview CXC-D2). The term ‘translation’ was used repeatedly throughout interviews to describe the work CXC undertakes, and this repetition stood out in contrast to the work of other science–policy actors who prefer ‘brokerage’ (Sniffer) or ‘science communication’ (Met Office). Wider science–policy literatures, often use the concept of translation to describe science and policy exchange, but frequently deploy it uncritically, as Chapter 2 outlined. This chapter draws from Fazey *et al.*’s (2014) suggestion that the way a process is described has implications for the way it is conducted. Through examining what the process of translation involves and how it differs from other forms of boundary work, this chapter argues that terming boundary work ‘translation’ is significant given the Scottish Government’s intent to make science more responsive to policy. The chapter finds that an important tenet of translation, as it is employed within CXC, is the act of making knowledge meaningful for a specific audience. Describing boundary interaction as translation performs discursive work, offering a useful way of shaping boundary work to prioritise policy audience needs. This specific emphasis on the audience is not differentiated by STS accounts of translation discussed in section 2.2, which could equally apply to other instances of boundary work discussed in this chapter. Instead, an argument is made for thinking translation through Laclau and Mouffe’s logics of equivalence and logics of difference (1985) to better capture the specific relations of power involved in CXC translation process.

The chapter is structured to first introduce and develop an understanding of translation through the logics of equivalence–logics of difference. Reading translation through Laclau and Mouffe is a theoretical move that builds on the more general introduction to Mouffe outlined in Chapter 2. The chapter then turns to the empirical accounts of translation in CXC to discuss who is using the term and what the envisaged work of translation entails for different actors. Here the notion of ‘audience’ is an important feature within

practitioner narratives. The way in which CXC foregrounds the discursive value framings of its policy audience through its working practices is the subject of section 5.3. Description of boundary work as translation is then compared to co-production, knowledge brokerage and science communication in section 5.4 to consider what is significant about the process of translation. The inability of STS approaches to distinguish the specific influence of hegemonic power in the shape of the privileging of audience grounds the turn to Laclau and Mouffe's work to help further thinking about the notion of translation.

5.1 Translation as boundary work between similarity and difference

Theoretical discussion of the concept of translation in Chapter 2 focused on debates within STS. A key feature in these discussions was the tension between stability and change in meaning involved in translation, in which similarity comes to be established across conditions of difference. This tension is also typical of other disciplinary accounts of translation such as those within linguistics and communication studies which have long struggled with tensions between faithfulness to the author's intention and 'dynamic' (Nida, 1977) or 'functional' (Nord, 1997) equivalence that increasingly emphasise meaning for the perceived audience (Nord, 1997). The way that CXC practitioners refer to translation appears to draw on lay understandings that originate within these linguistic understandings – of establishing equivalence in meaning across different languages or communities. The impossibility of achieving perfect translation is recognized within both traditions. For Venuti, the impossibility of 'double fidelity' to the source and target domains simultaneously creates an *inevitable violence* in the work of translation (Venuti, 2008: 267); as in the appearance of equivalence, difference is obscured (Venuti, 2008: 267). Venuti's account draws attention to the politics of overlooking difference in the act of establishing equivalence, the priority often given to the frameworks of the new community and the possibility for other meanings to be gained in translation (Venuti, 2008: 14), however, his language of violence privileges an original. Where for Callon processes of translation have no normative sense of faithfulness, only continuous practices of displacement, Venuti valorises an original

which is not helpful within a science–policy context that does not wish to advocate for interaction as simple ‘science communication’.

5.1.1 Laclau and Mouffe on similarity and difference

Mouffe does not use the concept of translation directly, however, the concept of similarity and difference and the process of claiming equivalence that are recurrent within translation, are central to Laclau and Mouffe’s notion of the logics of equivalence and the logics of difference that are foundational to their work on identity constitution and the formation of hegemony. Reading translation through the theoretical lens of logics of equivalence and logics of difference is helpful in attending to the politics of translation that are manifest in the case of CXC. Making this bridge requires bringing several of Mouffe’s ideas together, including further explanation of the logics of equivalence and difference.

First, to understand logics of equivalence and logics of difference it is necessary to understand Laclau and Mouffe’s concept of identity formation. Laclau and Mouffe start from the impossibility of a fully positive identity – complete or freestanding – for this would constitute an essence. Instead, identity is always formed relationally, through two processes. Firstly, drawing from Derrida, they argue identity comes to be defined by what it is not (Mouffe, 2005b: 15), forged in relation to a constituent outside (Laclau and Mouffe, 1985: 127). This constitution of identity in relation to what is not involves the designation of ‘same’ through “constituting a chain of equivalences which construct what it is beyond the limits as that which it is not” (Laclau and Mouffe, 1985: 143-144). Secondly, they claim identity is also prevented from realising itself as a complete whole (i.e. as a purely positive characteristic) from within itself – through subversion of the positive characteristic to a negative, within the very boundaries drawn around identity itself. This makes positivity without any trace of negativity impossible (Mouffe, 1993: 114) and creates contingency and ambivalence within identities that can never be stabilized as pure essences for “the contingent subverts the necessary by preventing it from fully constituting itself” (Laclau and Mouffe, 1985: 128). The effect of these two processes is that “neither the conditions of total equivalence nor those of total differential objectivity are ever fully achieved” (Laclau and Mouffe, 1985: 129). In discussing equivalence and difference, Laclau and Mouffe argue that as identity cannot

be grounded in purely positive characteristics (essences), identities are formed instead through opposition to shared difference

“by their common reference to something external... It is because a negative identity cannot be represented in a direct manner – i.e. positively – that it can only be represented indirectly, through an equivalence between its differential moments. Hence the ambiguity penetrating every relation of equivalence: two terms, to be equivalent, must be different – otherwise, there would be simple identity” (1985: 128).

Equivalence is therefore constructed through commonality in difference for otherwise the claim would be to being identical, not being equivalent.

Based on this groundwork on construction of identity, and Mouffe’s emphasis on the collective we and collective they in ‘the political’, Mouffe argues that building chains of equivalence is a tool of hegemony that seeks to establish the terms through which the collective ‘we’ comes to be defined. She suggests that:

“The building of a new hegemony implies the creation of a ‘chain of equivalence’ among the diversity of democratic struggles, old and new, in order to form a collective will” (Mouffe, 2005b: 53).

Constructing chains of equivalence Mouffe maintains is not an innocent act but a claim for setting meaning in particular ways that always requires “the demarcation of a they” (Mouffe, 2005b: 53) who are the constitutive outside, defined through difference. This expansion of a chain of equivalence – the claiming of ‘same’ in the face of a shared opposition, is a claim to universality (Rear, 2013) that is central to the construction of a hegemonic claim.

5.1.2 Reading translation through logics of equivalence and difference

Reading the process of translation through the logics of equivalence and difference builds from an understanding of translation as the construction of equivalence across situations of difference. Understanding translation as an expansion of a chain of equivalence reflects that equivalence is always partial and is based not on positive (essential) characteristics, but on shared difference (Figure 5.1).

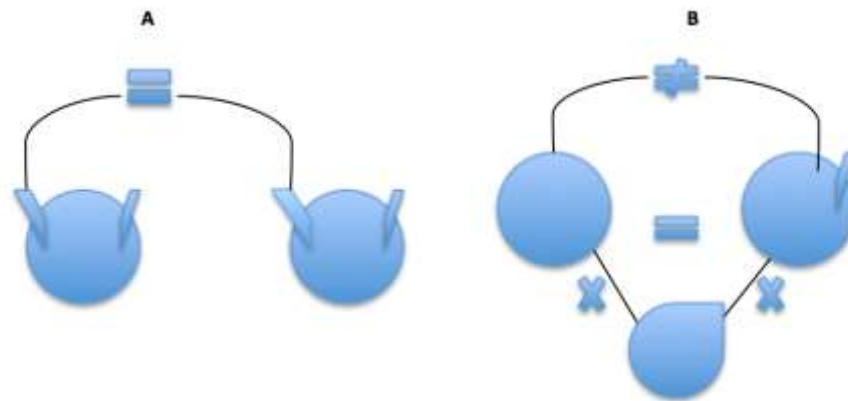


Figure 5.1: Identification through positive characteristics (A) and Identification through shared difference (B).

The shared outside needs to be a state of meaning that prevents the realization of each party's identity/goals. An example from the previous chapter that helps to illustrate this claim is the discursive alignment of climate change with the reindustrialization of Scotland through renewables. In this case equivalence is created between climate change and economic policy, not through shared values or identical interests, but through seaming together these concerns through a shared adversary – in this case a weak carbon neutral electricity generation capability that would prevent the goals of each policy from being realized. This chapter considers the specificity of the way the concept of translation is being employed within CXC and how it might be seen as an expansion of a claim of equivalence with regard to the discursive value framings of policy.

5.2 Translation as a process in CXC

At a broad level, the way in which the term translation is being employed within CXC was notable in three ways. First, active usage of the term was encountered primarily among policy and boundary actors and not among scientists. Second, the narratives of translation encountered foregrounded the importance of the 'audience' and of making knowledge meaningful for a defined audience. Thirdly, scientists and boundary/policy

actors held very different understandings of what the *process* of translation entails. These findings are discussed below.

5.2.1 Active use of the term ‘translation’

Only certain actors spontaneously used the term translation. The term arose prolifically and spontaneously in the narratives of the ClimateXChange Secretariat and ClimateXChange Directorate and of Scottish Government policy-makers during interviews and participation at events (Interviews: CXC-S3, CXC-D1, CXC-D2, SG-6, CXC-S1, SG-2) but was rarely spontaneously employed by CXC researchers (Interviews: CXC-R1, CXC-R3, CXC-R4, CXC-R8, CXC-R9, CXC-R10, CXC-R12). This specific usage of the term ‘translation’ by those in a policy-facing role suggests that description of boundary work as translation is part of a Scottish policy discourse, rather than driven by the scientific community.

Further, as Chapter 4 outlined, the science–policy interface is a complex, messy and overlapping space of heterogeneous scientific and policy communities, with boundary work taking place as much within and between these communities as across any clear demarcation of science and policy domains *per se*. For example, the nature of call-down requests usually requires cross-sectoral and cross-disciplinary conversations that require the input of multiple authors (Interview CXC-D1). Yet, despite this multiple boundary working and interfacing different knowledges across disciplinary boundaries, the emphasis on translation and foregrounding the meaning of the audience both occur only in the case of science- policy boundary work. In STS terms – all these acts of boundary work might be termed translation, yet the term translation tended only to be used for science–policy boundary work.

5.2.2 Making knowledge meaningful to the audience

An important reference point for those who are actively using the term translation within CXC was the notion of ‘audience’. The audience for CXC is quite clearly the policy community – the Scottish Government and Government Agencies:

“The point of the centre is... to do (.3) policy responsive work which means that ... they’re there to have their brains picked... really, the understanding has to be that it’s all about policy” (Interview SG2).

Translation was understood as “making knowledge understandable and relevant to the audience” (Interview CXC-R5). Foregrounding the needs of the policy audience is the *raison d’être* of CXC, and demanded through their funding agreement with the Scottish Government (Interview SG6, SG2). The secretariat describe: “That’s what we are paid to do is to serve the needs of policy” (Interview CXC-S3). Making knowledge meaningful for CXC’s audience was central in descriptions of the translation work that CXC undertakes. For example, the CXC knowledge officer described her role as

“translating the intelligence, or the information, the feeling, that I have from direct engagement into something that is then meaningful to the other audience” (Interview CXC-S3).

This prioritisation of the needs of the policy audience works towards establishing knowledge’s salience for policy (Cash *et al.*, 2002: 4). Concern for understanding and connecting with the audience was recurrent in narratives of all CXC directorate and secretariat staff. In this process of establishing meaning, the interests, problem framings, discourses, objectives and values of the audience hold primary importance. As the communication manager describes,

“to me the number one is always to find what is it that motivates your audience...*what* is it that is their objective, their goal so what have I got that I can package up, it’s a marketing task” (Interview CXC-S1, original emphasis).

Instrumental to this foregrounding of audience meanings is getting the right translators who will seek to prioritise policy meanings. The policy director in particular was both cited (RN: CXC-WAW) and observed (RN: Climsave, RN: C2020-M) to excel in his ability to look at and frame problems or information through the eyes of his audience. His ability to shift conversations to reflect the needs of his audience was experienced first-hand. When asked about these skills directly, he recounted previous experiences of working in the private sector, as an entrepreneur, trying to engage new markets (Interview CXC-D1):

"The first thing you had to do was go and find out what people wanted or thought they wanted and so the first conversation was not the same as a typical academic... hey look this is what I’ve done, you know, here’s my papers here’s my presentation, what do you think? Instead you actually have to go in and say ‘What’s your problem’, you know what is the thing that’s facing you?... So I think it’s probably driven from my private sector experience of trying to deliver a service that will deliver a product that met people’s needs" (Interview CXC-D1).

With a long working relationship with the Scottish Government the Policy Director recounted some previous disastrous examples of bringing policy teams and scientists

together in which scientists had launched into presentations entirely focused on their own world. He described his own reaction as “whoa, whoa, whoa. No, stop right there, ask them what the problem is, really tailor it to their approach” (Interview CXC-D1). The importance of starting with what is valued by policy could not be clearer.

These former private sector experiences are informing the design of the CXC approach to science policy interaction in the following ways. Firstly, ClimateXChange’s approach is framed in terms of delivering a *product* to meet a *demand*. The provision of policy awareness workshops focuses on helping scientists to better understand policy needs in order to tailor their product. Secondly, offering secondments for scientists into policy roles is seen to develop greater understanding of policy and the establishment of “rapport” (Interview SG6). This is entirely focused on scientists better understanding the world of policy (as audience) not vice versa. Thirdly, the practical editing and rewriting of scientific briefing notes by secretariat staff to ensure they respond and deliver against the policy need helps to better serve policymakers as *clients* or *customers* – both terms were used prolifically within CXC’s discourse (RN: CXC-AGM 2013, RN: CXC-AGM 2015, RN: CXC-PAW 1, RN: CXC-PAW2, RN: CXC-PAW3).

The original combined bid to deliver CXC by the directorate⁷ was successful because of its promise to deliver a service that was responsive to policy. The secretariat subsequently appointed consists of highly experienced boundary actors with long previous policy experience and strong understanding of a policy perspective (Interviews: CXC-S3, CXC-S1). They then encourage scientists to become translators by understanding the goals, motivations and objectives of the other party and to stand in the shoes of the other (Interview CXC-S3; RN: CXC-PAW2). This is an outward looking skill at which CXC staff excelled (Interview CXC-S3) but scientists were very bad at (Interviews: SG2, CXC-D1) and constituted an important reason for CXC’s establishment. While STS narratives of translation capture the status of translator and the change in knowledge they do not capture this orientation towards policy framings which is carefully being built into CXC’s practice.

⁷ Originally several bids went in to establish the centre for expertise. The successful bid was a combination of two bids, each led by one of the current directors, which were asked to merge (Interview CXC-D1).

5.2.3 Differences in epistemic understanding of the process of translation

Whilst the need to make knowledge meaningful for an audience was generally understood and accepted by scientists, there were significant differences in the expectations of what the process of translation involved between CXC scientists and CXC's Directorate and Secretariat. During interviews it was found that scientists tended to envisage translation as a continuous process of *filtering* of a discrete set of knowledge from a wider whole:

“There's a lot of information out there and certain key people were like information filters... extract the useful from the noise... I think that role of translating something that is quite general into, something that is particular for their particular peers... is still fundamental... these particular key people know what the issues are for their sector so they can extract that... I think it's partly what ClimateXChange was meant to do, to be a filter like that” (Interview CXC-R11).

In such cases, translation involves selection of a subset of information based on relevance to a specific domain from a larger whole, with no fundamental change in character. As another researcher described “making that distinction about what needs to be there and what doesn't need to be there and getting rid of anything that really doesn't need to be there is what the translation process entails” (Interview CXC-R4). One domain is simply a subset of the other, and meaning in one context flows smoothly to the other, with no disjunctures. In natural science literatures such as physics, biology, mathematics and computer science, translation is often used to connote stability through change. This contrasts with social science where attention is drawn to the dimension of ‘change’ – whether betrayal (Bassnett, 2014) treason (Callon, 1986) or violence (Venuti, 2008). For example, in mathematics and physics translation is understood as uniform movement without rotation (Morris, 1992), in computer science and artificial intelligence as stable conversion through coding and decoding, and in biology and virology as transmission. This creates a difference in understanding of what the process of translation entails and therefore, very different expectations over the work that translation performs - leading scientists to view the process of getting scientific knowledge to policy without political distortion – as one scientist suggested “we can deliver messages but messages get muddied” (RN: CXC-UW). While the concerns of policy become the selection criteria around which filtration of scientific knowledge takes place, the meaning of knowledge in filtration appears to remain unchanged. This is

characteristic of models of science communication (see further discussion in section 5.4.2).

Understanding translation as filtration contrasted with understanding by policy and CXC staff of translation as conversion. Policy and boundary actors emphasised the disconnection and required jump that translation involves, during the application of knowledge to a different problem that is not the same – "the policy problem is the real one that's on the ground just there, which won't be the same, it might be similar, but it's not the same as the paper that's written over here" (Interview CXC-D1). Instead the emphasis in translation-as-conversion asks scientists to interpret their knowledge in a different context:

"It's trying to get them... to think more in terms of... being professional, they have more expertise in that field than the policy team do so we're asking them to impart that professional excellence knowledge into that space... what we're interested in is your professional opinion and how it applies to this particular problem" (Interview CXC-D1).

As the secretariat described "its that '*turning into*' that's important" (RN: CXC-PAW2, original emphasis). Some natural scientists within CXC are less comfortable with demands to convert meaning in this way, than others, however it was emphasized that the real difference CXC brings compared to the MRPs (Main Research Providers⁸) is providing expert opinion/expert judgement⁹ rather than research itself (Interview SG2).

Part of the Scottish Government move towards centres for expertise was policy recognition that scientists were understandably reluctant to share reflections in writing prior to peer review "but you can tap into the brain and the knowledge, that's in a scientist, an expert working in the right area" (Interview SG6). In the face of need for rapid information in policy, verbal conversations with experts for their 'expert opinion' are presented as a way of circumventing this difficulty:

"It's that kind of kind of translation... the hunch aspect right? So you've got the scientist that says, no no... it's just this species that I can tell you anything about. Ok that's fair enough scientifically ok. Yeah but! Tell me! What is your expert judgement!" (Interview SG-2 see Appendix D).

⁸ Research Institutes with a long standing renewed research contract for Scottish Government

⁹ Expert opinion and expert judgment both used in interviews.

Demands for expert opinion are stimulated partly by the complexity and interdisciplinarity of modelling information that requires specialist interpretation (Interview SG6) and partly because climate change, as an area of post-normal science, asks scientists to contribute knowledge in areas of urgency, uncertainty, high stakes and values disputes (Funtowicz and Ravetz, 1991). These calls for expert opinion over evidence can be seen to involve precisely this emphasis on conversion. Providing evidence can be seen to refer to the *distillation* of conclusions from data, whilst expert opinion refers to the *conversion* of expert knowledge in one area to application in another area, which is not the same. While in practice, CXC both filters robust and relevant knowledge from a wider body of scientific knowledge and converts meaning in one area into meaning for another; the emphasis on translation by policy and CXC actors is a push for the *conversion* of meaning.

This tapping into a scientist's brain and shift in emphasis on 'evidence' to interpretation of implications and emphasis on 'expert opinion' can be seen as one way in which the discontinuous leap between science and policy is being navigated, but asks scientists to take a more flexible approach to their habitual boundaries around the role of science. The move from written peer reviewed evidence to consultation with scientific experts further asks scientists to occupy different subjectivities – as experts with opinions, rather than as the collective voice of science (discussed further in Chapter 7). For policy and boundary actors, conversion of knowledge from one domain to another through extending equivalence is epistemically unproblematic, and part of how they understand the process of translation. This is illustrated by the words of a CXC Director at the 2013 AGM, who refers to scientists' reluctance as reticence and stubbornness:

“Policy want your judgment, even if you're not sure, and just have an inkling... its about overcoming resistance to wanting everything just so, and... making a judgement call on it in the absence of certainty” (RN: CXC-AGM 2013).

For many natural scientists, the request for expert opinion requires a discontinuous leap across difference; extrapolating or interpreting implications of findings in one area to that in another runs counter to many of the methodological principles upheld by scientists trained in natural science, as one scientist described:

"My role is to... make sure that the way that people make use of data is robust... that the relationship between the data they've collected and the questions they want to answer and the conclusions they draw using that data are reliable and defensible... that those statements are actually backed up by the evidence behind it... I wouldn't say my role was to go any further than that in terms of

advocating particular outcomes, or even communicating those outcomes more generally” (Interview CXC-R3).

These demands for expert opinion require the passage of judgment outside the boundaries of experimental evidence. The very different meanings of the term ‘translation’ for different communities within CXC is likely to create very different expectations among scientists for the work required and different understandings of where boundaries of equivalence and difference might be drawn means that such equations are felt as problematic. Scientific researchers who have clear boundaries over what constitutes ‘the same’ and what constitutes ‘different’ – find translation, when understood as conversion, troubling whilst those who understand these boundaries in more flexible ways are able to interpret likely implications more provisionally in ways amenable to policy needs thus generating two communities of researchers (Interviews: CXC-S3, SG2).

Further, researchers are often caught in a tension between epistemic pressure to separate scientific practice from judgment and pressure through CXC for “less research and more judgment and expertise” (CXC’s Science Director, at RN: CXC-AGM 2013). At the 2013 AGM, the Science Director suggested to his audience of scientific researchers that although there was a tendency in the science community to say that unless you’ve got absolute evidence then you’re not going to say anything at all, he emphasised “we’re a centre for expertise not a centre for certainty” and called on scientists to “be prepared to provide judgement/expertise” (RN: CXC-AGM 2013). As STS describes, this pressure for scientists to convert knowledge into policy meaning is simultaneously accompanied by a parallel discourse that demands separation of science from policy. One policy official described this by saying,

“I wouldn't expect policy colleagues to design science, I wouldn't expect scientists to design policy but they'll often come up at the end of the consultancy and say 'and the policy should be this' and policy colleagues would go berserk, you know, you've got to accept where your area of expertise stops and just because you know the evidence doesn't mean you can design the policy” (Interview SG6).

This enforces a very definite boundary over where the responsibility and involvement of scientists should stop and suggests that scientists in the past have been guilty of overstepping this boundary. These competing pressures are contentious for many CXC scientists who feel that they are being asked to draw conclusions beyond their evidence

or expertise (Interviews: CXC-R1, CXC-R3, CXC-D2) at the same time as upholding strict boundaries between science and policy. On the one hand, it is recognized that science and policy are not the same and are governed by different responsibilities, areas of interest and epistemic processes of meaning making. On the other, they are asked to be made functionally equivalent, in order to make scientific knowledge on climate change meaningful to policy problems – such as making buildings, reducing transport journeys and waste or conserving peat and forestry (Interview SG4) and policy framings of what is being valued. STS literatures help us to understand the parallel narratives at play here but not the politics of the demand from policy. Unpacking understanding of translation-as conversion enables the discursive emphasis on translation to be understood as a significant epistemic challenge to the scientific community over the way that knowledge is being constructed and is circulating at the science policy interface.

5.2.4 Designating similarity and difference

If active use of the term translation constitutes a discursive challenge to the way boundary work is taking place at the science–policy interface, it is important to enquire deeper into the politics of this work. Laclau and Mouffe’s framework, introduced in section 5.1, enables translation as conversion to be understood as the expansion of a claim to equivalence across difference. Translation understood as filtration, justifies the ability to interpret from one case to another through shared characteristics of a problem (see example A in Figure 5.1). This creates essentialist notions of identity in which when characteristics are not shared scientific findings do not hold. Translation understood through conversion by contrast, recognizes that the two domains do not share identical characteristics, but suggests they can overlook their differences in the face of a common opponent. Science and Policy are not the same (identical), but these differences are seamed over in the shared opposition to a common opponent. In this case, this opponent is the joint problem of rising carbon emissions and the lack of policy response. Both scientists and policy actors are seeking to address this problem (often with passion). Commonality is found in the shared problem as adversary that prevents each party achieving their own goal (of addressing climate change). Differences between different types of policy response are strategically overlooked in the pursuit of some form (any form) of policy response. Recognition of these differences were occasionally indicated:

“The transition to the low carbon economy is kind of the Pandora’s Box. because *what does that mean* and to me... that means doing sustainability... but

it doesn't to everyone else... I mean there's lots of low carbon economy that is not particularly sustainable... *to me*... you can't think about this whole agenda without thinking about it as sustainability... but of course *specific* questions posed to CXC won't have that dimension" (Interview CXC-S1, original emphasis).

In the urgency and difficulty of delivering a policy response, *some* policy response is perhaps considered better than *no* policy response. The gratification of seeing a policy response was celebrated by the secretariat at CXC's AGM 2013 through quantified guestimates over peat in the RRP2 (RN: CXC-AGM 2013); it was emphasised that policy teams like "people who get on with it and produce work they can use" (RN: CXC-AGM 2013). The common enemy for CXC researchers was also constructed in practical ways by emphasizing the relevance of "making it clear to the academics that if we don't provide that information to time then they'll go elsewhere for it" (Interview CXC-D1), referring to Scottish Government and to a potential threat of discontinued support for Scottish research institute funding. The boundary working that draws some boundaries into sight as significant and important and establishes connection across other lines of difference is political work in which the seaming together of differences under the promise of some policy response as opposed to no policy response, is a practice of hegemony into which passionate actors are being enrolled. Section 5.2 explores these politics further through examining CXC's Policy Awareness Workshops through which scientists are prepared for performing the translation work of the call-down service (discussed in Chapter 6). The strength of thinking about translation as an expansion of a chain of equivalence, is that in constructing equivalence in meaning across difference, the politics involved in emphasis on the policy audience in CXC's use of 'translation' may be understood as a practice of hegemony – expanding claims to equivalence in the face of a shared constitutive outside.

5.3 Preparing scientists for translation: CXC's Policy Awareness Workshops

Within CXC, the language of translation is used to refer to the call-down service in particular, which is discussed in detail in Chapter 6. CXC secretariat prepare research scientists to respond to call-down requests through running 'Policy Awareness Workshops' for CXC researchers to help scientists understand the needs of the policy community as their audience. These sessions aimed to raise awareness of the policy making process, the demands and pressures involved, and the discourses important in

making Scottish policy (RN: CXC-PAW1, RN: CXC-PAW2, RN: CXC-PAW3). Workshops involved a number of presentations and participative exercises, for which a sample copy of the agenda is included in Appendix E. Policy Awareness Workshops are an important process through which orientation to policy needs and understanding of what is considered meaningful for policy is constructed for scientific researchers in order that they might better perform the call-down service function. These expectations shape knowledge translation processes and encourage the development of particular types of knowledge that ‘fit’ over others.

5.3.1 Emphasising the fit with existing policy discourses

Presentations provided information on the way that policy is made, both in theory and in practice, drawing from recent examples of climate policy from the UK Government to convey the messiness and non-linearity of the policy process and outline differences in perceptions of risk and markers of success. During all three Workshops presentations emphasized the need for all policy to deliver against sustainable economic growth as well as the context for Scottish Independence (RN: CXC-PAW1, RN: CXC-PAW2, RN: CXC-PAW3). Policy needs, problem framings and motivations for acting were recurrently emphasized. AtCXC-PAW2 the problem policy are seeking to address in climate change involved the following slide representing climate change as carbon dioxide, user energy consumption monitoring, the stock market, commerce and health, while emphasizing the green growth and jobs imperative (RN: CXC-PAW2) (Figure 5.2).

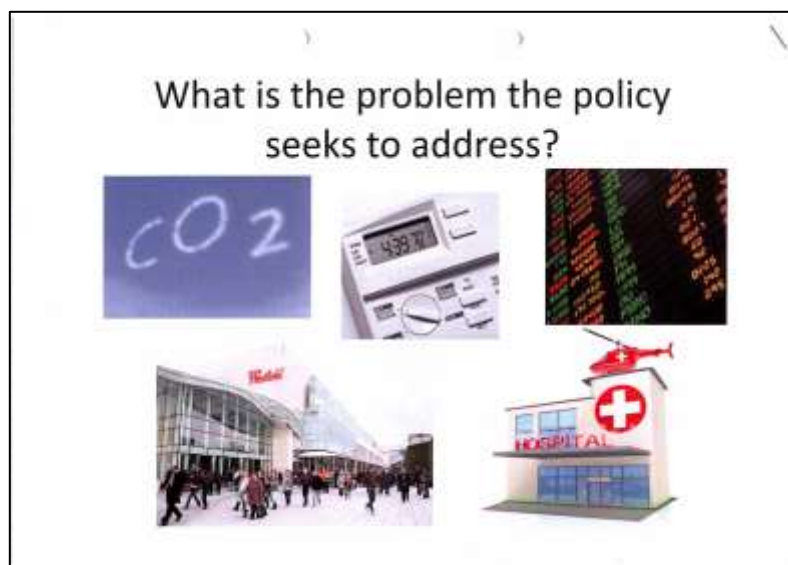


Figure 5.2: Slide shown at the second CXC Policy Awareness Workshop illustrating their problematisation of climate change (RN: CXC-PAW2).

In addition to an emphasis on economic growth, the relationship between science and policy was recurrently described in business terms, for example referring, to the Scottish Government as customers (RN: CXC-PAW1, RN: CXC-PAW2, RN: CXC-PAW3), to the shop window of CXC services (RN: CXC-PAW3) and to meeting the policy 'demand' (RN: CXC-PAW1, RN: CXC-PAW 2, RN: CXC-PAW3). The effect was to frame the relationship between science and policy both in market terms and with a sense that 'the customer is always right'. Discursively framing the relationship with policy and the focus of policy interest in this way foregrounds particular expectations for knowledge to meet neoliberal values of economic growth, private sector models of operation, and thinking of knowledge provision in terms of a demand led service. Repeatedly emphasizing these discursive value frameworks encouraged science to work within these framings when shaping knowledge communications. While public science and market logics have arguably long been entwined, particularly through historical reliance on patron funding and co-evolution of science and neoliberalism via key figures central to the development of the philosophy of science and to the Mont Pelerin Society - the intensity of this relationship is increasing (Lave *et al.*, 2010: 664). These examples of actively framing both scientific knowledge and science-policy relations in market terms observed within CXC sessions demonstrate an important way in which this intensification is taking place.

5.3.2 Internalising and rehearsing framings

Sessions also included a participatory role-play exercise that encouraged scientists to step into the shoes of a policy maker and share the visceral experience and pressures of policy making. The ninety-minute exercise involved working in groups to review competing sources of information on flooding and designing a flood management policy in five bullet points that addressed the following questions:

- Scale of the plan
- Whether revision of the Scottish Rural Development Programme is required
- How stakeholder views should be incorporated
- Resource implications for Scottish Government and local communities

The proposed policies developed in the participatory exercise offered significant diversity of approach (helping to illustrate that many solutions can be forged out of the same evidence) but all apart from one fitted well within the existing, broadly neoliberal,

policy ethos (RN: CXC-PAW1, RN: CXC-PAW2, RN: CXC-PAW3). Most schemes emphasized cost neutrality to the Government (fiscal austerity) and required no mandatory action (de-regulation/state withdrawal). Instead approaches favoured financially incentivised action (envisaging an individual economic actor), cross partnership delivery with a national approach but flexibility at the local level, public consultation (rather than community devolved design), voluntary action and redistribution of funds. This participatory exercise demonstrated a rehearsal of and internalization of expectations of what policy audiences would consider not just meaningful but also acceptable responses. The strong role for the private sector and market mechanisms as necessary solutions to problems indicating the neoliberal character of solutions being framed. The need to fit solutions into these requirements seemed well understood by many scientists.

In the second workshop, one flood policy proposal stood out from the others, advocating a highly regulatory approach that relied on governing through force – a national scale plan of centrally planned flood defences, compulsory purchase orders of land, active flood diversions, and funded by a premium insurance tax and levy on irresponsible developers building on floodplains that serves as a redistribution fund (RN: CXC-PAW2). Other participants met this with humour and there was a clear sense that this would not be considered acceptable for policy, with one person suggesting it sounds like a dictatorship (RN: CXC-PAW2). Both CXC secretariat and other scientists responded by emphasising more typical approaches within policy – including stakeholder consultation, utilizing existing delivery partners and local authority led approach based on their ability to pay (RN: CXC-PAW2). In this case acceptability of policy approaches is constructed through aligning proposed solutions to current policy frameworks, and the types of policy instruments that are habitually used to influence citizen behaviour. This particular policy proposal that strayed outside this familiar territory was policed through humour and subsequent discursive realignment.

5.3.3 ‘Speaking their language’

Workshops 2 and 3 also discussed practical writing strategies for communicating to policy audiences in response to scientist requests at CXC-PAW1 (RN: CXC-PAW2, RN: CXC-PAW3). Accessibility of language and requirements for text to be short, clear and to the point were emphasized during workshops, reflecting comments made by policy makers during interviews on what is required of briefing notes (Interview SG4). Workshop

sessions illustrated differences in writing styles, and presented use of active voice and policy preferences for the format, layout, length, sentence structure, writing style and tone of written documents as an important feature of translating knowledge for a policy audience. However, translation is about more than just writing style.

The notion of ‘speaking their language’ was often used during interviews to describe the process of connecting with things considered important by the policy audience (Interviews: SG6, CXC-D1, CXC-S1). For example, “recognising that you speak a different language” (Interview SG6), describing the practice of translation as “turning it into the language that your listener is speaking” (Interview CXC-S1) and emphasizing to scientists the need to ‘speak the same language as your listener’ (RN: CXC-PAW1, RN: CXC-PAW2, RN: CXC-PAW3). The capability of speaking different languages was often attributed to previous experience and exposure to different communities. It was suggested by the secretariat that,

“engagement has often been pushed by a very small number of either charismatic researchers... who have a relationship already, who are well engaged in the kind of broader stuff around Scottish Government objectives and understand what Ministers are trying to achieve in Scotland and are able to speak a language that policy people are able to understand” (Interview CXC-S3).

This quotation demonstrates, that for the CXC secretariat speaking the language of policy is about more than writing styles, short formats and plain English, but about having an eye to the bigger picture – the ‘broader stuff’ the ‘Scottish Government objectives’ and ‘what Ministers are trying to achieve’. Speaking someone else’s language can be thought as making knowledge connect with discourses and concepts that are recognized and valued within the audience’s context. In the view of one CXC scientific researcher, translation is the slotting into frameworks that policy use:

“We don’t do basic research... but its still too far away to be slotted into the type of policy questions that RESAS or any other part of government have got, which are fundamentally about policy costs and benefits... impact assessment... as an economist I find that relatively easy, you know I’ve worked in Government before and so I’m quite familiar with the kind of general frameworks they’re working with you know... that’s not research, it’s just translation” (Interview CXC-R12).

At one point debate erupted at the second Policy Awareness Workshop in the context of how to make land use and agricultural research useful if it is not already being seen as useful. The question centred on “what’s the policy hook?” (RN: CXC-PAW2). The CXC

secretariat response came in the form of framing the research in terms of crop *efficiency* (RN: CXC-PAW2). Here meaning for policy is constructed through connection with the characteristic of efficiency as a valued characteristic within prevailing policy discourses. The policy 'hook' becomes a way in which the interest of policy makers might be captured by speaking to, and connecting with, what is valued within their discursive practice. According to the CXC secretariat, the "way to influence is to provide the information they can grab as their own, can run with" (RN: CXC-PAW2) – making sure research speaks to such discursive value framings enables information to be successfully absorbed within the policy making process. The communications manager described this process of making meaning as a question of 'making sense' within the wider framework of your audience:

"Any message that we get we put, we hook onto what we already know. We put it into the framework that we use to make sense of the world and you know that that's part of my job... to make some of that make sense" (Interview CXC-S1).

It is the language of Scottish Policy discursive value framings presented in section 4.2 that scientists are being asked to speak.

5.3.4 Affectual strategies

As well as verbal and written discursive frameworks, the CXC secretariat emphasized in both presentations and the participatory exercise, the importance of simulating a visceral experience of policy making:

"The founding kind of thought is, is understanding the policy team's requirements, their needs, and the way in which that the way in which they work, so not just the policy problem that they're grappling with, but also how they work, what pressures they're under in terms of their external stakeholders, or relations with Westminster, or whatever it might be... to try and step into their shoes" (Interview CXC-S3).

Presentations further gave a humanised account of policy makers, from Ministers to stakeholders and lobbyists to delivery agents, who all have feelings, whose jobs are often on the line and who were subject to intense pressures (RN: CXC-PAW1). The secretariat stressed both - "policy starts and ends with people" and the importance of starting 'from where people are' (RN: CXC-PAW1). Connecting with the audience in a visceral and interpersonal sense both brings the audience into view in a sympathetic way, building

interpersonal identification, and encouraged acceptance of the frameworks within which policymakers work. The emphasis on visceral experience is a strategy employed to bring home and internalize the view of the world that the policy maker faces.

The CXC secretariat expressed a strong feeling that it is scientists who need more awareness of the demands of policy and need to reach out to policy, not vice-versa (Interviews: CXC-S3, CXC-D1). Secondments of scientists into policy placements within the Scottish Government are being encouraged to raise understanding and empathy of policy needs – “once they see that, they better understand what it is that they need to produce” (Interview CXC-D1). Emphasis on secondments probably reflects the personal experiences of the former RESAS chief scientific advisor and the CXC policy director who, having both trained as scientists and moved into policy roles, experienced differences through immersion. Such encounters between scientists and policy makers directly were nevertheless managed with some caution in order to protect/construct CXC’s organisational reputation with policy (Interview CXC-S3) and avoid repeating previous bad experiences had by policy officials during interacting with scientists (Interviews: SG2, CXC-D1). This careful management acknowledges that understanding between two communities is built gradually over time as one scientist with extensive policy experience suggested – prolonged interaction is needed to allow “the common language, common objectives common goals” (Interview CXC-R11) to develop.

This interpersonal approach was also presented as central to building a strong relationship of trust between the CXC secretariat and the policy teams to help stimulate call-down requests, by helping policy teams become aware of what CXC can provide (Interview CXC-S3), ensuring policy problems are well understood (Interviews: CXC-D1, S3) and build trust through good working relationships (Interview CXC-D1). It was suggested this establishment of trust is central to CXC’s success and reputation (both in terms of being turned to and listened to). This emphasises on visceral experience, emotional connection and trust understands discursive practices beyond written and spoken text and instead as more widely embodied in practice.

Policy Awareness Workshops and policy secondments were one among several ways of building discursive familiarity among those performing translation of science for policy, and naturalizing the framework through which meaning is constructed. This can be understood as the interactional expertise – the “tacit components of a strange language” (Collins, 2007: 12) – which when internalised complement the development of boundary

objects. These workshops serve as processes through which concerns of non-scientists become integrated as concerns of scientists (Star and Griesemer, 1989). Through understanding the visceral pressures and demands on policy makers as well as their systems of meaning, discursive value framings and motivations, the discursive value framings of policy becomes a lens through which translation takes place. Translation as a process draws on lay understandings of the term with their emphasis on audience to prioritise discursive value frameworks of policy in knowledge circulation. In these processes of translation the audience is always that of policy.

5.3.5 Summarising the Policy Awareness Workshops: the scope for encouraging/discouraging policy challenge?

Each of the CXC Policy Awareness Workshops opened with the quotation from Bismark “politics is the art of the possible” (RN: CXC-PAW1, RN: CXC-PAW2, RN: CXC-PAW3). However, it was only slowly during the period of research that what was first interpreted as an open expansive horizon of possibility, dawned on me to be a narrowing of understanding of the possible – to considerations within existing policy frameworks. While interpreting the implications of scientific information for policy, and making suggestions for action were often encouraged (Interview SG2; RN: CXC-PAW 1, RN: CXC-PAW2, RN: CXC-PAW3), suggestions for action within existing policy framings were favoured. In response to CXC emphasis on developing the ‘best possible option’ within policy frameworks (RN: CXC-PAW1, RN: CXC-PAW2, RN: CXC-PAW3) debate erupted at two Policy Awareness workshops in particular over whether scientists should focus on the ‘*best* option possible’ or the ‘best *possible* option’ (RN: CXC-PAW1, RN: CXC-PAW2). The ‘*best* option possible’ was understood as the best option for addressing climate change in an ideal constraint free world and the ‘best *possible* option’ was understood as the option that addressed climate change best within the limitations of the policy framework in which the Government Officials were operating. Some scientists, who felt that it was the role of science to suggest the best actions possible and for policy to be responsible for compromising and restricting these to the best *possible* actions, based on a justification that science was not equipped to comment on the influences outside science which needed to be taken into account (Interview CXC-R4). CXC staff argued that scientists should be providing the best option *possible* (RN: CXC-PAW1, RN: CXC-PAW2) within the framework of policy and it was suggested, “there’s not a huge amount CXC can do to change the structure” (RN: CXC-PAW2).

In response to a question about what to do if scientists think policy is wrong, the secretariat suggested scientists should say so, as critical friends, but with awareness that “if you’re already in the process, radical solutions mean going back to the beginning and starting again” (RN: CXC-PAW2). Instead the type of response encouraged were those that were not challenging to policy framings. In relation to an example of agricultural research and policy, the secretariat suggested:

“They’re interested in the areas where you can achieve emissions reductions rapidly and cheaply... there’s a limited range of things that you might be able to tinker with, without upsetting the entire apple cart or looking at the CAP... you are constrained completely by what the CAP lets you do” (Interview CXC-S3).

Further, the original CXC proposals for adaptation indicators to examine success of existing policies was described to have been rejected by Scottish Government as “too close to the knuckle, too critical of ineffectiveness of current policy teams” (RN: CXC-AGM 2013). When another scientist asked “how do you move society to a better place then?” the answer given was through political voting (RN: CXC-PAW2). In this sense emphasis on translation involves resonating with, and being constrained by, possibilities for action within current policy frameworks. The need to work within policy suggests the circulation of particular types of climate knowledge and policy solutions. This will be explored in further detail in Chapter 6 through closer examination of three call-down examples.

This section demonstrates the extent to which, in preparing scientists for translation, CXC is internalising the framings valued within policy within its practice, to help create ‘meaning’ for a policy audience. The understanding of the logic of equivalence developed in sections 5.1 and 5.2, suggest these discursive value framings may be understood as nodal points through which the fixation of meaning occurs, generating particular forms of discursive articulation (Laclau and Mouffe, 1985: 109,115). Nodal points work to frame climate change as a problem in terms of GHG, energy consumption, economic growth, jobs and health (Figure 5.2), advancing what suitable policy responses look like – through constructing chains of equivalence in policy terms, linking climate change to fiscal austerity, deregulation, the development of individual economic actors and cross partnership delivery (section 5.3.2). The strategies of the Policy Awareness workshop that seek to internalise these nodes of meaning of the policy audience within scientific researchers consciousness practice, expand claims to equivalence between the meaning

of scientific findings and the meaning in policy terms. Translation (understood as conversion) might therefore be understood as a form of hegemonic practice.

5.4 Distinctiveness of Translation

The CXC science director described translation as the latest stage in a historical transition between knowledge transfer, knowledge exchange and knowledge translation:

“It’s back to KT again but the T stands for Translation ((laughing))... it’s to do with getting the information translated into a form that’s, that’s relevant for the policy maker...and that’s different from knowledge exchange... where you... get the stakeholders together in a room and... the farmers say one thing and the foresters say another and the scientists say another and then you find the common ground. What we do within CXC is more translation, our customer is the Scottish Government, they need to know answers to specific questions and our job is to translate that science.... into some headline messages that can be acted upon” (Interview CXC-D2).

In this description, translation is characterised as a directional process in which the policy audience is framed as the customer needing to be supplied with what they need. Translation is described as a discursive shift in Scotland, contrasted firstly to knowledge transfer which was seen as transferring science to policy in an ‘un-mediated form’ and secondly with knowledge exchange in which, in this example, common knowledge ground is sought between different parties. The way translation is described places policy very much in the driving seat and frames a private sector model of science–policy exchange through the reference to TSG as a customer. This section compares the practices termed translation within CXC with other boundary practices to explore whether the distinction in practices goes beyond naming. The section continues to ask why might a discursive shift from knowledge exchange to translation be occurring in narratives of policy and boundary actors through CXC. The section examines how the process of translation differs from other forms of boundary work by comparing it to firstly to the brokerage of Sniffer and the science communication of the Met Office and then to processes termed co-production within CXC to explore the specificity of translation.

5.4.1 Sniffer and knowledge brokering

Sniffer describes its boundary work as 'brokerage':

"We call ourselves a knowledge broker... Sniffer is saying right so, this is what we know from organisations like climate change or other academics, what do we do... who needs to know this, who needs to do something, you know, what can we do, how do we do it." (Interview CXC-S1).

Emphasis in brokerage is more than just distilling or converting knowledge but is also on bringing people and knowledges together to facilitate action:

"It's about conveying messages between different sources of information. The *brokering* role is actually sort of almost translating it, so the bringing of knowledge from one source, where we *know* that knowledge exists, and we're taking it to others, but we might be translating it in the process, or we may be bringing different parties together... different organisations, different people, or even different people within the same organisations... introducing and facilitating of the conversations and trying to clarify what's important, what isn't important, what needs to be acted upon" (Interview Sniffer 1, original emphasis).

In this case brokering may involve translation (understood here as a change in the knowledge itself) but is more about making connections to facilitate conversations as Meyer's definition of brokerage suggests (2010). Where translation is focused on knowledge, brokerage is about bringing knowledges and people together. Sniffer also has a strong emphasis on the action that results from brokerage. The Managing Director describes Sniffer as a change maker (Interview Sniffer 1) and a "catalyst" (Interview Sniffer 1). Sniffer's *raison d'être* as an organisation is as a mechanism to deliver greater sustainability through partnership working (Interview Sniffer 1) and Sniffer's identity has been built around a commitment to generating action on sustainability (increasingly community resilience) that is increasing not decreasing over time – "a move along the continuum from what we used to do, which is commission research to what we want to be, which is sort of making change happen" (Interview Sniffer 1). This is unlike literature definitions of brokerage which, at most point to strengthening the use of science (Bielak *et al.*, 2008: 203). Bracken and Oughton suggest political involvement in action is not the typical role of the broker, but more the knowledge intermediary (2013), suggesting Sniffer occupies a dual role.

Sniffer constructs an official narrative of neutrality through its independence from both science and policy. Rather than being a member of both communities (like a translator),

Sniffer is a member of neither community – again embodying the model of a knowledge intermediary, suspended between two communities (Guston, 2001). Sniffer balances commitment to taking action on the basis of scientific findings by not specifying what those actions should be. Instead, such actions are defined by the communities themselves through working in partnership (Interview Sniffer 1). In this way Sniffer is not challenging or converting but supporting, facilitating and enabling those who are already committed to action:

“We are not really doing something terribly controversial, so we are not trying to get them to change their opinion... we are not telling them that they have to do something that they wouldn't have done otherwise” (Interview Sniffer 1).

It was suggested that “Sniffer is a very um friendly organisation... we build alliances of the willing... who's inside the tent... how can we um support, enable, facilitate” (Interview Sniffer 2). The practitioner audience is important for Sniffer, but the relation with that audience is of *exploring together* rather than meeting a customer demand. Nevertheless, Sniffer holds an active role in competing to establish discursive meaning – through suggesting what sustainability or the low carbon economy mean and knitting these two discourses together (Interview Sniffer 2) or populating the First Minister's vision of what a better Scotland looks like (Interview Sniffer 1). Sniffer organized a conference on Climate Justice (with the Joseph Rowntree Foundation) hosted by the Scottish Government in November 2012. This profiled the need for climate adaptation to be *socially just* adaptation (RN: Sniffer-CJ). While this claim for meaning can also be seen to utilize an expansion of a logic of equivalence, it is Sniffer's discursive value framings of meaning that are claiming dominance. Through staking claim to discursive meaning Sniffer performs brokerage in ways that lubricate channels for science, policy business and civic interaction that further the discursive value framings to which Sniffer has expressed commitment. Through encouraging and supporting those practitioners who also identify with these framings, Sniffer enables the development of political collectives and enables particular counter hegemonic debates to be staged. This occurs whilst their third party independence enables Sniffer to construct claims to be passive, neutral and simply responsive to their partners' requests. Through enabling voices of practitioners, who self-identify with Sniffer's sustainability objectives – Sniffer facilitate these practitioners to better use science to challenge policy practice, without ever becoming a challenging organisation itself.

In maintaining a clear boundary with science – speaking forwards from a received

platform of science, without being science – Sniffer is also able to focus on what is done with science without challenging scientific practice. This enables a greater focus on action and greater latitude in the languages chosen, which would not necessarily be considered legitimate within the scientific community, such as framing climate change in terms of weather (Interview Sniffer 1). It also means that, for Sniffer, the emphasis for change has historically been focussed on changing policy not changing science:

“We probably do more to take the techie language into plain English. Whereas there are probably things that could be geared the other way. I don't think we do much that way, of trying to convince scientists of why there are other ways of framing it... I think we tend to take, the words almost as gospel from scientists, and put them into a language we think would be suitable for other audiences” (Interview Sniffer 1).

In contrast to CXC, there has been little incentive for Sniffer to push the challenge back towards these scientists. In this respect the boundary of science is safe in Sniffer's hands.

In summary Sniffer provides a very different role to CXC. Sniffer constructs the boundary between science and policy in ways that allow a degree of what Pielke has described as stealth advocacy (2007) or what might be considered expansion of claims to equivalence in meaning to form counter hegemonic claims. The focus for challenge is on policy practice not scientific practice and the anchor for meaning is the discursive value framings of the broker, which the self-selecting audience share.

5.4.2 Met Office and communicating science

A second model of science–policy interaction with which translation might be compared is the science communication of the Met Office. Here boundary work is described as ‘communicating science’:

“... its about keeping the level of science right... so that people don't get false messages... there are an awful lot of problems... when you put a message out it can be misread and misinterpreted quite easily, so it's about keeping that in balance all the time so part of my task is with civic Scotland with the broader Scottish electorate and organisations effectively is to *keep* them on the right track” (Interview Met Office, original emphasis).

This model of science communication echoes the process that some natural scientists within CXC understand by translation. There is a sense of science acting as a check and a balance against misinformation or runaway politics. The scope of engagement here is broader than that of CXC, with invitations to speak at a broad range of civic events as

well as more formal interaction with Ministers through the Scottish Parliamentary Committees and Civil Servants and Government Agency staff (Interview Met Office). Communicating science is seen to be the *provision of information* upon which politicians and civic Scotland can and should, base their thinking (Interview Met Office). Getting people to think for themselves was a recurrent phrase during the interview:

“I don’t try and brow beat people at all but saying these are the kinds of information available...ensuring that the kind of information is there for them to let them do their own kind of thinking” (Interview Met Office).

Science, in this model becomes a baseline for politics. There is a clear boundary around science that stops short of decision-making – “we don't make policy decisions” (Interview Met Office). Yet, through the provision of science, particular forms of response are staged. One example emphasises individual action (discussed in greater detail in Chapter 7), another is the way in which certain political responses become naturalised in responses to the science presented:

“I'm just a meteorologist I'm not a politician in that sense. But if people think about it for themselves some of the answers that actually fall out are quite obvious, I mean you need to reduce the amount of energy that you use, um, you need to use more local stuff you need to travel less in your own motor car” (Interview Met Office).

In this task, like Sniffer and CXC, the importance of tailoring messages to the interests of the audience is of paramount importance (Met Office) and focus is on the salience of science to the audience. For example, differences in the information provided to the Eco Churches of All Ireland compared to the Scottish Parliamentary Committees were described:

“What they were looking for was generalities, they were looking for reasons to change, moral reasons... so we were looking at global impacts of climate change, but when you go talk to committees they're much more interested in the local impacts” (Interview Met Office).

This tailoring involves ‘filtering’ and ‘zooming in’ on relevant portions of interest, but in science communication, the science does not, at least formally, have to convert meaning to align with dominant policy positions.

Whilst the opportunity to influence policy development is constrained by the prevailing political appetite, the established authority of the Met Office as a scientific institution allows communication of ‘the scientific message’ to continue regardless of prevailing political values. A comparison of Scotland and Northern Ireland illustrates this:

“Scotland's been fairly straightforward in the sense that the previous administration was committed... The decision had been made... Northern Ireland is very different... the previous two ...environment Ministers were sceptical to say the least... *Nevertheless we are there to provide them with the science, we have briefed cross party groups...* the new Minister is keener... and... minded to introduce a climate change act in 2014... *to that end um myself and the head of Hadley Centre will be over in Northern Ireland the week after next... talking to the committee and then we'll be talking to the Ministers at the beginning of December*” (Interview Met Office, emphasis added).

Separation of science from policy enables the on-going communication of science regardless of prevailing political values, but for that voice to influence policy development science is dependent on awaiting resonance with policy discursive value framings. The Met Office is (apparently neutrally) simply continuing to provide the science until a window of opportunity opens up. However, when such a window of opportunity arrives, the Met Office and the Hadley Centre ensure they are in the right place at the right time to influence emerging policy. In science communication, like brokerage, there is a clear boundary constructed around science. This enables science communication, unlike translation, to not directly depend on policy discourses. This is set within the caveat that science is never independent of, or disconnected from such policy discourses and science is indirectly and directly made responsive to policy goals through funding (Braun, 1998) or regulation (Jasanoff, 1987; Burawoy, 2011). Science communication, like brokerage is speaking on from science without challenging or trying to change scientific practice. Translation pushes back on science whilst science communication protects the scientific community from involvement in political debates.

5.4.3 Co-production through facilitated conversations: CXC's Woodlands Adaptation Workshop

As well as translation, CXC uses the language of co-production. Co-production tends to be used in relation to medium term planned work in relation to a policy goal, for example, the publication of the Scottish Climate Change Adaptation Programme or facilitating thematic conversations around particular issues. Two facilitated conversations were staged during the time of research in the form of CXC hosted workshops – one on Communicating Uncertainty and another on Woodland Adaptation. These were hosted by CXC and offered the opportunity for scientists and policy officials to meet together to discuss and debate a thematic issue (Interview CXC-S3). The desire for face-to-face exchange between scientists and policy makers was frequently

expressed by CXC researchers (Interviews: CXC-R5, CXC-R4; RN: CXC-PAW2). The Woodlands Adaptation and Uncertainty Workshops may have been an attempt to develop a safe space for such face-to-face interaction to take place in a carefully managed way that minimised risk to organisational reputation. Whilst CXC secretariat took a backseat role during the workshops, the workshop format itself served as a mediator and was a carefully engineered space for interaction. With its back seat role, CXC as an organization were able to retain their own value-neutral status through simply staging the voices of others (a strategy that is discussed more in Chapter 7).

These co-productive forums enabled policy makers and scientists to enquire and respond to each other directly. The Woodland Adaptation workshop enabled a vigorous debate around different ways of valuing trees. This was made possible by bringing together a diverse set of voices to facilitate debate and interaction. The process was underpinned by understanding of a fair process of engagement and exchange, and a respect for diversity of values (Cash *et al.*, 2002). The session, described by the CXC secretariat as generating really interesting dialogue between science and policy (Interview CXC-S3), allowed what might be described as agonistic debate over different value positions (Mouffe, 2005b). Central to the debate was recognition of the legitimacy of these different actors to hold differing value positions, such that whilst consensus around how management of trees should respond to climate change was never reached, and areas of conflict were unresolved, the validity of different valuations of trees were recognised. In the Woodland Adaptation workshop there were many translators all marshalling the right to speak on behalf of particular entities (Callon, 1986). Amongst this collection of voices, exchange was based on sharing discursive renditions, response and dialogue (Beals, 2014). Differences were retained and different perspectives valued even where participants did not agree. In many ways this contrasted with the Policy Awareness Workshops described in section 5.3.2 where differences in values were not open for debate. While the WAW demonstrated the legitimation of a plurality of values, it is important not to be blind to the inequalities of discursive participation and to recognise the unequal operation of power in a workshop space like this. Further, CXC's usage of the concept of co-production appears to relate to that proposed by Ostrom within organisational literatures (Ostrom, 1996: 1073), which refers to the involvement of users in the provision of services rather than Jasanoff's ontological notion of the co-production of science and social order (Jasanoff, 2004).

When the workshop report was produced (by the CXC secretariat together with two

policy actors from the session), it streamlined these diverse and varied positions into a coherent narrative that spoke to current policy framings around ecosystems services. Differences in values discussed were acknowledged only through reference to trade-offs between different ecosystems services. For Callon “to translate is also to express in one’s own language what others say and want” (1986: 18). The agonistic debate of the discussion became ‘translated’ into an account that aligned it with the dominant policy discourses. This closure, to allow progression of the ideas discussed involved little debate in how such closure was achieved, rather ‘ecosystems services’ as the prevailing policy framework and nodal point, was naturalised as the necessary discursive framing. In this sense, in the translation of agonistic discussion into a report format, discursive alignment to policy goals was a form of hegemonic practice that traded usability by policy for the flattening value plurality. The translation process re-established an obligatory passing point for knowledge and a claim for dominance in meaning in which only those who are speaking in unison are heard (Callon, 1986: 18). This performance of agonistic debate followed by translation into a neoliberal framing of ‘ecosystems services’ could be seen as a neoliberal device of pacification, however this implies intentionality around the politics of this act, which is much less clear. Alternatively, the exclusion of difference can be seen with less intentionality as the overwriting of differences retained during debate through practices of translation that narrow meaning into dominant policy terms and excluding differences in meaning claims. In characterising plurality and the inability to represent difference in any such instances of summing up, Law describes:

“if unassimilability is characteristic of the world that is described there can be no question of drawing things together in the description, of summing them up. Instead there will be lots of stories, different stories, stories that are orthogonal to one another, that cannot be told together. In which case...? In which case... I do not know” (Law, 2007: online).

Mouffe suggests that any drawing together into a consensus position involves exclusion (Mouffe, 2000: 17). Law’s expression of the inability to account for this exclusion both signals the difficulties CXC face in making knowledge useful to policy without generating some form of exclusion, and the difficulty of STS approaches in capturing the politics involved when meanings are claimed through nodal points that enable hegemonic meanings to extend their claim to power.

5.4.4 What does translation do differently?

CXC, Sniffer and the Met Office all perform boundary work between science and non-

science in different ways. Translation, brokerage, science communication and co-production, are all processes through which meaning for scientific knowledge in non-scientific domains is sought. However, there are a number of important differences involved in understanding the process of exchange as translation, over brokerage, science communication or co-production (Table 5.1).

	Translation (CXC)	Brokerage (Sniffer)	Science Communication (MET Office)	Co-Production (CXC)
Model of engagement with knowledge?	Shaping knowledge to hold meaning for practitioner audiences	Bringing practitioners and knowledges together to catalyse action	Providing knowledge to new audiences	Bringing people together to create knowledge
Knowledge and user relation	Frames existing knowledge in terms of user	Brings different knowledges and people together	Provides existing knowledge to potential users	Involves users in knowledge production
Direct/ Indirect engagement	Interaction of communities mediated through a translator	Interaction of existing knowledge communities with mediation	One directional communication through a spokesperson	Interaction of existing knowledge communities without mediation
Debate/ contestation enabled?	Iterative exchange CXC and scientists to achieve acceptability to both parties	Debate around application of knowledge in context but knowledge itself is relatively fixed	May be used to provoke debate/contestation but knowledge itself not open to debate	Agonistic debate about what is valued allows questioning of premises of knowledge generation
Conflict?	Non-conflict approach to policy, (sometimes conflict with science)	Non-conflict approach with science or policy	Conflict with Policy Possible	Some conflict accommodated but could be detrimental
Responsibility for Success	Responsibility for successful translation rests with translator (including scientists), responsibility for action with policy	Responsibility for successful brokerage rests with broker (not scientists), responsibility for action with policy	Some acceptance of good communication style but responsibility for uptake is with policy	Success for communication in hands of science and policy communities jointly
Relationship with science and policy communities	Translator is a member of both science and policy communities	Independence of broker from both policy and science	Communicator is a member of scientific community and separate from policy	Policy-science community is mixed
Neutrality Narrative	Yes through impartiality of translator	Yes through non value-confrontation and detached independence of science	Yes through detached independence of science	Yes through trading of plurality and independent stance of host
Decision-making responsibility	Decisions rest firmly with policy/practitioner community, expert opinion sought	Decisions firmly with policy/practitioner community	Decision firmly with policy/practitioner community	Decisions are made jointly as the relationship between science and policy evolves
Science policy boundary	Boundary constructed through translation act, at same time as formal aim is to lessen	Clear boundary	Clear boundary	Little boundary except in knowledge terms

Table 5.1: Key differences between the processes of translation, knowledge brokerage, science communication and co-production from the empirical examples studied.

All the modes of exchange discussed differ from each other in a variety of ways – translation does not stand alone in contrast to the other three. Instead each model of interaction enables and restricts different types of relationships with knowledge. All modes maintain some boundary between science and policy for legitimation of scientific knowledge and constructing neutrality for boundary work (although in each case this is claimed differently; see Table 5.1). In this chapter translation is the focus of attention, however, co-production and translation (both used by CXC) share a weaker boundary between science and policy, foregrounding importance of knowledge user concerns and discursive value framings, pushing a challenge back on science to work differently, reducing / dissolving a boundary between science and policy practices and re-allocating some responsibility to scientists for knowledge communication success and decision making. Both contrast with science communication where responsibility for using scientific knowledge is distanced from the act of communicating. Together forming CXC's practice, translation and co-production demonstrates changes in the science–policy relationship, but translation and co-production also have marked differences between them in the process they facilitate.

Firstly, translation asks scientists to frame knowledge in policy audience terms for communication to be successful. As Hoppe suggests the kind of statements deemed tenable depend on the standards and values of the targeted audience (Hoppe, 2010: 110). Translation explicitly constructs meaning for knowledge through alignment with the discursive value framings of policy. This contrasts with science communication where meaning for knowledge is constructed in scientific terms, and to brokerage where, at least in the case of Sniffer, the brokers own discursive value framings remain an anchor for meaning around which practitioner collectives are invited to gather. In co-production, knowledge is a product of both science and policy communities involved, and the predominance of one or the other is, at least officially, not known in advance. With translation, science is on tap not on top, as Laski famously suggested (cited in Richter, 2009: 13). Although the funding and structuring of science beyond translation mode means that science has never been insulated from the value framings of policy, translation explicitly demands construction of meaning in policy terms, and builds this into the condition for future funding.

Secondly, translation and science communication focus on mobilising knowledge only, whereas co-production and brokerage focus on bringing people as well as knowledges

together. As the co-production example of the Woodland Adaptation Workshop demonstrates, this bringing together of people holds potential for agonistic debates to occur. Whilst such co-productive and brokerage encounters by no means achieve Habermasian ideal discourses, they at least provide forums through which alternative voices have the potential to enter into discursive struggles. Translation then established an obligatory passage point for knowledge in which differences are collapsed and written out in the process of constructing meaning within a dominant discursive framework. However, co-production is no simple solution with Lövbrand (2011) highlighting similar concerns over balancing policy responsiveness and policy critique in co-production.

In this comparison, the question is whether Laclau and Mouffe's notion of extending the logic of equivalence applies equally to knowledge brokerage, science communication or co-production, or only to translation? In the case of science communication, meaning for knowledge is set according to the frameworks of science – whilst this is a political claim to meaning there is no extension claimed. In co-production, meaning is officially not set in advance of the co-productive practice. Whilst the dynamics of practice and power may render an extension of claims to equivalence in meaning, these remain at least theoretically open to collaborative contestation. In the case of knowledge brokerage there is a complex claim to meaning that does seek to establish a claim to equivalence of meaning, in the brokers' terms. This parallels the claims for meaning in translation, in the audience's terms. Whilst both processes could be seen as a claim to the extension of a logic of equivalence, the relations of power in this specific case suggest that knowledge brokerage is part of a counter-hegemonic claim, whereas translation is part of a hegemonic claim. This suggests Laclau and Mouffe's approach does capture the specificity of translation as a form of hegemonic practice.

5.5 Understanding boundary work as translation

This chapter has explored the use and discursive power of the term 'translation' within CXC. The centrality of the concept of translation to CXC's practice was discussed in section 5.2, including for whom the description of translation is important and what the envisaged process involves. CXC draw upon the concept of translation, and its colloquial emphasis on producing meaning for a new audience, to encourage its research scientists to tailor research findings to the policy goals and frameworks of meaning of the Scottish

Government. Emphasis on translation within CXC creates a model of science–policy interaction that posits policy in the driving seat by encouraging knowledge generation to speak to policy concerns, placing greater responsibility on science to make science work within policy settings, and constructing meaning for knowledge through the discursive frameworks of policy. While different understandings of translation as a process by natural scientists (as filtration not conversion) potentially reduce the effectiveness of the term as a discursive strategy, overall, the need to serve policy as CXC’s ‘customer’ is clear. Understanding translation as expanding a logic of equivalence between the discursive value framings of scientific knowledge and the discursive value framings of policy, as a way of asserting what responding to climate change means, helps to understand the dynamics of power involved in the way that claims to meaning are constructed through boundary work. In section 5.3, the Policy Awareness Workshops were presented as one way in which the discursive value framings of policy are made central to CXC’s practice, and through which claims to meaning in policy terms are encouraged in preparation for translation work. Comparison of translation practices to knowledge brokering by Sniffer, science communication by the Met office and co-production by CXC in Section 5.4 enabled translation to be understood as a particular form of boundary work that embodies a particular knowledge politics. While STS theories of translation take us so far in understanding the processes and politics of boundary working in general, they do not account for the specificity of the way in which translation is being deployed within CXC. In this concluding section the advantages that STS and Mouffe’s approach each bring are presented.

STS accounts of translation firstly draw attention to translation as an on-going process (Callon, 1986: 19), the shuttling back and forth (Latour, 1993) that does the *work* of difference (Law, 2007). This highlights the role of boundary work in bringing science and policy as domains into being (Guston, 2001) – as Callon describes: “Translation is the mechanism by which the social and natural worlds progressively take form” (1986: 19). This is important not only in understanding the contingent constitution of the science–policy boundary (as discussed in Chapter 4) but also in emphasising outcomes of translation as the result of particular achievements, struggles and politics. Secondly, Law describes the way in which knowledge itself, as much as the target domain is changed in the process of translation (Law, 2007). For Callon “the notion of translation emphasises the continuity of the displacements and transformations which occur” (1986: 18). The

emphasis on partial unstable connections of meaning (Law, 2007) dissonance (Callon, 1986) and trahison (Law, 2007) allow recognition of both the way in which boundary work involves contingent changes in meaning, and also conceals and manages conflict in meaning (Star and Griesemer, 1989) – exemplified by the description of the low carbon economy as a Pandora’s Box holding different meanings for different people (Interview CXC-S1; see also Hajer, 1995). Thirdly, STS narratives of translation explicitly draw attention to the politics involved in claiming the voice of translator – securing an obligatory passage point to dominate meaning, establish oneself as a spokesman and collapse difference so that “only voices speaking in unison will be heard” (Callon, 1986: 18). In this sense STS accounts signpost translation as a practice through which provisional closure is rendered. In these accounts, translation is neither a neutral act (Callon, 1986; Law, 2007) nor a simple linear model, but rather a complex process through which claims to power are established that bring the world into being in particular ways.

However, in the Scottish empirical case, STS notions of translation might as easily be applied interpretively to account for all four forms of boundary work studied – translation, co-production, science communication and brokerage. STS accounts do not account for whose meanings predominate, implying only that the translator decides. Callon’s emphasis on particular figures as obligatory passage points could equally apply to the broker or the science communicator. All three organisations claim positions as spokesperson for science, for their own organisational longevity and authority. STS accounts of translation take us so far in understanding the boundary work of CXC but do not account for the distinctiveness and politics of the boundary work being undertaken by CXC in prioritizing the policy audience. Instead, understanding translation in terms of the expansion of logics of equivalence (Laclau and Mouffe, 1985) and as a discursive tool of hegemonic practice that reproduces policy discursive value framings, better helps to understand the privileging of policy framings without relying on notions of violence against an essential original meaning (Venuti, 2008). Laclau and Mouffe’s account offers both an anti-essentialised account of similarity and difference, and one that attends to the operations of hegemonic power missing in STS accounts. This brings two contributions to a study of CXC translation.

First, in making knowledge meaningful for the audience translation can be understood as a process of building equivalence between scientific knowledge and policy goals– a

staking of claim to meaning that expands and reproduces hegemonic meanings, and can therefore be understood as a practice of hegemony. Claims to equivalence in meaning are constructed through nodal points which temporarily fix meaning (Mouffe, 1993: 114). In the example of the CXC Woodland Adaptation Workshop it is possible to understand the discourse of ecosystems services as a nodal point in the rendering of juxtaposed difference and agonistic debate (during co-production) into a narrative that collapses these differences into alignment with policy goals (through translation). Translation collapses differences, generates exclusions and implicates CXC in the closing down of political questions around possible policy responses. Mouffe suggests that different discursive actors constantly attempt to dominate the discursive field through the use of nodal points that stake claim to meaning in particular ways (Mouffe, 1993: 114). Claims to meaning staked through nodal points can be seen in Sniffer's often more subtle attempts for discursive influence as well as through translation. However in the case of CXC translation, a combination of the relations of power and location of an anchor for meaning within policy, enable CXC translation to be understood as part of a hegemonic claim and Sniffer's work to be part of a counter hegemonic claim. For Mouffe such (hegemonic) "power is constructed in a pragmatic way... through the opposed logics of equivalence and difference; power is never foundational" (1985: 142).

Secondly, claims for equivalence are constructed, not through identification of essentialist characteristics, but through a collective adversary that becomes a 'constituent outside' (Laclau and Mouffe, 1985: 127) and prevents both from realising their goals (as in example B in Figure 5.1). In CXC's practice this can be seen through the overlooking of differences between different actors in the type of policy approach envisioned in the interest of developing *any* policy response to climate change. Specifically, the widely accepted need for a climate policy response among the scientific community is being equated with a specifically neo-liberal discursive value framing in the Scottish policy response in joint opposition to no policy action. Likewise, scientific claims to robust impartial knowledge are being equated with specific neoliberal policy proposals to claim robustness and impartiality for these approaches too in joint opposition to bias and interests, which is framed as a common opponent. Translation is used to construct a claim for scientific knowledge to be understood through the dominant value framings of policy through opposition to a shared threat that prevents both parties from realizing

their goal¹⁰. It is important to stress that at this stage, the argument is not that these goals are being envisaged in terms of values, understood as positive identifiers, but that the outcome of this expansion of logics of equivalence reproduces and strengthens the hegemonic claim of policy discursive value framings.

Howarth suggests that the greater the claim to equivalence, the greater the concentration around two antagonistic poles (Howarth, 2000: 107) and the reduction of possible legitimate differences in meaning. Recognizing the plurality of difference, legitimization of alternatives and focusing on turning relations of antagonism into agonism, draws in contrast from a logic of difference that expands discursive space (Howarth, 2000: 107). Although Mouffe's own focus is on the specificity of democratic relations, developing relations of agonism may also broaden the discursive space for debate and therefore widen possible climate change policy responses (rather than presenting a few narrowly defined responses as natural and necessary).

Examining the politics of boundary workings through logics of equivalence/logics of difference helps to draw attention to the politics of such boundary practices in constructing hegemony and counter hegemonic claims and to the way in which the expansion of equivalence as a hegemonic practice allows particular discursive value framings of knowledge to circulate over others. Discursive alignment through nodal points is strategic; as Hajer and Versteeg suggest, rather than reject or "resist environmental values... a more effective strategy for recalcitrant actors will be to cloak themselves in the language of environmentalism" (2005: 180). This cloaking not only stakes a claim for one particular interpretation of meaning but also, through Laclau and Mouffe's framework, masks and excludes differences between the two discourses. Marginalising differences in meaning further extends the pragmatic difficulty for science to be critical of policy discussed in section 5.3.1. One effect of the revised relationship between science and policy being implemented through CXC could be a reduction of the scope for science to be critical of policy. In the context of the abolition of the Sustainable Development Commission, known to be an outspoken critical friend to both the Scottish Government and UK Governments (Interview CXC-S1), the CXC model of science-policy

¹⁰ For Mouffe it is important that equivalence is constructed through a common threat to the realisation of each party's goal, rather than any shared positive identification. This is important for the goal not to be rendered in essentialist terms.

offers a more convenient and compliant science–policy relationship partner. Extending logics of equivalence play a strong role in this compliance.

There is a perception within CXC that translation does not affect the way the science is done, only how it is communicated, thereby establishing a boundary between science and science communication (Interview CXC-S3). While there may be no intention among CXC secretariat that translation changes the way science is done, and certainly the focus of CXC is to synthesize existing research rather than generate new research, this thesis argues that the processes of translation shapes knowledge in terms of policy audience frameworks of meaning – and in doing so seeks to embed the discursive value framings of policy into the CXC scientific community. This occurs through the Policy Awareness Workshops, secondments, repeated emphasis of what is considered relevant, important and useful (in policy terms) and through the nodal points and claims for equivalence that fix meaning in terms of hegemonic policy framings. Further, increased engagement with policy through co-production of research knowledge may well increase the internalization of policy framings within future research practice, particularly as funding is increasingly ring-fenced for knowledge that demonstrates policy relevance and impact. Reflections on translation and co-production presented in this chapter suggest that these processes seek to lessen the boundary between science and policy, making this distinction between how science is done, its communication, difficult to maintain.

Discourses of translation are useful in encouraging a science–policy relationship that is policy responsive. In return for policy responsive knowledge, CXC secures a valued position as an obligatory passing point, and climate science secures a route through which scientific knowledge might influence policy. The double reading of what was ‘possible’ at the Policy Awareness Workshops illustrated the extent to which dominant neoliberal policy instruments “foreclose possibilities of thinking and acting differently” (Tambakaki, 2014: 8). This highlights the limited ability of CXC to exert policy challenge through boundary work as translation. Given prolific uncritical usage of the notion of translation within science–policy literature (Cash *et al.*, 2002) this chapter argues that we need to be attentive to Wynne’s concern about characterising science–policy exchange as translation (2010: 290) and to the way in which the language of translation establishes particular processes and expectations of science policy boundary work, less for its evocation of a knowledge deficit model and more for the value politics of boundary work that translation involves.

Chapter 6.

Translation as a Process of Legitimation

This chapter focuses on the call-down service as an example of CXC's translation. Moving from a broad scale analysis of translation as a form of boundary work (Chapter 5), this chapter looks at the specific processes involved in the work of the call-down service and specifically at how legitimacy is constructed – for knowledge, for policy action and for CXC as an organization itself. In this chapter there is potential for confusion between the general process of translation described in STS boundary work literatures, and the specific form of boundary work that CXC describe as translation. Careful attempts have been made to differentiate these through references to 'CXC translation' where the specific process under study is being discussed. The chapter develops overall concern with the politics of boundary work by focusing on how legitimacy for knowledge is constructed through responding to call-down requests. Interest in legitimation comes from an interest in which knowledges are enabled to circulate through CXC's translation as a boundary process. Thinking about what types of knowledge, and in turn, what types of policy responses are becoming legitimated through the process of translation, is particularly relevant given the theoretical connections between legitimation and hegemonic power (Chapter 2) and the empirical emphasis on policy meanings during CXC's translation work (Chapter 5).

The chapter is concerned less with what legitimacy is, and more with the processes through which legitimacy is constructed. To this end the chapter starts from the observation that at the CXC AGM 2013 successful translation was being defined explicitly in terms of Cash *et al.*'s tripartite framework (2002: 1) of credibility, salience and legitimacy (RN: CXC-AGM 2013). Yet, of Cash *et al.*'s three attributes, legitimation appeared least obviously understood. The credibility of CXC research findings appeared to be largely accepted by policy teams (RN: CXC-AGM 2013) and during an interview with the knowledge manager it was suggested "to a certain extent the policy team is really only interested in the output... provided that they are given comfort that the researchers are approaching the problem in a robust, and scientifically... an independent and neutral

way and using scientific methods... they implicitly assume that peer review and all that kind of thing goes on in the background” (Interview CXC-S3). Similarly, although questions of salience were of utmost importance in everyday operations, and central to the establishment of CXC, the design of the call-down service itself as a responsive service supports the generation of salient knowledge. While salience is still not guaranteed – and much work was going into “a massive cultural shift” (Interview CXC-D1) within CXC to ensure responses to call-downs are both timely and relevant – the way in which knowledge achieves legitimacy is much less immediately clear. Discussions of legitimation at CXC’s AGM 2013 provoked some debate about what legitimacy entailed, with suggestions that legitimacy had its reference point not just with the source of information (science) but also in policymaking terms (RN: CXC-AGM 2013). This raises questions about how CXC knowledge constructs legitimacy for knowledge through its work.

The empirical analysis is structured around three call-down examples that were profiled by CXC and the Scottish Government as either successes or failures of CXC’s translation. Detailed examination of the processes of each occurred through textual analysis of the Scottish Government request, the final and draft call-down responses, Scottish Government feedback on the process, and CXC’s own presentation and evaluation of the cases at their AGM 2013, as well as interviews with key actors involved. These have been used to identify factors important to perceived success and to explore how legitimacy for knowledge is constructed. An argument is made that both aligning knowledge with/reproducing dominant discursive value framings was a clear factor in the legitimation of knowledge, and was important in both instances of successful CXC translation. As a result, CXC translation can be seen to lubricate and facilitate the flow of particular forms of knowledge. Attention is drawn to the type and contingency of knowledge enabled to circulate, and in doing so to the political functioning of boundary work. The chapter begins with further theoretical clarification over the concept of legitimacy.

6.1 Multiple forms of legitimacy

Legitimacy is a highly diverse concept that is “rarely defined” (Lister, 2003: 176; Kronsell and Bäckstrand, 2010), with multiple meanings and “surprisingly fragile conceptual

moorings” (Suchman, 1995). In political theory, theories of legitimacy are often organised into descriptive vs. normative approaches. Weber’s descriptive approach bases legitimacy in the belief of something as legitimate. He suggests that people construct ideas of legitimacy in relation to characteristics influencing the acceptance of domination – traditional, charismatic and legal-rational (Weber 1956, cited in Lister, 2003). In this approach Lister, who provides a helpful review, suggests legitimacy is based on conformity with regulatory institutions, rules and laws, cognitive structures and normative values (Scott 1995, cited in Lister, 2003: 179), legal compliance (Edwards, 1999), accountability (Edwards and Hulme, 1995; Saxby, 1996, cited in Lister, 2003) or even acknowledgement by others as legitimate (Friedrich, 1974, cited in Stillman, 1974). Other political theorists have adopted a more normative approach, which involve clear designations of right and wrong. Normative groundings can be distinguished according to both the input and output sides (Scharpf, 1998). Input side legitimacy is concerned with factors such as the degree of participation, notions of justice and democratic values (Rawls, 1995), representativeness (Eade, 1997; Hudson, 2000, cited in Lister, 2003) and consistency between “professed mission (values) and actual behaviour” (Lister, 2003: 177-178). Output side legitimacy focuses on the effectiveness of outcomes in relation to audience interests (Suchman, 1995). Many approaches mix descriptive and normative approaches (Fabienne, 2014) and Beetham suggests this diversity demonstrates that legitimacy is multidimensional (Beetham, 2013).

Approaches to legitimacy within science policy studies also show this divide between normative and descriptive approaches (though often contesting Weber’s narrow focus on domination). STS often appeals to normative ideas of input legitimacy both of knowledge and processes through emphasis on civic participation and consensus (section 2.4), while argumentative theories instead tend towards descriptive understandings, not grounded in right and wrong but in conformity to contingent discourses. Chantal Mouffe’s approach to legitimacy shares the descriptive approach – making legitimacy contingent in relation to hegemony. Recent attention to knowledge legitimacy within science–policy often follows Cash *et al.*’s credibility saliency legitimacy framework (2002; 2003) that defines knowledge legitimacy through the input conditions of an unbiased process, procedural fairness and consideration of “values, interests, concerns, and specific circumstances from multiple perspectives” (Cash *et al.*, 2002: 5). Section 2.4 developed a critique of Cash *et al.*’s naturalization of policy as a reference point for the

judgment of legitimacy, and their implication that if a 'fair' process that considers values and interests is undergone, legitimacy is somehow automatically secured and not therefore an achievement or outcome of struggles through power. This leaves reasons why some values are able to predominate over others unaccounted for, and takes an uncritical approach to the setting of terms of how, why and in whose interests they come to matter (Backstrand, 2003: 27; Lister, 2003: 178). Respecting value differences in the absence of attention to workings of hegemonic power appears oxymoronic. It is precisely Hajer's discursively constrained fields of action that Cash *et al.* naturalize and take for granted (Hajer, 1995: 275).

Jordan *et al.* (2015: 83) call for science-policy scholars to "move beyond broad brush explanations of selection and adoption couched in Cash *et al.*'s (2002) terms of 'credibility saliency and legitimacy'". Similarly, Jasanoff (2009), Lovbrand *et al.* (2011) and Goeminne (2012) have all called for STS to think further about the models of legitimacy being employed. This chapter seeks to respond to such calls by favouring descriptive approaches to thinking about how legitimacy is constructed with a critical approach to the relationship between legitimacy and power. Argumentative policy analysis approaches foreground the discursive constitution of legitimacy (Hajer, 1995; Litfin, 1994) and signal the fitting of knowledge into existing framings to render it meaningful (Litfin, 1994: 15; Rein and Shon, 1993; Lister, 2003: 188; Hajer, 1993; Hajer, 1995). However, in attending to other forms of discursive power Hajer gives little attention to the relations between legitimacy and hegemonic power and takes the hegemonic claim for totality at its word (section 2.4).

If reproduction of dominant relations is not to be inevitable, then greater attention to thinking about the relations between hegemony and processes of legitimation is required to highlight its contingency, to denaturalise it, and to examine processes of legitimation through which particular claims to legitimacy become stabilised. Mouffe's thinking about legitimacy specifically builds on argumentative policy approaches to discursive construction of legitimacy, but with clearer conceptualization of the relationship between legitimation and hegemonic power. Emphasising no unbridgeable divide between legitimacy and power (2000: 14) means that legitimacy is always thought through a relationship with hegemonic power (section 2.6.3). Further, her refusal to ground legitimacy through any reference point outside of discourse draws attention to why normative references for legitimacy are unsatisfactory. Grounding legitimacy in

rationality or in any particular input/output normative goals generates legitimation through essentialist appeals to right and wrong. These are non-negotiable, and therefore boundaries of legitimacy cannot be considered political, or contestable. Mouffe argues that designations of legitimacy are always political decisions and therefore should remain open to contestation (Mouffe, 2005b). This approach to legitimacy complements that within argumentative theories, but with greater attention to hegemonic power and to *why* these grounds for legitimation cannot be essential. It also responds directly to critiques of normative approaches to legitimacy within STS.

Before leaving STS approaches, there are two further ways of thinking about legitimacy within STS that draw more from descriptive approaches and form a central point of discussion in this chapter. Firstly, Star and Griesemer's emphasis that accountability for boundary objects is required on both sides of the boundary prompts questions over the equality of influence being exerted by each domain over the construction of legitimate knowledge (Star and Griesemer, 1989; see also Guston, 2001; Miller, 2001a). Secondly, Jasanoff's emphasis on legitimacy as a context – specific process of construction through boundary work (1990; 2005) is an important foundation that this chapter builds upon to examine how boundary work as a process of legitimation operates through the three empirical cases. However, boundary literatures have drawn attention to the production of legitimacy through separation of fact and value (Jasanoff, 2003b: 229; Owens, 2012: 15; Jasanoff, 2003a; Litfin, 1994: 35; Irwin, 2006). As Chapter 2 suggests, understanding legitimacy through this separation is in crisis (Backstrand, 2003). This chapter argues that knowledge is becoming legitimated within CXC through the translation component of boundary work as much as through that of purification. In the case of CXC translation (with its emphasis on the policy audience) discursive value framings of policy naturalise particular values through connections of equivalence (Chapter 5). While separation of fact from value remains important in constructing legitimacy, it is suggested that both translation and purification are active components of legitimation at the science–policy boundary. This argument is made by tracing the processes of legitimation involved in the CXC call-down service that CXC term translation. It is suggested that descriptive approaches to legitimacy bring a more critical engagement with how legitimacy is being claimed and naturalized than Cash *et al.*'s understanding of legitimacy, and therefore better help understand what is being legitimated when the success of translation is heralded.

6.2 The call-down Service

The short and clear format of call-down briefings belies the complex and multifaceted work behind their production. The call-down service was introduced in Chapter 4 as a responsive service to policy and a signature of CXC's translation work. Every stage of the process of producing a briefing note involves moments of re-interpretation, shaping, framing and sense-making – from the secretariat's framing of the policy question in ways answerable by science, to the selection and construction of knowledge by the scientific researchers, to the subsequent reshaping and rewriting of the content and format of the briefing response between the CXC secretariat and the scientific researchers involved. Key figures within CXC secretariat and the directorate, who have tacit understanding of policy requirements and sufficient overview of the science, are vital to the stages of interactive rewriting. The policy director specifically describes the role of the secretariat in re-writing briefing notes in the language of translation as:

“... pure translation; that is actually rewriting... as a briefing note that is meaningful so a lot of the ones you can see on the website, a lot of those will have been rewritten by us... so it is a process of translation” (Interview CXC-D1).

This funnelling of exchanges through the CXC secretariat establishes the secretariat as an obligatory passing point (Callon, 1986), at least temporarily, in the aspiration for a more policy responsive science.

The function of the briefing note varies depending on the information request, but usually includes some distillation of relevant scientific knowledge and some conversion of knowledge to the particular policy problem in question, as discussed in Chapter 5. This section describes three call-down requests – two of them profiled at the CXC-AGM 2013 as successful examples by CXC staff and policy makers alike. In contrast, the third was presented by the CXC secretariat as a less successful example of CXC translation. Analysis of each case helps to understand what was considered successful or unsuccessful about these examples and how legitimation occurred in each case.

6.2.1 Call-down 1: Peatlands

The Peatlands call-down was highlighted as a success by RESAS who suggested the knowledge had been well received by the Scottish Government's Natural Assets and

Flooding Division, and well used in the RPP2 (Interview SG2). It was also profiled by scientists at the CXC Uncertainty Workshop as a successful example of providing an answer that commented on uncertainty without weakening ‘the message’ (RN: CXC-UW). The work was championed at the Rural Affairs, Climate Change and Environment Committee on 6th Feb 2013 (The Scottish Parliament, 2013) by one of the scientists involved, and the CXC secretariat also profiled the example as an example of best practice at the 2013 AGM of CXC.

In preparing the second Report on Policies and Proposals for carbon mitigation, the Scottish Government was interested in quantifying abatement potential of peat. The specific wording of the call-down to CXC asked for ‘expert opinion’, as described in the following text taken from the original call-down request (D: CXC-Peatland-CDR)¹¹:

1. An expert opinion on provisional ‘optimistic’ and ‘pessimistic’ emissions factors (tCO₂e ha⁻¹) which could be used to indicate the GHG abatement potential of peatland restoration measures in Scotland, pending forthcoming reporting guidelines from the IPCC; together with an indication of the uncertainty involved.
2. An expert opinion on the approximate area of peatland in Scotland, which has the potential to undergo restoration and achieve abatement within this range.
3. An expert opinion on the nature of the profile of the abatement potential from restoration measures over time.

In response, CXC provided a series of staged briefing notes (RN: CXC-AGM 2013). The scientists’ vision of success of this work drew from the credibility of the knowledge provided, which appeared important for scientists although was never put at stake by the policy team. In presenting the work, CXC used provisional language describing

“a range of values relevant to Scottish conditions to use as indicative emissions factors; an initial indication of the size of the land area where peatland restoration measures would achieve these reductions in emissions; and the timeframes likely to be involved” (CXC, 2015: online, emphasis added)

¹¹ D refers to ‘Additional Documentary Sources’ consulted, as listed in Appendix A.

This provisionality balanced the precision required for the question to be framed in scientifically answerable terms, with tentativeness over quantitative values, such that scientists could still respond in a way that was considered robust given the limited data availability. Estimates of realistic restoration abatement figures were described by researchers as rough figures with “significant data gaps and uncertainties” in which researchers “had to make a number of assumptions in modelling emissions savings” (CXC website 2015). This preparedness of science to provide a provisional but informed response, gave policy rough numbers to work with (Interview SG2). Large caveats included in the briefing report, such as ‘indicate abatement potential’ and emphasis on ‘expert opinion’, allows these figures to remain provisional, helping to create information that met policy requirements yet easing scientific fears over validity (RN: CXC-AGM 2013). The policy team were not concerned, however, that knowledge was uncertain and provisional, and this was made clear to the scientists:

“We are aware of the very wide range of results reported in published literature, as well as the difficulty of applying these to Scottish conditions, and are therefore looking for the views of ClimateXChange researchers as experts in GHG emissions and in peatlands” (D: CXC-Peatland-CDR).

As the knowledge officer suggested policy makers are often less concerned by uncertainty than scientists think – “it’s not a novel thing... they are used to poor data sets... it’s kind of decision making under uncertainty all the time in a policy team... so they are fairly understanding” (Interview CXC-S3). In this specific case, the policy team were awaiting the IPCC supplementary guidance on a methodological approach to assessing abatement potential (IPCC, 2014) but due to the timing of the RPP2 Scottish Policy makers were looking for “indicative values... in advance of the IPCC guidance” (D: CXC-Peatland-CDR). In their view seeking “an expert opinion from ClimateXChange” (D: CXC-Peatland-CD) was one way of overcoming these temporal and spatial gaps. Credibility of knowledge was important for scientists but policy did not put the credibility of knowledge at stake, they simple wanted narrower estimates (Interview CXC-S3). Part of the success of the call-down was the ability to provide quantifiable figures in ways that accommodated the concerns of science about robustness and credibility, yet still provided policy with useful knowledge (RN: CXC-UW).

But to what does useful knowledge refer? Saliency of peatland knowledge was in many senses already configured, through the recent Durban Summit ruling in 2011 on the use

of carbon sinks (UNFCC, 2011) that allowed peat management to be included in national greenhouse gas emissions (CXC, 2015). The fact that knowledge was being requested through a call-down in many senses also prefigured its salience for the Scottish Government. However, preparedness for scientists to respond with “guestimates and gut feelings” and to acclimatizing to iterative processes of refinement (RN: CXC-AGM 2013) was important in continuing to provide salient knowledge.

In considering knowledge legitimacy, engagement occurred between two well-informed communities who already shared common expertise and a common framing for the type of quantitative and costing information required. It is suggested that fostering equivalence in these framings of reference helped to legitimate knowledge. The policy team requesting the call-down were government analysts (Interview CXC-S3) who already had strong knowledge, interest and background in peat research (Interview CXC-D2) and simply needed more specific and measurable information (Interview CXC-S3). This made the type of knowledge sought a good fit for scientific response. These analysts were familiar with the epistemic needs of science and so respected scientists’ needs for framing the question in specific and measurable ways and for greater time to deliver a more robust answer (Interview CXC-S3). Likewise, peat is a strong existing research area for CXC and part of these particular researchers’ core funded research from the Scottish Government, meaning they were working on familiar territory with a strong empirical basis (Interview IUCN; RN: CXC AGM 2015).

However, behind the immediate interaction of the call-down was a longer history of boundary work to align the scientific community with the content-based discursive value frameworks of policy (not vice-versa). As an area of strategically funded research (commissioned by Scottish Government with the Main Research Institutes outside of CXC) research on peat was also already focused around a clear policy-orientated management approach “to better understand the potential for peatland restoration to contribute to greenhouse gas emissions reduction in Scotland” (CXC, 2015: online). This encouraged a strong degree of similarity and synchronicity in what was being valued within both science and policy communities involved in the call-down, both epistemologically and in terms of outcomes. Further, the particular researchers involved were experienced in working with policy having had a long-term working relationship with the International Union for Conservation of Nature (IUCN) and providing evidence for the UK Biodiversity Action Plan target (RN: CXC-AGM 2013). An interview with the

IUCN Research Manager suggested a great deal of work had gone into developing alignment between this particular scientific research community and policy goals at a higher strategic and UK-wide level (Interview IUCN), which constructed this apparently naturalized compatibility. He described the way in which the IUCN, acting as a boundary organisation, generated a hard won pragmatic consensus within the scientific community through negotiation, in order that it might engage with policy more productively (Interview IUCN). Alignment occurred between peatland conservation aims and carbon abatement aims that enabled science–policy conversations to productively prioritise peatland restoration (Interview IUCN). This appears to be a clear and proactive case of establishing a discourse coalition (Hajer, 1995) through which different soil and biological scientific communities and policy could participate in a shared message. This work behind the scenes performed preparatory discursive framing that then enabled the call-down requests to CXC to benefit and build on this existing alignment (Interview IUCN). As the CXC Science Director commented – both sides were framing the problem in a similar way (Interview CXC-D2). This involved valuing the same methodological approach of quantification, which provided a concrete figure for policy in terms of carbon saved, and enabled the question posed to science to be specific, narrowly constrained and measurable and so well served by ‘normal’ science despite the uncertainty involved. The temporary nature of the answer pending the IPCC approach may have helped alleviate concerns about the accuracy of these figures.

The usefulness of knowledge to policy was therefore not incidental, but the result of long term boundary work and funding arrangements, and meant that information being provided was aligned with and not controversial or challenging to policy discursive value frameworks. Whilst values of (peat) conservation and quantified carbon mitigation were not necessarily shared across the discourse coalition (Interview IUCN)(c.f. Hajer, 1995), they were at least not threatened by, or threatening to, policy. As Di-Gregorio suggests, in order for coalitions to develop there must be some “compatibility of values” (2012: 18). Discursive alignment meant that peatland conservation aims within the scientific community and the valuing of carbon sequestration by policy were able to find common ground in which they could both be pursued. In Laclau and Mouffe’s terms through a common threat to their realization (Laclau and Mouffe, 1985: 127), which in this case could be thought of as policy approaches that lead to the declining health of peat bogs. Whilst the content-based values of the soil and biological scientists – peat conservation

aims – were not lost (Star and Griesemer, 1989), they were made equivalent with this policy framings of meaning in ways that enabled the holding together of the discourse coalition as described in Chapter 5.

Perceived legitimacy of the knowledge generated can be interpreted from the championing of this example as a case of good practice by all three communities, suggesting that legitimacy was achieved on both sides (Star and Griesemer, 1989). It is unlikely that science, policy and boundary communities would hold up knowledge they considered non-legitimate, as best practice. Within the specific CXC process, respect for the epistemic values of science and the pragmatic needs of policy were important procedural factors in the establishment of legitimate knowledge. However, in the longer history of boundary work, legitimacy for knowledge was produced through content-based discursive value framings of policy, by placing a volume and cost on carbon that makes it governable through management (in this case peatland management to yield quantifiable figures of carbon savings). It is argued that it is through these boundary struggles that these discursive value framings of policy came to be accepted as the frameworks through which legitimacy for knowledge was claimed. This goes beyond mutual respect of value differences. Aligning knowledge with these frameworks through relations of power becomes one way in which scientific knowledge came to be legitimated. The discursive value frameworks involved were reproduced through the immediate interactions of the call-down process itself, not as a one off achievements by CXC, but through longer-term discursive alignment both through the Scottish Government Strategic Research Programme and IUCN.

6.2.2 Call-down 2: MAC Curves

A second example of a successful call-down, profiled at the CXC AGM 2013 and at the Uncertainty Workshop 2013 by RESAS (RN: CXC-UW), was the work on Marginal Abatement Cost Curves (MACCs). Like in the previous example, this call-down also relied heavily on a history of boundary work that aligned the scientific team with the discursive value framings of policy. Once again, these discursive value framings include the quantifying of volumes and costs of carbon to make carbon governable through management. In this example, aligning scientific knowledge with policy meanings occurred through MACC graphs – as boundary objects (Star and Griesemer, 1989) – which then became the focus for call-down requests. Three call-down requests were

placed: firstly for a Scottish MACC update and policy cost effectiveness tool for the RPP2, secondly for a review of potential measures for RPP2 and thirdly, for a specific precision farming review for RPP2 (RN: CXC-AGM 2013).

MACCs are defined as “a graph that indicates the marginal cost (the cost of the last unit) of emission abatement for varying amounts of emission reduction” (Elkins *et al.*, 2011: 7). In simple terms, they outline a cost per volume of emissions savings for any given mitigation policy option. Despite strong critiques by Elkins *et al.* and others of the MAC Curve approach to decision making – based on its oversimplification, limited assessment of interactions and lack of transparency over uncertainty and assumptions (Elkins *et al.*, 2011) MAC Curves are a common approach within mitigation policy. They have a long history in European environmental economic modelling (see Nordhaus, 1991), and since the Ellerman and Decaux report (1998) have been used to assess the impacts of responding to the Kyoto Protocol (Klepper and Peterson, 2003). MACCs have been used prolifically at UK level by DEFRA and the UK Climate Change Commission (CCC), and in Scotland form a key part of the RPP1 and RPP2 emission reduction strategies (Interview CXC-R12). One of the Scottish Research Institutes had led the agricultural work on MACCs for CCC and DEFRA at a UK level (Interview CXC-R12). The Scottish Government had been made aware of this work by the CCC and wanted to make the most of this knowledge for Scotland given Scotland’s ‘policy gap’ between forecast emissions reductions identified within current policy measures and the increase in measures required to meet the 42% emissions reduction goal by 2020 (Interview CXC-R12). MACCs offered the Scottish Government a tool to prioritise cost effective emissions reductions and identify where further emissions reductions might be “squeezed out of sectors”, at what cost (Interview SG2).

Once again, the specific CXC call-down response was able to draw on a longer history of boundary work that demonstrated strong prioritization of discursive value frameworks of policy. Like with peat, the success of the specific MACC call-down responses relied in part on previous alignment of science and policy approaches at UK level. As a result of the CCC referral, CXC researcher’s MACC work already had a degree of established reputational authority within Scottish policy and, like peat, interactions did not have to struggle for credibility, salience or legitimacy during the immediate call-down. This history also meant that CXC scientists were speaking from relatively confident and familiar territory, despite the uncertainties in estimations.

Credibility once again did not seem at stake for policy but was a concern for science. Referring to the longer history of interaction over MACCs at UK level, one CXC researcher involved throughout indicated that there had been difficulty in establishing legitimacy for the MACC approach within the agricultural science community (Interview CXC-R12). Although he used the term 'legitimacy' in his narrative, what comes across is that these concerns are about the robustness and validity of the knowledge produced, concerns more usually associated with credibility. During early stages of developing a MACC approach it was suggested that agricultural scientists were not keen on the MACC process and MAC Curves were seen to hold little benefit for science. Like much economic modelling, MACC calculations are highly uncertain and rely on a large number of assumptions and educated guesses (Interview SG2). In the early stages of designing MACCs, CCC were described in an interview as "woefully ((laughing)) brilliantly... crazily optimistic about what the science was" (Interview CXC-R12). The respondent went onto explain that

"... scientific methodolog[ies] to do this, are very contested... there's a legitimacy issue... I think the scientists were slightly nonplussed that they were being put on the line... but then as the thing firmed up I think they got more galvanised and more confident... that process still could be contested, but it wasn't" (Interview CXC-R12).

Residual unease about the MACC approach can be seen in the concern around early versions not taking into account all the cost benefits, having lots of associated uncertainty, and having only estimations of cost and policy risks included (RN: CXC-UW). Caveats were used for the approach in the final CXC call-down briefing stating that:

"ClimateXChange produced this brief early in the preparation of the second Report on Proposals and Policies. Its purpose was to help frame questions and lines of enquiry and as a result, did not fully take account of real-world constraints (economic, political, social, institutional) that mean that these theoretical abatement levels are unlikely to be achievable in practice" (D: CXC MACC-CD1)

Salience of knowledge was again in part prefigured by the call-down request in the context of the development of RPP2. Although salience did not appear to struggle, the post call-down evaluation suggested, "in general, when working under CXC, it is important that researchers understand the specific policy context of the area they are working in and around the question they are being asked. This is different from their day

to day work which might be for Government in a less direct sense” (D: CXC MACC-CDF), indicating that salience still required active attention and was not entirely prefigured.

Legitimation of MACC knowledge among scientists was achieved precariously through the pragmatic benefits offered by the MACC tool to scientists in expert elicitation and interdisciplinary working (Interview CXC-R12). Descriptions of the process demonstrated an over-ruling of initial scientific value framings, rather than respect:

“This framework actually allowed us to get a lot of people in the room and essentially bully them into hearing what we’re trying to do ...if we did your measure in lots of farms... how much carbon would it save...*we know* you don’t know, but give us your best answer, it basically brigaded, well I say brigaded, we bullied them basically... just give us an answer, and then we hung them on that diagram and said well how does that work? And then it was either ‘mmm well that doesn’t look too bad’ or, ‘oh no that’s really wrong because...’ then... there’s a construct there to be refined and improved... they start to say, ‘I’m not sure, x has published a paper over there to say that’s not true and somebody else has published a paper and so on’ and so you can actually build up a database” (Interview CXC-R12, original emphasis).

The approach is implicitly justified by the rationale that as soon as scientists understand the process, they will see the benefits of working this way. Here, credibility and legitimacy of the method are in question for agricultural scientists, but are tentatively produced through the ancillary benefits of offering a pragmatic tool with which to approach the difficult tasks that scientists increasingly face (through policy demands), but for which they are poorly equipped – i.e. connecting with non-scientific or interdisciplinary concerns. Procedural markers of legitimacy are used to construct credibility and legitimacy, including using initial statements as hypotheses, reviewing evidence, and revising estimates. This slowly constructed legitimacy for the scientists involved, through recognised procedures of science. However, it was suggested that the MACC approach would not have a life of its own within the scientific community, “because why would anybody ask the question?” (Interview CXC-R12). This indicates that legitimation not only remained tentative, but also was constructed within the discursive value framings that structure policy questions not science questions.

For policy and boundary actors, knowledge was legitimated through alignment with the discursive value framings of policy. It was suggested that resistance arose because agricultural scientists were not used to having to operate within these policy frameworks:

“Natural scientist... are not used to being shoved into the frameworks that that the government uses to try and frame their questions and answer their problems... they boil down to well you know what are the costs and benefits of doing this... certain disciplines like economics, well that’s what we do... fundamentally you try your best to work within those frameworks... that’s the crux of the policy CXC space” (Interview CXC-R12).

Here there are tensions between different scientific disciplines, as described by a policy officer in another interview with the Scottish Government:

“What you find is that the economists are probably the most valued analysts... because the approach that the economists take is very pragmatic ... statisticians will give you the data and will tell you about how it was all collected and how it is robust or not... different ways you are not supposed to use the data ((laughing))... and the economists will ride roughshod over this and will say, ok that’s the data it’s the best information we’ve got, let’s use it. It might not be entirely appropriate... but we’ve got nothing else... what else should we do!... I think it’s this pragmatism... that is really valued... economists... through their training, have a certain philosophy or approach ... which is an approach that is generally used in government, which is about costs and benefits... These kinds of things are actually the types of questions that people are interested in... economics is not very much evidence based ((laughing)) as a science, so therefore it is perhaps easier for economists to... just make pronouncements... they are more willing to do that... the view as a whole is perhaps... less rigorous than the natural sciences... this lack of rigour ((laughing)) allows them to do things that a natural scientist would not be comfortable to do” (Interview SG2).

In this excerpt, the particular ways of thinking that arise from economics are seen to be favoured by policy because they generate knowledge that provides information suited to the types of decisions policy has to make, that embodies looser ways of working with knowledge, and that are practical in conditions of incomplete, conflicting and uncertain knowledge. Economists hold important policy and scientific advisory roles (both in CCC and through the way CXC is managed), which normalise (and naturalise) economic ways of thinking. At a UK level the CCC had been instrumental in requesting use of the MACC approach – commissioning the original research, providing guidance on how the task should be done and even setting up a spread sheet that “short cut our job a bit” (Interview CXC-R12). CCC were described as being made up of former Government economists (Interview CXC-R12). Their involvement in the design of the approach in the earliest stages helped align the scientific approach to policy discursive value framings. As

a result, the MACC approach was already well aligned with economic ways of thinking about managing carbon within the Scottish Government.

The CXC call-down response is being used directly in the preparation of RPP2 to identify policy actions (RN: CXC-UW). The call-down response outlined “20 further measures that could offer additional abatement potential over and above that identified in RPP1” (D: CXC MACC-CD). MACCs as a knowledge tool are therefore also directly legitimating particular courses of policy action:

“MACCs are just relatively clear stories... they tell you exactly what you can get in terms of the mitigation story... they’re the clearest way of representing... within given constructs all the things that are out there to do, which ones of them are low cost, or negative cost... which ones are more progressively more expensive, *which ones you should forget about*... you can draw this so called cost of carbon line through the diagram and cut off the ones that are more expensive... so that story is very useful, it tells you... *here’s the ones you should be concentrating on*” (Interview CXC-R12, emphasis added).

Presenting MACCs as ‘clear stories’ that ‘tell you exactly what you can get’ naturalises decisions based on least cost, and demarcating a line specifying ‘here’s the ones you should be concentrating on’ vs. ‘ones you should forget about’ prefigures particular options as natural rational choices. MAC Curves become “a useful representation of the whole economy [and]... policy makers love it because they can see what they’ve got to do” (Interview CXC-R12). Such naturalisation removes opportunities for political debate about the effectiveness of measures with regard to climate change or the social implications or distributions of costs of these measures, vis-a-vis others that fall outside the demarcated scope of possibility. MACCs therefore enable knowledge which quantify and prices carbon to achieve legitimacy and to circulate, reproducing the constraining of possibility through cost, and encouraging market led responses to carbon ‘management’:

“We aim, where reasonable and practical, to encourage a portfolio of technologies and create competitive market conditions in which the most sustainable and cost effective succeed over time” (Scottish Government, 2013: 32).

At the CXC Uncertainty Workshop, the Scottish Government confirmed, “the MACC story is the way that policy is conceptualising policy targets” (RN: CXC-UW) and emphasised cost curves encourage priority of low cost measures that pass under the required cost threshold (RN: at CXC-UW). “We can now design policy by positioning MACCs to see if policy contains most cost effective measures” (RN: CXC-UW). MACCs therefore become a

process through which policy approaches minimising high cost structural change and encouraging minimal cost and minimal structural disruption become legitimated and prioritised. These knowledge forms are contingent in that, under different circumstances, the relative balance between questions of cost and questions of methodological robustness may create processes through which other forms of knowledge become legitimate.

Policy options were on one hand constrained through the questions asked by Scottish Government. As Rein and Shon suggest “the questions we ask shape the answers [i.e., policy solutions] we get” (1977: 236). The scientist responsible suggested,

“For reasons I couldn’t fathom at the time they were obsessed with peat... it’s really weird what they asked us to focus on... some of the more robust science was on things like adapting livestock housing and transport... temperature and thermal heat... they weren’t quite so interested in that... It’s almost like in some ways they had what they wanted to say already” (Interview CXC-R12).

On the other, the MACC approach constrained understanding of possible policy responses. In the report produced for the UK CCC *UK MACC for Agriculture and Land Use and Forestry Sectors (Moran et al., 2008)*, it was suggested that shortlisting of measures was made not only based on abatement potential, but also perceived industry acceptability (Table 6.1). This is also apparent in the detailed presentation of reasons given for omission of certain options (Figure 6.2), where the traces of omissions based on perceived acceptability among industry indicate the construction of legitimacy for options in private sector terms.

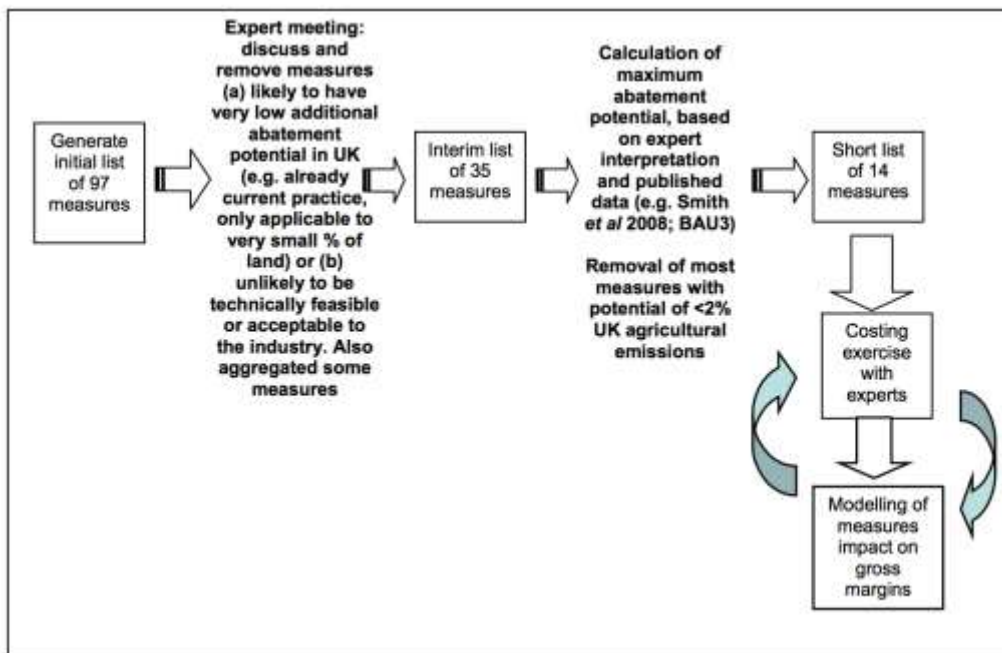


Figure 6.1: Methodology for shortlisting measures in UK MACC for Agriculture and Land Use and Forestry Sectors (source: Moran et al., 2008: 35).

Title of table in original publication:

“Annex A4: Full list of measures and reasons for omission from interim list”

ID	Category	Sub-category	Measure	Included in interim list?	Reasons for omission
86	Management of organic soils	Avoid drainage of wetlands		y	
87	Management of organic soils	Avoiding row crops and tubers		n	Unlikely due to high value of land
88	Management of organic soils	Avoiding deep ploughing		n	Small abatement potential
89	Management of organic soils	Maintaining a shallower table	Peat	y	
90	Management of organic soils	Maintaining a shallower table	Arable	n	Unlikely
91	Management of organic soils	Erosion control		n	Small amount of degraded land so small potential

Table 6.1: Reasons for omission of options in UK MACC for Agriculture and Land Use and Forestry Sectors (excerpt) (source: Moran et al., 2008).

The call-down responses provided by CXC researchers to the Scottish Government in relation to MACCs both drew from and reproduced these particular framings. Their heralded success, as examples of best practice CXC translation, might in some ways come

as no surprise given this historic narrative, for once again the difference between the two communities which requires translation is already small. As the CXC researcher interviewed suggested, the example is actually not a good example of translation “because it is just so clear, you know” (Interview CXC-R12). Yet the apparent obviousness of the match conceals precisely the collapse of objectivity and power that Mouffe so adamantly maintains requires attention. It is through their very use, as science, and the claims to authority that this gives knowledge within the policy making process, that MACCs naturalise particular courses of mitigation action. Such boundary devices have implications not just on the type of policy that comes to be developed but also on the type of science:

“People might go back to their everyday research but somewhere in the backs of their minds is some, some policy device that they can still kind of relate to, not to say that they have to, but if it’s still there and it’s still relevant it’s still asking, it’s begging us questions” (Interview CXC-R12).

Frameworks with which to order and prioritise decision-making were emphasised as being very important. “The world would be a lot easier if we had more of these frameworks... its so much the better if you can put up a nice diagram so we can all coalesce, and that’s effectively what MACCs have done” (Interview CXC-R12). In doing so, the MACC approach becomes a framework for consensus:

“I mean the policy question is very clear, you know, everybody’s on board... everybody’s now attuned to the fairly fundamental principle that we need to do the cheaper things first, and there is nothing to argue there...its like clinical effectiveness you know NICE, its effectively the same thing” (Interview CXC-R12).

The homogenising potential of MACCs immediately alerts us to the absence of attention to power and exclusion of alternative ways of approaching the policy challenge. The claim to consensus apparent in this narrative is indicative of the closing down of possibility and difference about which Mouffe is so suspicious. It was suggested by the CXC researcher interviewed that MAC Curves can, under particular conditions, encourage debate and become the focus for critical engagement,

“This is what we think is the story, if its wrong tell us why its wrong... you’ve got to start somewhere... they’re good devices because they spawn this debate... they give you a direction of travel in terms of things you can get better” (Interview CXC-R12).

However this debate is limited to options already within the framing and constrained ranges of MACC representation. He also suggested that a MACC curve “makes space for new technologies that are over there on the right hand side and cost a fortune... should we be investing in those you know, and why are the ones that really work, all off the political agenda – you know biotechnology, GM genetic modification?” (Interview CXC-R12). Whether or not these are options that are politically or ethically desirable, the way in which this space is made for expensive options is already within a low priority zone for interpretation, and so the likelihood of these types of options being chosen is already prefigured by the logic through which they are presented.

Mouffe’s attention to exclusion is important here in drawing attention to the way in which framing a view of the world according to particular established discursive values generates a perspective from which no alternatives can be envisaged. The CXC researcher whose narratives have been so important in exploring these processes of constructing legitimacy neatly describes the success of this hegemonic practice when he concludes “you organise your information by something like that, and it could be something else, I just can’t think what it could be” (Interview CXC-R12). Mouffe’s approach encourages us not lose sight of how this might be otherwise. It was recognised that in the end, the MACC graph is “just a construct right?” (Interview CXC-R12). A MACC is a construct that enables the legitimation of particular forms of knowledge and particular forms of action to the exclusion of others.

6.2.3 Call-down 3: Extreme weather variability

The call-down on extreme weather variability is considered by the CXC secretariat as a less successful example of CXC translation. The purpose of the call down was to establish the extent to which climate change is likely to involve an increase in extreme weather events which will be challenging to predict. Although the outcome is considered a very robust briefing note (RN: CXC-AGM 2013), the Scottish Government Adaptation team remained little further forward in what they needed to write in the Adaptation Programme as a result (Interview CXC-S3). In this case, the prior background boundary work with the wider scientific community was not present. In fact, the specific call-down request relates to a wider long-standing dispute between meteorological physicists and wider policy and public communication of climate change over attribution; the ability to

connect extreme weather events and climate change is a wider debate within climate science. The IPCC suggest that:

“... unequivocal attribution would require controlled experimentation with the climate system. Since that is not possible, in practice attribution of anthropogenic climate change is understood to mean demonstration that a detected change is ‘consistent with the estimated responses to the given combination of anthropogenic and natural forcing’ and ‘not consistent with alternative, physically plausible explanations’... This is an area of research with considerable challenges because different forcing factors may lead to similar large-scale spatial patterns of response” (IPCC, 2007: online).

Attribution was a point of contestation in science–policy conversations in Scotland at the time of research because extreme weather events constitute an important way in which policy and boundary actors are establishing meaning for a lay public in relation to adaptation (Interviews: SG3, CXC-R3, Sniffer 1; RN: Sniffer-CJ). Insistence on the inability to make a statistical connection equates to inability to use a discursive connection between climate change and extreme weather events. This poses difficulty for policy and boundary actors in communicating the risks of climate change to the general public. The head of the Adaptation Programme suggested “people could relate to that... [it] is a message people can understand” (Interview SG3). Some prominent climate scientists in CXC felt that an overall connection between climate change and extreme weather could be drawn, suggesting “I think you can say it’s more likely... you can say it’s more likely with strong confidence is what we’d often say... what we can’t do is to be definitive often” (Interview CXC-R11). However, the Met Office was vociferous in objecting to a connection between the two. Emphasising the difficulty in statistically connecting instances of extreme weather with climate change (RN: C2020-PEWG) the Met Office cited a paper published in the Bulletin of the American Meteorological Society (Peterson *et al.*, 2012) involving Met Office staff which considered global attribution probabilistically, concluding that only some events were attributable to human induced climate change (Interview Met Office). It was into this controversy over the legitimacy of a connection between extreme weather and climate change that CXC was asked to speak.

The call-down was relatively unusual as the request was actually prompted by the CXC knowledge officer whilst on secondment within the Scottish Government Adaptation team. In the midst of the controversy outlined above, the Scottish Government

Adaptation team was facing a specific difficulty of 'selling the message' of adaptation to both policy colleagues as well as civil society in Scotland:

"To the general person on the street and even you know to the general policy area that's not that engaged in it, that's a really difficult message for them to understand and to take on in terms of priorities" (Interview SG3).

The secretariat described how they

"thought it would be really nice if we could come up with a couple of paragraphs... that would allow us to say something in... the Adaptation Programme that said... actually, we're going to have more variability and we're going to be less able to predict from one summer to the next..." (Interview CXC-S3).

The Adaptation Policy team needs a clear message of why adaptation action is required. In order to communicate the risks and urgency of climate change the Adaptation team was relying on precautionary principle discourses, with the Ministerial forward to the Adaptation Programme stating, "uncertainty is not an excuse for inaction" (2013: 1). Although interpretations of precautionary action are diverse (Jordan and O'Riordan, 1999), under such discursive framing unknown risks become the basis for preventative action. Tannert *et al.* suggest that "the precautionary principle is applied as a strategy to prevent incalculable possible dangers" (2007: 894). O'Riordan and Jordan suggest that "the point about the precautionary principle is that it swims against the economic, scientific and democratic tides" (1995: 19). It is therefore suggested that political legitimacy needs to be constructed for deployment of a precautionary approach. Interviews with policy actors suggest that the unpredictability of extreme weather was being used to legitimate precautionary action. O'Riordan and Jordan suggest "precaution requires being honest and open about uncertainty, rather than dismissing, ignoring or downplaying it. It means exploring the worst case scenario" (1999: 19). In practice, such honesty about uncertainty serves to legitimate a precautionary approach.

Although the briefing report was robust/credible and timely, it was not salient to the policy need and struggled to legitimate either one or other narrative over attribution or policy precautionary action. The extensive and lengthy process of iterative struggles over meaning were analysed through access to the email exchanges and reviewing edited track changes of the briefing note during production, which provide insight into the process through which salient meaning and legitimation were not secured. Due to

agreed confidentiality there is a limit to the specific detail of the textual struggles that can be reproduced here but a number of points will be distilled from the exchanges. This example demonstrates problems in translation in part due to failing to align with discursive value framings of policy. In this case, it is suggested these are a valuing of uncertainty that would help legitimate precautionary action.

A subtle yet important discursive shift occurred during the process of translation, which saw an interest in unpredictability turn into an emphasis on predictability. This first manifested itself in the wording of the formal call-down request to CXC, from the Adaptation team (written by the CXC knowledge exchange officer):

“To produce a short brief on current and future climate *variability and unpredictability* in Scotland. The brief should summarise current understanding of *how climate variability* – particularly inter-annual – *and unpredictability will change with climate change...* and, as far as possible, highlight any gaps and uncertainties... The brief should flag whether and where evidence on the future predictability of extreme events has a bearing on broader climate *variability/predictability...* We intend to use the brief to help with drafting the Scottish Adaptation Programme... *to say something about variability and unpredictability* to help present a more nuanced interpretation of the 'hotter, drier summers; warmer, wetter winters' headline, in terms that are more meaningful to the layperson” (D: CXC-Extreme weather-CDR, emphasis added).

Although the words variability and unpredictability are recurrent, there is also a reference to predictability. In the research scientist’s response it was the *predictability* rather than *unpredictability* of climate variability that was emphasised (D: CXC-Extreme weather-CD).

The wording of the call-down references the problematic connection between extreme weather and climate change, acknowledging the difficulty of the link and pushes specification on where and when this link could be drawn. The call explicitly asked for consultation with the Met Office given the wider controversy, as an authoritative source of scientific information on climate change for the Scottish Government (Interview SG3). The tension had created an impasse at the Scottish science–policy interface, over which there is great frustration, as described by the CXC secretariat who posed the call-down:

“It’s very frustrating not to be able to communicate something to the public, to make them aware of what we all think is going to happen... if it’s as simple as hotter drier summers and warmer wetter winters, then adaptation doesn’t seem to be that difficult ...just, I don’t know, put more drains in... I don’t think we’ve got the messaging around it right and I don’t really understand why

((sighs))... I don't understand why we can't say something more categorical than we are able to say... or find a form of words that lets us say something, and if we genuinely can't say anything then why don't we actually say - do you know what, this is so uncertain, that anything could happen so let's be prepared for that - but we're kind of unable, we're just totally mute, you know?" (Interview CXC-S3).

The intention of requesting consultation/collaboration with the Met Office through the call-down may have been in part to try to resolve this longstanding tension; as well as to prevent future challenge to the Scottish Government Adaptation Programme, the work of Sniffer, CXC and other stakeholders in Scotland; and establish CXC as an authoritative voice on this thorny issue.

The experience of the secretariat in understanding how to frame the request for scientific engagement is evident in the way that a rather vague policy 'need' becomes a well-structured and delineated problem, that can be responded to in scientific terms. Like the example of Peatlands (call-down 2), it was important to consider the scientific community's framings of knowledge. The brief provides a clear indication of what is required: 'summarise current understanding', 'review the evidence' and 'highlight any gaps and uncertainties'. These can be seen as all legitimate tasks within the remit of a scientific epistemological approach, and the full brief further specified a clear scale, dataset, format and indication of what the briefing will be used for to try to ensure the needs of the audience are clear. However, in recognition that the subtext of the policy interest in on-going uncertainty and the difficulties of being able to predict might not be clear, further email clarification was sent directly to the CXC scientist in question, clarifying what the policy team were looking for:

"A form of words for the Scottish Adaptation Programme that explains to Joe Public that climate change... is going to mean *more unpredictability from year to year and so make our lives a bit more complicated* (as opposed to more pleasant, which is the message people take from 'hotter, drier')" (D: Email 1).

Whether the subtlety of purpose in the original wording of the call-down was intentional or accidental is unclear. Clarification may have been a mere correction of ambiguity based on later reflection. Perhaps it was recognised that the interest in unpredictability rather than predictability would only be perceptible with tacit knowledge on how the information was to be used. Or perhaps, in the boundary work of constructing the neutrality of science so that science was not seen to be drafted in to provide a

predetermined message, the conclusion or outcome of what policy was trying to show was officially left open. As the person framing the call-down is also the person responsible for it being delivered successfully, perhaps desire to demonstrate the worth of CXC's services contributed to interest in ensuring the scientific researcher knows exactly what is required so that the briefing is useful. However, despite this extra clarification, the valuing of unpredictability in policy appears to have been missed, overlooked, or ignored by the CXC researcher. This was apparent in the wording of the first draft that concentrated on how well science might be able to predict climate variability in the future. Draft versions of the briefing note emphasised variability of climate and the difficulties of prediction, but the focus was on hopefulness about being more definite about what could be said in the future – a key premise within the climate science community (D: CXC-Extreme weather-CD draft Dec 2012). In emphasising potential for improved prediction, there is loss of touch with what is being valued by policy (unpredictability). This resulted in a failure of CXC translation as the briefing provided was not relevant to the policy maker's need, and failure to provide legitimation for the types of policy response that the policy team looked to the call-down to provide.

The language and structure of the briefing underwent extensive changes during the six months of iterations between the CXC researcher and the CXC secretariat and directorate – orientating it more towards policy language and a more direct writing style. The scientist easily accepted changes to the format or presentation, but some of the more significant changes to meaning were not considered acceptable and the scientist appeared to retain the right of veto to revoke wording changes where it was felt the meaning of the text was being lost (D: Email 2). Part way through the CXC scientist was keen to consult a range of colleagues to check the on-going accuracy and validity of the briefing note. This appears to have been based on concern over accurately representing the science, rather than in relation to the needs of the audience. During this process, one senior scientist (who had significant previous policy experience) immediately picked up on the mismatch with what the policy team were interested in. He appeared to understand the valuing of unpredictability rather than increasing predictability and suggested inclusion of the following statement:

“UKCP09 may well be right that 'wetter winters, drier summers' is a robust projection for the 2080s (medium confidence) but the closer we get to the present for future planning, then the less reliable that is for guidance...All this

means we should be preparing more for the unusual rather than waiting for a better 'answer' from the models" (D: Email 3).

Despite this suggestion, this piece of advice was never incorporated. It is not possible to ascertain whether this repeated omission of delivering a message on unpredictability was a result of insensitivity to these repeated requests or an aversion to a policy-led message. The final text says much about the difficulties of climate modelling prediction but little about the relation with everyday weather, or the impacts of unpredictability on everyday life. The particular researcher responding to the call-down had shown great capability, eagerness and astuteness in anticipating and discussing science in terms of what the policy makers need during the Policy Awareness Workshops (RN: CXC-PAW1). Perhaps in his enthusiasm to anticipate, he had jumped to assumptions over what policy wanted (the narrative that policy want to be able to better predict climate is a common narrative, and one especially amenable for scientists who have faith that predictability will improve through scientific and technological development). Or, perhaps he felt uncomfortable being asked to make science perform obligingly in this way. During interview he expressed strong scientific epistemic value in neutrality suggesting: "being politically neutral is kind of top (billing) so... anything I write has to be completely independent of whoever is actually running the show... it has to be just the best science we have" (Interview CXC-R4). Perhaps he resisted science being used to back up a pre-existent policy decision. Regardless of the reason, prioritising the discursive value framings of science and demonstrating more concern over accurately representing the science than aligning knowledge with what was being valued by policy. This corresponded with failure in CXC translation.

Although it was not possible to obtain specific reflections on this call-down from the Adaptation team because the interview took place before analysis of this example was undertaken, their comment on how useful the responses to call-down questions in general was lukewarm: "...er it is. I mean it was useful; I mean it is still early days in terms of what we do with the information but it gives us just an additional source of information to weigh in" (Interview SG3). For the CXC knowledge officer who had requested the call-down in relation to the needs of these wider policy and boundary actors however, the call-down however did little to resolve the problem:

"I still don't know what The Scottish Government can write in the Adaptation Programme, that tells people anything other than hotter drier summers,

warmer wetter winters... if we can't say anything more meaningful than that then you know, it's a real shame; it's a real missed opportunity and between all the brains that are involved in climate science if somebody can't come up with a form of words... I just don't, I cannot understand it" (Interview CXC-S3).

This feeling of dissatisfaction with the ability of scientific knowledge to be translated into a form usable by policy, reflects the presentation of this example as a poor instance of CXC translation, despite the credibility of scientific knowledge presented. The briefing note was delivered to the policy team and provided them with some robust information on current scientific predictability of climatic changes, however, the final briefing note did little to speak directly to the controversy over linking extreme weather events and climate change, or emphasizing the unpredictability of future climate. Although it slipped on timeliness (taking 6 months, not 6 weeks, to be delivered) it nevertheless still fell within the time window of the Adaptation Programme development and information was credible and robust (RN: CXC-AGM 2013). The call-down response failed on salience and legitimacy – not providing the information needed by policy and failing to legitimate precautionary action.

6.3 Translation, legitimation and hegemony: Analysing the three cases

Analysis of the three cases together enables some provisional reflections on what makes CXC translation successful in the eyes of practitioners, how legitimacy is constructed and the role of knowledge legitimation in translation success.

6.3.1 What makes successful translation?

Cash *et al.*'s (2002) emphasis on credibility, salience, and legitimacy is a good starting point for thinking about translation success, as all three elements recur in the three call-down examples profiled as contributing to successful CXC translation. However, while some aspects of their understanding of the process for constructing legitimacy can be identified, knowledge legitimation did not only entail fair unbiased process and respect for values, as Cash *et al.* suggest (2002). At times credibility of knowledge was at stake. However, often concern with robustness tended to be a concern of scientists, not of the

policy teams. Saliency was important in all three cases, and while the nature of the call-down function itself enabled knowledge to be provided at the right time, and with relevance to a policy problem, saliency was only partly preconfigured by the process. Saliency also relied on wider policy context and relevancy to the policy problem still required construction through the knowledge process production (as call-down 1 suggested), with varying success (as call down 3 demonstrated). Further, one challenge in applying their model was the difficulty of distinguishing between credibility, saliency and legitimacy, which Cash *et al.* have themselves suggested are often intertwined (Cash *et al.*, 2002; Cash *et al.*, 2003).

Procedural concerns and respect for values did not fully account for the way in which knowledge achieved legitimacy; instead knowledge legitimation was achieved through discursive alignment with the discursive value framings of policy. Procedural factors, including scientific research and synthesising peer-reviewed material, did play a function in the construction of legitimacy of knowledge for scientists, however, these procedural aspects were largely taken for granted by policy teams (Interview CXC-S3). Examples 1 and 3 did demonstrate a certain level of respect for values during the call-down process itself, based largely on the epistemic values of science and the pragmatic values of policy, however, in call-down 2, the process of constructing scientific legitimacy for MACCs as a tool, demonstrated little respect of the values of the scientific community. Indeed, when the scientific community expressed resistance, their objections were over-ruled. Yet MACCs were still legitimated by boundary and policy actors. In the longer histories of boundary working around peat, scientific values around peat conservation appeared to be respected only to the extent they were made equivalent through a discourse coalition that established equivalence in the face of joint opposition. In the two successful examples profiled, differences in values were not merely respected, but connected as equivalent through a discourse coalition with particular dynamics of power. As Star has highlighted such boundary object allow co-operation in the absence of consensus (Star and Griesemer, 1989; Star, 2010).

In both successful cases, alignment with the dominant discursive value framings of policy through long histories of boundary work seemed vital to knowledge legitimation and call-down success, and its absence may have played a part in the failure of the third case. Discursive values framings may be understood as the frameworks through which descriptive approaches to legitimacy argue that legitimacy is claimed. Rather than taking

these frameworks as naturalised, normative markers of legitimacy (as Cash *et al.* do), descriptive approaches critique their naturalisation and highlight the relations of power through which legitimation occurs. In this sense call-down briefings themselves were successful only as the tip of a boundary work iceberg, and their perceived legitimacy in many cases is a product of this wider boundary work.

Cash *et al.*'s three categories well capture the ways in which success of CXC's translation might be assessed, and they are right to extend attention beyond credibility alone; however their framework does not capture the value politics involved in the way that legitimation takes place. Framing knowledge through the discursive value framings of policy is one way in which legitimacy for knowledge is being constructed through CXC's translation process. Successful call-downs legitimate knowledge through alignment with policy discursive value framings – in the two successful cases, this occurred through quantifying and pricing carbon. As Hajer and Versteeg describe “meanings do not emerge ‘out of the blue’, but come into politics channelled through a particular set of operational routines and mutually accepted rules and norms” (Hajer and Versteeg, 2005: 177). The prominence of alignment with particular policy value framings signals questions around who, and what, become legitimated in the processes of CXC translation, and what is excluded, which descriptive approaches to legitimacy are better placed to address. As Van Egmond and Bal demonstrate, boundary configurations “shape[d] the incorporation of specific types of knowledge and associated norms and values while leaving others out” (2011: 110).

6.3.2 Legitimation and hegemonic practice

In the two successful call-downs profiled, significant discursive alignment occurred through longer histories of boundary work that constructed discourse coalitions which enabled different parties to share a storyline (Hajer, 1995) and form strategic alignment (1993: 47). Argumentative policy theories help to draw attention to the way that these functional coalitions rely on precisely the misunderstanding of and/or overlooking of difference (Hajer, 1995) to create a shorthand in which it is assumed everyone shares the same understanding (Hajer and Versteeg, 2005: 177). For many practitioners, such differences are considered inconsequential, as just different ways of talking about the same issue (Interview CXC-S1). However, the politics during such struggles over discursive meaning are not incidental or inconsequential. Behind these “visible changes,

there is the creation, thickening or discarding of meanings” (Hajer and Versteeg, 2005: 176). This ‘seaming’ together of different discursive value framings through an extension of the logics of equivalence occurs through discursive struggles within particular relations of hegemonic power that benefit from analysis through a Mouffian discourse approach. This argument is developed through interpretation of Mouffe through Howarth, an Essex School discourse theorist, who further interprets and develops this area of Mouffe’s work.

With no reference outside discourse, no third person judge (Mouffe, 2009: 556), Howarth argues that the reference point for legitimacy is the framework for meaning within any given hegemony (Howarth, 2000: 115). The development of a joint storyline involves the articulation of nodal points (discussed in Chapter 5) that “organise social orders” (Howarth, 2000: 110) – seaming discourses together and “covering over disjuncture” (Howarth, 2000: 111) in order to dominate the field of meaning. Drawing from Laclau and Mouffe (1985: 142), Howarth argues that the construction of such discursive formations are a practice of hegemony. The processes of discursive alignment referred to in the case of MACCs and by the IUCN in the Peatland case may be interpreted as examples of this seaming together and extension of claims to equivalence in meaning, and therefore as a form of hegemonic practice. For Peatlands, finding a storyline that accommodated the content-based values around peat conservation as well as those of carbon abatement was important, for as Vernon recounts “No actors, Latour suggests, will be recruited until the cause presented is more or less in line with their previous orientations” (Vernon, 1990: 345). Such identities must not be lost during interaction (Star and Griesemer, 1989). However, these content-based values need not be shared (Hajer, 1995), especially if they are seen through a logic of equivalence that is constructed through shared difference (Laclau and Mouffe, 1985).

Mouffe’s approach to legitimacy enables the discursive value framings through which CXC’s translation promotes alignment during legitimation, to be understood as an outcome of the achievement of power, not as fixed, necessary, or natural. These dominant framings for Scotland were set out in Chapter 4 (economic growth and a neoliberal state, Scottish Independence, socialist traditions in policy and an evidence based outcomes orientated policy approach) and in Chapter 5 (in more specifically neoliberal terms). These discursive value framings can be seen in both the two successful call-down examples. In both MACC and Peatland examples, the types of knowledge

provided are quantifiable volumes and prices of carbon that are helpful for management approaches which, in turn, prioritise minimizing government spending and market led approaches to carbon management and trading. These are not naturalized policy responses to climate change, but discursive value framings that help to reproduce neoliberal policy approaches. Mouffe's attention to the naturalization of such claims helps to understand how particular forms of knowledge appear to have natural fit with policy that disguises the political struggles and exclusions in their formation. The act of translation in CXC creates a moment of closure through which narratives of practical usefulness both naturalise and rationalise (through their scientific claim) particular forms of knowledge. The MACC case, in particular provides an exemplar of the way in which this naturalisation and rationalisation of particular framings of knowledge collapses distinctions between objectivity and power, obscuring the contingency of claims and the possibilities for alternative forms of knowledge. As Lövbrand suggests "the bureaucratic intellectual' has to refrain from the full opportunity of choice" but rather in working within what is deemed to be acceptable, one is already committed to certain frames that favour technical and instrumental implementation of those commitments (2011: 226).

Analysis of a greater number of call-down examples would be needed to ascertain whether claims for meaning that differed from existing policy framings would be considered non-legitimate. While unlikely to be so clear-cut, being framed as less useful to policy, might conceivably affect the legitimacy of knowledge indirectly. One scientist raised an example of knowledge that was provided outwith CXC that supports such suspicions. The SDC report on Sustainability Without Growth was described as

"a very complicated piece of sociological research... changing how society as a whole globally works... but it was such a radical change and radical way of looking at things... a Labour administration [UK] threw their hands up in horror basically when they saw it" (Interview Met Office).

The lack of take-up of recommendations from this report, despite its professed credibility and salience, suggests legitimacy in relation to existing policy frameworks may have been at stake.

In thinking about legitimacy during CXC's translation, discursive value framings are understood not as fixed, necessary or natural in their arbitration of legitimate knowledge, but instead as a product and achievement of power secured through a

hegemonic claim. Alignment with these policy framings need not be thought simply as a one-way engagement in which new knowledge deforms to fit with static and pre-existent policy discourse, but rather an on-going process through which that dominant policy discourse is itself being constantly legitimated through the provision of scientific knowledge that reinforces its claim to power. As such these acts of boundary work reproduce, and constantly create, the legitimacy from which hegemony legitimates its claims. While Jasanoff drew attention to legitimacy being constructed through boundary work (Jasanoff, 1990) her emphasis was on the production of legitimacy through separation of fact from values. In these processes of establishing equivalence and connection during CXC's call-down processes, legitimacy is being produced through the translation function of boundary work as well as through purification. The connecting and mediating of knowledge to align with discursive value framings of policy is an important way in which legitimation of knowledge occurs.

Mouffe argues that political relations always involve exclusion. During both the Peatlands and MACC narratives, moments of closure can be identified during which scientists come to accept (with varying degrees of willingness) the necessity of fixing meanings in the ways specified by policy. Closure is the point at which a claim to hegemony of meaning is made – “collapsing objectivity and power” (Mouffe, 2000: 14). These moments of closure obscure the partiality of claims to meaning, and the exclusions that could render meaning otherwise. Whilst the Peatlands and MACC responses appear to naturally fit with policy needs, this alignment was carefully constructed in both cases through long histories of boundary work, which reveal in each case significant discursive conflict and tensions through which hegemony of meaning was fixed temporarily, through political boundary struggles (Iverson, 2012). The apparent natural character of politically achieved social ordering is central to Mouffe's definition of hegemonic practices, which “conceal the originary acts of their contingent political institution and that appear to proceed from a natural order” (Mouffe, 2014: 151). Further participant observation or draft accounts of such struggles would be necessary to be able to be specific about such exclusions, which tend not to be recorded in final products or narratives. However these exclusions remain as traces in the first hand accounts of conflict (Interviews: IUCN, CXC-R12), or in the way policy options were written out in documents such as the UK MACC for Agriculture and Land Use and Forestry Sectors (Figure 6.1). For Mouffe, the boundary between legitimacy and illegitimacy is political one “and for that reason it should remain

contestable” (2005a: 49), yet in the case of the MACCs and Peatlands there is little possibility for alternative meanings to be treated as legitimate alternatives to discursive framings that value the quantification and pricing of carbon.

In many ways the scientific community is tied in this process. Formal suspension of all but epistemic values in the professional cultures and narratives of science restrict the extent to which alternative values might be directly mobilised by scientists. That scientists *do* suspend all content-based values in practice has long been disputed (Latour and Woolgar, 1986; Mouffe, 2000; Longino, 1990; Lacey, 2005; Douglas, 2009). Establishment of a discourse coalition among scientists through which competing values could be aligned in the Peatland case is also testament to the role that content-based values play in science. However, formal suspension of content (rather than epistemic) values in scientific discourses enables discursive values of policy to take precedence in boundary interactions. Whilst scientists can resist policy framings, where this occurred during call-down 3 (extreme weather), CXC translation was deemed unsuccessful. Where resistance occurred in the longer histories of boundary work (call-down 1), compliance of the scientific community was wrought through stabilization of a discourse coalition. When scientific values obstructed the approaches of policy (call-down 2), a more forceful approach with science was taken. Alignment with even the epistemic values of science therefore seemed to occur only when it was in the interests of policy. While there are similarities between Cash *et al.*'s emphasis on respect for participant's values and Mouffe's concern for differences in value to be held in a relation of agonism (as legitimate adversaries) rather than antagonism (enemies), Mouffe's approach recognizes the conflicting and political nature of such relations.

Boundary literatures emphasise the *positive* role of boundary objects in enabling differences to coexist without either conflict or consensus (Star, 2010: 602; Star and Griesemer, 1989; Galison, 1999), and discourse coalition approaches emphasise the possibility of co-operation without values being shared (Hajer, 1995). However, Mouffe highlights the way in which concealment of conflict occurs through relations of power and exclusion that do not respect conditions of value pluralism. CXC translation through call-down briefing boundary objects constitutes a hegemonic practice that constructs equivalence at the expense of difference. Rather than these differences in priorities being subject to debate, these inconsistencies are being equated in claims to meaning. For example, addressing climate change becomes about economic growth, and

quantifying and pricing carbon. In contrast to being open about such partiality and contingency, hegemonic practices through which dominant power and social order are constructed (Howarth, 2006) establish their claim to power precisely through obscuring their partiality and exclusion of difference, through claims to totality and neutrality (Mouffe, 2005a: 53). It is the partiality of hegemonic claims (underpinned by recognition of legitimacy only among some groups) that generates competing and non-cohesive policy ambitions. One policy official described competing governmental priorities are often left unresolved and the Scottish Government remains unclear in their priorities (Interview SG2) which supports Mouffe's claim that hegemony is unable to be finalised and conflict is eradicable from politics (2000: 15).

In concealing such tensions and differences and internalizing boundary negotiations (Guston, 2001: 402), this chapter argues that boundary work can reduce the space for re-articulation and challenge held open through difference being kept apparent. Instead, elisions form precarious bonds that allow particular meanings to be advanced over others. It is important to consider the relationship between CXC's translation and reproduction of hegemonic power, and the extent to which CXC is enabling the legitimation of policy action that fits within the hegemonic discursive value framings presented in Chapter 4. As one concerned scientist expressed at the 2013 AGM of CXC "in responsive mode, aren't we just letting policy dictate – the IPCC doesn't do that?" (RN: CXC-AGM 2013). While the frameworks of policy are theoretically open to challenge within CXC (as suggested in the Policy Awareness Workshops), pragmatically in the operations of CXC call-downs, these were not open to challenge, and challenge is not encouraged in the interest of constructing legitimacy both for knowledge and for CXC as an organization. The role of boundary work, and translation in particular in de-politicising climate change knowledge is therefore foregrounded by drawing on a Mouffian approach.

6.3.3 Legitimation through translation: One anchor or two?

Both this chapter and Chapter 5 suggest that translation is a particular form of boundary work that encourages prioritisation of the discursive meanings of the policy audience, this is supported by both argumentative and Mouffian theories of legitimacy that

emphasise the discursive and hegemonic reference points through which legitimacy is constructed. However, Star and Griesemer suggested that boundary objects need to account to both sides (Star and Griesemer, 1989). These two contributions to thinking about legitimacy could be in conflict.

Analysis of the translation processes of these three CXC call-downs suggests that the specific act of producing the briefing note, as a boundary object, did require legitimation within both science and policy, but the relative influence of each side is not necessarily equal. Whilst a degree of perceived legitimacy is needed on both sides for legitimation to hold, the tethering and anchoring in both science and policy worlds that Guston suggested (2001: 405), do not involve equal balances of power. Further the discursive value framings of science tended to be methodological or epistemic, and their accommodation was seen to be important only in realizing policy goals. In contrast the discursive value framings of policy were important at the macro-scale in both successful cases but absent in the third less successful example. Legitimation of knowledge in the three call-downs appeared to depend on aligning and reproducing dominant discursive value framings of policy without losing the discursive value framings of science altogether. This importance of discursive alignment with policy values in legitimating knowledge echoes Miller's observation that credibility has a stronger reference point within science and legitimacy has a stronger reference point within policy. He suggests "boundary organizations appear to need the approval of science for the credibility of their knowledge claims as well as the approval of political institutions for the legitimacy of their policy orientations" (2001a: 483).

6.4 Translation and legitimation in summary

This chapter has examined three examples of CXCs call-down process – a particular form of boundary work being termed translation – to consider what makes CXC translation successful and how legitimation of knowledge is achieved. Cash *et al.*'s credibility, salience and legitimacy framework (2002) is helpful in understanding knowledge's appeal to policy and their identification of the importance of respecting diverse values is welcomed. However, drawing on the production of three call-down briefings, legitimacy is not an automatic outcome of following due process, nor secured automatically when diverse values are respected. If so, the third call-down example would have been

considered a success. This understanding of legitimacy neglects the operations of hegemonic power.

Instead, Hajer's attention to discursive constitution of legitimacy and Mouffe's attention to the inability to separate discursive legitimation from questions of hegemonic power are useful in attending to questions of politics of CXC's translation. Drawing on Mouffe's approach, the chapter found that discursive alignment with neoliberal economic ways of thinking about carbon as a quantifiable and tradeable resource were important in the success of two call-down examples, contributing to the legitimation of market led responses to carbon mitigation. Non-alignment with a valuing of uncertainty and unpredictability that would have legitimated precautionary action contributed to a failure of CXC's translation in the third call-down case. Undoubtedly these were not the sole factors in success or failure and, in the third case, wider difficulties including diplomatic relations with the Met office and lengthy iterations over wording all contributed to perceived difficulties. The act of translation in CXC creates a moment of closure through which narratives of practical usefulness to policy both naturalise and rationalise particular forms of knowledge. In this process, the distinction between objectivity and power is collapsed, obscuring the contingency of claims and the possibilities for alternative forms of knowledge to become legitimated.

The examples of this chapter epitomize the boundary suspension that Star and Griesemer (1989), Guston (2001) and Cash *et al.* (2002) identify, in which meaning and legitimacy in the immediate call-down are constructed on both sides of the science-policy boundary (Star and Griesemer, 1989). However, the relative influence of each domain was not necessarily equal, with discursive value framings of policy predominating on the macro-scale. While only three examples make conclusions very provisional, the three cases illustrate a politics to legitimation that would benefit from further analysis beyond Cash *et al.*'s approach. It is precisely these questions of power in the emphasis on 'audience' that warrant further critical engagement with how legitimacy is being constructed beyond these three examples, to strengthen the provisional conclusions being drawn here.

It is difficult to specifically attribute the politics of this discursive alignment to CXC's practices of translation, for much of the work of discursive alignment took place outside the specific call-down process itself and instead in the longer histories of boundary

working outside CXC's operations. This suggests that any move to demand led science is wider than CXC's model of translation (as supported by wider science-policy literatures such as Sarewitz and Pielke, 2007). Nevertheless, while discursive alignment might be central to both hegemonic and counter hegemonic practices (as Chapter 5 suggests) and neither discursive alignment nor extensions of logics of equivalence through nodal points are unique to CXC's translation, rather the language of translation is providing a useful discursive tool to emphasise policy discourses as the reference point through which construction of legitimate knowledge should take place: positioning policy meanings as the meanings that count. Although, much work in the struggle for knowledge authority was already underway through wider boundary working, it is important to emphasise that such processes of legitimation are never complete. Instead, the CXC call-down provides part of a continuous process of knowledge legitimation that is on-going, and always only provisionally achieved. These three cases, present some evidence to suggest that CXC's translation as a process is contributing to the legitimation of knowledge through policy discursive value frames, fixing and continuously reproducing hegemonic framings for knowledge.

As well as legitimate knowledge, the call-down process constructs legitimacy for policy action, for CXC as an organisation, and for particular types of scientific subjectivity. Argumentative scholars have indicated that "discourses shape what can and cannot be thought, delimit the range of policy options and thereby serve as precursors to policy outcomes" (Hajer and Versteeg, 2005: 178). The MACC call-down in particular, legitimates policy responses that are low cost and non-structural, and both MACC and Peatlands call-downs involve quantifiable carbon that can be costed and traded. The RPP2 suggests quantifiable reductions of carbon by sector but does not yet specify the chosen policy measures to deliver these, so at the time of writing it is too early to say whether these types of action are predominating in response to the MACC and Peatlands call-down provisions.

Successful translation by CXC also legitimates particular voices and reinforces the privilege to speak. CXC as an organisation is constructing legitimacy in the eyes of the Scottish Government through cumulative positive experience for policy makers as it seeks to become their research provider of choice (Interview CXC-R1). Still in its early years of operation, and in a restrictive economic climate, ClimateXChange has a reputation to prove to retain funding from Scottish Government both for itself and for

Scottish research, so proving a service that is considered 'useful' is of utmost stake (Interview CXC-D1). Despite its overall success in demonstrating policy responsive knowledge, CXC faces an on-going struggle to demonstrate 'value for money' in the eyes of the Scottish Government, and the call-down service provides the substantive measurable output for CXC, which when compared with Scottish Government financial allocation makes the perceived cost investment per call-down expensive knowledge for work behind the scenes enabling the call-down to occur is often invisible (RN: CXC-AGM 2013; Interview SG2). The dependency of boundary organisations in constructing their own legitimacy in a precarious economic future, therefore contributes to reducing the challenge of hegemonic framings.

Finally, these processes of legitimation also construct understandings of what is legitimate science. Chapter 5 described the way in which CXC researchers were seen by the secretariat and any policy actors as arranging themselves into two communities – those who are prepared to work in a policy responsive way and those who are not (Interview CXC-S3). These moves to establish science in the service of policy are generating some vocalised resistance from scientists who are not keen to become consultants and want to retain their independence at (Interview CXC-S2; RN: CXC-PAW1). Although both scientific positions were at least officially suggested to be 'valid' (Interview CXC-S3), scientists who were willing to engage with policy and be responsive to policy needs were constructed in positive terms, as responsive and forward thinking (Interviews: CXC-S3, CXC-D2); those who were less willing, constructed as stubborn, backward and resistant – in need of a "massive cultural shift" (Interview CXC-D1) and pointing to how the "days of the ivory tower scientist are numbered" (Interview CXC-D2). Whilst this might not be surprising in an organisation established to make science more relevant to policy, it generates normative discursive categorisation over which models of science are considered forward or backward thinking. Representation of one community as "a very tiny minority of scientists who feel that society as a whole is not of interest to them; they're only really interested in the nuts and bolts of a particular soil structure or whatever it might be" (Interview CXC-S3) tend to marginalise those who may not feel comfortable with the relationship between science and policy being employed through CXC. The domains of science and of policy are not static and, as the discussion around MACCs showed, science and policy are done differently as a result of these boundary

experiences. These designations of legitimate science and the funding allocations that go with them shape scientific practice.

There is therefore a politics to the work of legitimation through translation that neither Cash *et al.*'s definition of due process and respect for diverse values nor Star and Greisemer's understandings of legitimacy on both sides of the science–policy boundary capture. This chapter contributes to unpacking how the processes termed translation within CXC are active in the construction of legitimacy alongside processes of purification. It also demonstrates how CXC's translation encourages particular forms of knowledge to circulate in science–policy boundary work, and particular types of climate policy actions to be defined. While the work of CXC's translation offers clear benefits – enabling both policy and science to benefit from mutual interaction, providing specific knowledge to assist policy-makers to deliver the climate policy commitments established through the Climate Change Act 2009 and supporting scientists to develop 'impact' for their work – it is also important to be attentive to what this model of science–policy restricts. Through the requirement for legitimacy with respect to the values of policy, emphasis on translation restricts the ability to challenge to discursive value framings of policy. While CXC actors *are* finding ways to reshape questions being asked, which offers scope for challenging policy (Interviews: CXC-S3, CXC-D1) and alternative forms of legitimation are opening up spaces and subjectivities that enable challenge, as discussed further in Chapter 7, it is important to indicate the limited scale and impact of these possible challenges. Any deficit of powerful challenges to policy framings further encourages their acceptance as natural and neutral rather than culturally and historically situated. However according to Mouffe, these processes are always incomplete, and differences in values while obscured are not removed. It is precisely in attention to these surpluses of meaning, conflicts, exclusions and partial fixations that Mouffe identifies the possibility for counter hegemonic struggle (2005a). As Torphing suggests, "there will always be something that escapes the seemingly infinite process of signification... The partial fixation of identity produces an irreducible surplus of meaning" (Torphing, 2005: 163). It is to these possibilities for counterhegemonic re-articulations that Chapter 7 turns.

Chapter 7.

Reclaiming Political Subjectivities: Resistances and Re-articulations

A key focus in Mouffe's work is the potential for re-articulation of counter-hegemonic narratives. This attention to alternatives is made possible through recognition of the contingency of boundary drawing. Both previous chapters have followed narratives of CXC's translation as a claim to dominate the way that science-policy interaction is undertaken and have focused on the restrictive side of constructing legitimacy. However, if legitimacy is contingent and hegemony always contested (Mouffe, 2005b: 18) then it is no surprise that scientists, and policy and boundary actors are also creatively opening up other ways of constructing subjectivity and legitimacy to enable political voice. This chapter focuses on these alternative forms of boundary working that enable political challenge over the framing of climate change or the relative urgency of action. Whilst recognising that these processes hold less discursive weight than narratives of CXC's translation, if there is any chance of taking the plurality of values seriously, then it is important to pay attention to these alternative narratives, exclusions, and openings. To give an account of the science-policy landscape in Scotland without attention to this resistance and diversity of struggles would be to misrepresent the totality of discursive power and over-exert the dominance of the process of translation. As Mouffe suggests every hegemonic order "is susceptible of [sic] being challenged by counter-hegemonic practices which attempt to disarticulate it in order to install another form of hegemony" (2009: 549).

This chapter explores five examples of passionate actors challenging the discursive value framing of climate change in Scotland through multiple instances of boundary working that enable them to construct alternative subjectivities and forms of legitimacy. This focuses on the people who perform boundary work: "the different players in boundary arenas – either scientists or policy workers, or those who combine or frequently oscillate

between these two roles" (Hoppe, 2010: 111). Practitioner narratives often emphasised the importance of key individuals in boundary work and this was also observed during participant observation, but rather than understand their agency as autonomous, Mouffe enables us to think of resistant and active subjectivities within a discursive understanding of power. Such actors identify with various subject, value, and political positions that are cleaved open within discourses and it is through these forms of identification that Mouffe allows dynamic agency in contesting and redefining relations within her discourse theory. Boundary configurations, values, subjectivity and legitimacy, as outcomes of practice, are constructed relationally and in different ways. Such struggles may or may not be politically deliberate and may also occur through political disassociation where the possibilities for re-articulation are not yet known. Through these practices of hybrid management (Miller, 2001a) passionate voices are finding many ways in which to shape new subjectivities and create alternative spaces through which political voices may be heard. In examining these accounts, the argument begun in Chapter 4 over the interaction of multiple boundaries is further developed. The chapter suggests that actors emphasise one boundary to compensate for attention to, challenge of, or breaching of, another. This creates fluid and fleeting boundaries that cumulatively establish science policy boundaries that are mobile and therefore highly resistant to challenge.

The chapter starts by evoking Bruno Latour's call for scientists to embody value explicit subjectivities publically, and Sayer's parallel call to bring values into public debate. While both approaches foreground attention to values, both also present overly optimistic notions of subjectivity in relation to power. This is the starting point from which it is argued that Mouffe's approach to subjectivity provides a more realistic way of thinking about subjectivity alongside a vibrant possibility to identify with, stand behind plural value positions. Mouffe's approach takes seriously the discursive constraints that restrict and preconfigure the ability of scientists to respond to Latour's demand, but at the same time offers a more dynamic possibility for agency and resistance than other discursive theorists. Building on the introduction to Mouffe in Chapter 2, this chapter discusses her conception of political subjectivity in more detail. Mouffe's understanding of vibrant political subjectivity, attentiveness to exclusion in value pluralism, and primacy of passions in political identification enables the empirical cases profiled, to be understood as the forging of political subjectivities through boundary working in ways that

simultaneously recognise the constraints of hegemonic discursive legitimacy and power. This demonstrates the helpfulness of Mouffe's approach in drawing attention to the re-articulations and possibilities for alternatives that are the very substance that make boundary practices contingent. However, in the final stages of the chapter, some difficulties with Mouffe's approach are identified particularly concerning the ability of re-articulations to escape hegemonic constraints and restriction of reason to rationality. The chapter is then summarised in preparation for the thesis conclusion.

7.1 Political subjects

At the Gifford Lectures 2013, Latour urged scientists to embrace situated and value-rich positions, *as scientists*.

"Climatologists, who are you representing and what are you fighting for? No reason to hide yourself behind the idea of a view from nowhere, held by people who belong to no-people... Stand on your own two feet, for God's sake, instead of believing that you have to try to make your science answerable to the impossible standard of epistemology requiring you to disembodify yourself towards a place of no place" (Latour, 2013b: online video, 41:07).

Driven from Latour's centring of the hybrid fact-value in science, this call pushes scientists to embrace and stand behind their value positions in the face of climate change and in doing so refocuses attention on questions of values and agency (2013c). This post-ANT Latour is no longer content with the absence of commitment that his former flat ontological tracing generated. One of the four problems Latour emphasises about ANT was "the question of the 'inside' of the subject" (Latour 1999, cited in Gad and Bruun Jensen, 2010: 62) and recent approaches within STS and post-ANT have begun to bring questions of the subject back into focus (see special issue by Schraube and Sorensen, 2013). Gad and Jensen drawing on Mol suggest that "analysis and description cannot be separated from political convictions and normative hopes" (Gad and Bruun Jensen, 2010: 67) and Wynne suggests "Woven into the disciplined scientific attempt to understand... are always ancillary but constitutive concerns and commitments" (Wynne, 2010: 291). The fact that Latour, who as Braidotti argues, is not known for his humanism (Braidotti, 2013: 5), is returning to questions of subjectivity and values (Latour, 2013a; Latour, 2013c), and his earlier interest in scientists as anthropological subjects, suggest a return

to conceptualising the human subject. Whilst still impressing on us the need to consider realities as always outcomes of processes that are more than human; the post ANT Latour is a very different person to the one who was criticised for propagating a notion of actors as vacant cores (Harman, 2009: 21). During questions after the first Gifford Lecture, Latour stated that climate scientists

“are the only ones really afraid... really anxious about every new set of data they have – are the ones who are supposed to be the most disinterested, the most emotionless, type of people, and that creates a completely, and the more I interview them, the more completely interesting and puzzling and tragic figure they are” (Latour, 2013a: online video, 1:11:30).

Yet, Latour’s call places great pressure on the scientist to stand against conventions of legitimation and power, as if indeed there was *no reason* to hide behind a view from nowhere. It is suggested that Latour’s call, although important for responding to climate change, pays insufficient attention to these relations between legitimation and power that affect how scientists construct and perform their subjectivity in climate science–policy debates.

A notable proponent for greater public debate around values is Andrew Sayer whose emphasis is on relational subjective attachments to the world through relations of concern (2011: 2). Sayer takes Latour’s (1993) lead in challenging the modernist dichotomy of fact and value arguing “values and objectivity need not be inversely related” (Sayer, 2011: 7) and like Jasanoff (see section 2.4.5), argues that values should be brought into what it means to reason (Sayer, 2011: 61). Sayer suggests that relegation of values to the private sphere protects them from criticism (Sayer, 2011: 28), keeping values as subjective and preventing them being “open to inter-subjective deliberation and evidence” (2011: 45). His critique could suggest a form of boundary work through which values are simply kept out of public discourse. However, empirical narratives in this chapter demonstrate both that some values are being restricted to the personal sphere, but also that others are naturalised within dominant discourses, and that personal professional boundaries are being employed in more creative ways to enable new subjectivities to be constructed. Although Sayer acknowledges that we all value and care about different things his conflation of values with ethics and morality foregoes, for Mouffe, the possibility of pluralism. Further, Sayer’s call for values to be subject to public reasoning, like Latour’s rallying call to scientists, fails to take into account the

relationship between legitimation and power that prevents subjects being able to openly take this up. Like Latour, Sayer acknowledges his account has little to say about power and the struggles through which particular values become legitimated over others. If the proverbial ball is to be passed back to the subject in these debates, then it must do so with attentiveness to the limited capabilities for agency of the post-structurally understood subject whose ability to act is constituted and produced through discursive positioning, and to the ways in which subject discourse interaction takes place. These include perceptions over acceptability, and the politics of which values come to be naturalised and which excluded.

Mouffe's approach is helpful in thinking about alternative forms of subjectivity in three ways. Firstly, Mouffe articulates a vibrant subjectivity that is nevertheless understood within the constraints of discursive power. Secondly she specifically attends to marginalised positions, alternatives and potential for re-articulation within specific relations of legitimation and power. Thirdly her concept of passions helps to explain collective political identification and motivation behind alternative boundary workings without relying on essentialist or individualised ideas of motivation. Each will be briefly discussed.

7.1.1 Vibrant discursive subjectivity

Mouffe builds on Foucauldian discourse approaches that decentred the subject (Litfin, 1994: 37) and foreground more distributed accounts of agency and power through discursive categories that steer actors in their thinking (Hajer and Versteeg, 2005: 182). However, Foucauldian discourse approaches offer little on what binds political forms of identification, little emotional attachment to some discourses over others that Berlant defines through an affective "a state of attachment" (2011: 6). Discourse captures little notion of 'commitment' (Smith, 1997; Baxstrom, 2008) or 'stickiness' that Ahmed describes as "what sticks or what sustains or preserves the connection between ideas, values, and emotions" (2010: 230). What these discursive approaches are less able to contribute is precisely what Sayer identifies as why things matter to people (2011). Several argumentative theorists became frustrated with the restrictive notions of agency in Foucauldian approaches. Hajer (1995) in particular turned to Billing, and has since drawn from Howarth (a Mouffian discourse analyst) to highlight that it is in the moments

in which “discursive regularities or routines are broken up” that political discursive struggles take place and

“develop ‘forcings’ that make that previously stable policy discourses lose legitimacy and need to be rethought and revised. The power then is not simply in the discourse, but in the performance of a conflict, in the particular way in which actors mobilise discourses and reconnect the previously unconnected” (Hajer and Versteeg, 2005: 182).

This distinctly Mouffian understanding parallels the re-articulation of previously disarticulated elements (Mouffe, 2013: 73). Mouffe’s approach builds on Foucauldian understanding of the discursive constitution of subjectivity, but in ways that enable a more vibrant understanding of agency within discursive subjectivity. Political subjectivity in Mouffe’s terms involves

“the social agent as constituted by an ensemble of ‘subject positions’ that can never be totally fixed in a closed system of differences, constructed by a diversity of discourses among which there is no necessary relation, but rather a constant movement of over-determination and displacement. The ‘identity’ of such a multiple and contradictory subject is therefore always contingent and precarious, temporarily fixed at the intersection of those subject positions and dependent on specific forms of identification” (Mouffe, 1993: 77).

For Mouffe, a subject’s identity is understood within the constraints of discourse but in ways that have endless possibilities for being transformed and rearticulated in different ways (Mouffe, 2013: 45). The quotation above demonstrates the fragmented nature of the subject together with emphasis on contingency, change and politics (Iverson, 2012: 58). It is the over-determination and contingency of meaning, which disrupts any structural relation or essentialist claim to identity (Lewis, 2005: 6) – “there is no essential identity, but only forms of identification” (Mouffe, 2013: 45). For Mouffe identities are relational and consisted through difference (Laclau and Mouffe, 1985: 112; Mouffe, 2013: 45) (see discussion of identity formation in Chapter 5). Taking an anti-individualist and anti-essentialist stance to political subjectivity Mouffe instead focuses on the formation of political collectives (Mouffe, 2013: 46). These are important markers in a post-structural approach to thinking about boundary actors and scientists as subjects. Like argumentative theorists who understanding subjects as “at least partially constituted by the discursive practices and contexts in which they are embedded” (Litfin, 1994: 37), Mouffe recognises that any expression of agency is always produced through

the spaces and subjectivities of discourse that are opened up and made available for identification through discursive interactions.

7.1.2 Attention to opening up alternative subjectivities to be occupied

Mouffe is interested in the potentiality for re-articulation and pays particular attention to the capability within discursive arrangements for alternative subjectivities to develop new forms of political identification and the conditions (of agonism or antagonism) that foster or restrict their development. For Mouffe challenge to hegemonic discourses requires new political subjectivities (Mouffe, 1993: 18) and this drives her to demonstrate the contingency of current hegemonic orders, to highlight exclusion and ways in which alternative spaces and subjectivities are being opened up to allow collective expression of difference in values. Connecting with her relationship between legitimacy and power, discussed in Chapter 6, this suggests that the legitimacy of such spaces and subjectivities are constituted through specific relations between legitimacy and power. However, such relations always generate exclusions from which the capability for relations and boundaries to be drawn otherwise, are always present.

7.1.3 Political identification through passions

Mouffe argues that it is collective 'passions' (as described in Chapter 2) that animate resistances through the formation of collective political subjectivities. Mouffe understands the various forms of commitment to particular discursive value framings and actions not as the pursuit of interests, reason or moral considerations, but as 'passions'. As Chapter 2 discussed, passions are collective forms of political identification, not individualistic (Mouffe, 2014: 149) and describe the emotional attachment to particular values over others. Mouffe argues that passions are central to politics as "the moving force in the field of politics" (Mouffe, 2002: 8). Throughout her work she emphasises "the importance of recuperating passions for political thinking" (Mihai, 2014: 31). As Hall, drawing on Mouffe, describes,

"in order to become politically involved, then, people must care about an issue, they must have some vision of how things ought to be done, and they must have hope that at least some progress can be made towards realizing this vision... this caring this vision, this hope are precisely the work of passion." (Hall, 2005: 125)

Passions help to understand the collective motivating attachments that drive these expressions of agency and exceed discourse's mere dispassionate presence. If we see the narratives of actors in this chapter as moved through identification with collective passions, around the need to act in a strong way in response to the science on climate change, their drive no longer comes from an essentialist set of values held individually and prior to discursive interaction but from political forms of identification. Mouffe's understanding of passions as collective, and relational effects of exclusion that deny subjects achieving their identities, offers an important explanation for the motivational force that values and passions play that moves away from personal and essential understandings.

7.1.4 Summarising Mouffe's political subject

Mouffe's approach to discursively constituted subjectivity, pluralism in value-identification and the inevitability of conflict over differences in values offers one way to reconcile a Foucauldian emphasis on discursive power with Sayer's call for attending to why things matter to people. The problem with Latour's call is that without attention to the politics of, and affectual engagement with, hegemonic discourses, an emphasis on individual responsibility is imposed on these scientists without attention to wider structural and discursive conditions of power. Mouffe's work offers a promising direction by reconceptualising a post-structural subjectivity that rejects appeal to a liberal subject formed before participating in democratic politics (Biesta, 2011: 149) and instead draws attention to the specific relations between legitimacy and power through which particular subjectivities are able to be developed. Despite the emphasis on networks, individuals still hold privileged statuses within STS as passage points of legitimate knowledge, as experts whose opinion, as well as evidence, counts; who create meanings, who translate, lubricate and open up as well as close down, particular channels of communication. It is important to better understand and be able to conceptualise the role of such actors who form important passage points but are at present theoretically discursively eroded, but recalcitrant in empirical narratives.

Mouffe's approach provides a starting point from which to approach Latour's call to reanimate the subjectivity of the scientist that requires neither an essentialist view of the subject, nor remains blind to their discursive constitution. Yet, like Harman's notion of an object that is not entirely explained through its relational interaction (2009), so the

subject is not entirely explained through its discursive constitution. This creation of subjectivity, relationally, in the context of practice, shapes our idea of who we are and what our values are (Mouffe, 2012). Far from abandoning the human subject, Mouffe's approach contributes "towards elaborating alternative ways of conceptualising the human subject" in more fluid and emergent ways (2013: 37). This responds to demands within STS to bring out other forms of human subjectivity beyond rational and self-interested actors (Wynne, 2010; Wynne, 2008) and calls for engagement of "the human subject as an active, imaginative agent, as well as a source of knowledge, insight, and memory" (Jasanoff, 2003b: 243). The following two sections profile accounts of actors from across the science–policy spectrum holding passionate positions on climate change and constructing forms of subjectivity and processes of legitimation in new ways. These subjects are seeking to reclaim political subjectivity through deploying discourses of fear, and of personalisation, by reframing questions, and using the voice of others to find alternative ways of stimulating and provoking action outside the formal narratives of CXC's translation and the value neutral claim of boundary work. Bringing a Mouffian understanding to how they do so, not as pre-established autonomous agents, but as situated within complex discursive relations of legitimacy and power, helps to further understand the political subject in boundary work.

7.2 Political scientists? The construction of legitimate subjectivities

During empirical fieldwork, two conflicting narratives of scientist subjectivity were encountered. On the one hand, the policy shift from evidence to expert opinion calls for scientists to speak not as the voice of 'science' but as the voice of a 'scientist' – not as an impartial voice of evidence, but as experts with opinions and a responsibility to advise:

"Being an expert, being you know, a top academic in something, gives you a bit of responsibility to draw those conclusions" (Interview CXC-S1, original emphasis).

This foregrounded subjectivity and value judgements in ways that some scientists, more accustomed to the discursive value framings of logical positivism, felt uncomfortable (as discussed in Chapter 5).

However, on the other hand, a number of scientists are seeking greater political voice over the need to respond to climate change. These instances encountered either in one-to-one interviews, during observed exchanges with other scientists or through public speech acts, form the focus of this chapter. This section discusses the way in which scientists construct legitimate subject positions and discursive value framings through boundary work, in ways that enable these positions to be expressed. In some cases, scientists demonstrated frustration at feeling excluded from political debate:

“Something that is frustrating me is that I don't think that we are contributing much to the public debate... In the UK there is a culture of not speaking up... a system of subtle coercion... I'm impressed by... Jim Hanson... who... because probably he's retiring ((laughs)) says look this is the situation and I think *I have a responsibility to say these things, you know, whether you like it or not – as a researcher* – I think the scientific community would do well to follow the example of someone who has a scientific reputation that is unassailable, so we're not talking about the head of Greenpeace, we're talking about someone who has an unassailable scientific reputation... who has simply seen what is coming and is trying to do something to, to raise awareness... *I don't think the scientific community is doing enough*” (Interview CXC-R10, emphasis added).

In this example attention is being drawn to the differences in the way that legitimate political subjectivity is constructed culturally, throughout a career and according to organisational affiliation. James Hanson, a US climatologist and activist is an example of someone who constructed his subjectivity *as a scientist* in ways that enabled inclusion of the right to hold a political voice in relation to his research. For the scientist with whom I spoke, Hanson's example contrasts with his own perceived possibility for political subjectivity. This absence of political voice is leading to personal anxiety:

“What is on the agenda now is very short sighted... we're not looking at what's coming in the future years partly because politically its very... very controversial... those are extremely serious consequences... the ball's in back in our court, what are we doing to avoid that now? We do nothing... if we keep that off the political agenda that would be great... what's going to happen to Scotland? Well to Scotland probably not too much but to Europe, a plus four degree is something that is something that should be as important as (.3) I can't find a more important political issue... we're not taking the responsibility we need to take essentially and that worries me” (Interview CXC-R10).

He described the simultaneous hope generated through Scotland's target setting in terms of international leadership – “all you can do is hope that by doing the right thing others will follow” (Interview CXC-R10) – and a loss of hope in the ability to respond to climate change, suggesting:

“In the end the interests are so entrenched I think that there's no hope... the world is too complex it's a big, big, machine... with all our might we can't steer the system because you know there are various reasons but, its too big an oil tanker to steer” (Interview CXC-R10).

His call to contribute to the public debate resonates with Latour's call for scientists to stand behind what they value. It also suggests that frustration over lack of political subjectivity is creating mounting pressure and a crisis in subjectivity for some scientists who are experiencing a disjuncture between what their science is suggesting and the form of political voice they are able to construct. However, other scientists are finding ways to resolve this through alternative modes of boundary working that enable a political voice. Two examples are presented of scientists who, operating in boundary roles, construct forms of scientific expression that enable a more active vocal contribution to public debates. In these examples multiple sites of boundary work can be observed to interact, building on the initial reflections presented in Chapter 4.

7.2.1 Political subjectivity through discourses of fear

One senior scientist in a Scottish Government Agency discussed, during interview, the way in which he had previously utilised fear as a communication strategy when presenting on climate change. His account is worth reproducing in detail because it illustrates a number of points:

“I used to do a lot of public speaking and *I used to do it very purposefully on the basis of wanting to scare the hell out of the audience* this was back in... 2000 onwards for a few years, I did a lot ... I just felt that that was probably useful because there's... complacency people don't want to be told things they don't want to hear and if they don't want to hear it and just exclude it from their thinking, then... they're not even going to be passive or acquiescent and have support for what need to be some fairly radical changes in the future, so it was instinctive to me... *but I got quite heavily criticised that that was, internally the wrong thing to do* and I know there's lots of research stuff that's showing that you get better behaviour change by showing the positives what people can get out of it... for some reason I just never bought that argument... something about *it*

just didn't seem right to me... so I just went on trying to scare the hell out of people, and I'm not saying that's right and I, to this day I know not whether it's right or wrong... it's just knowing which, which strategy or tactic to apply at which particular time" (Interview SGA4; emphasis added).

This account goes beyond 'just presenting information' that many narratives of science suggest is science's role (Interviews: CXC-R1, CXC-D2). The account is neither impartial nor neutral but is being communicated with intent to change people's thinking, stimulate action and encourage acceptance/acquiescence for unpopular policy decisions (Interview SGA4). This particular actor openly expressed strong personal commitment to addressing climate change describing it as "undoubtedly the greatest threat to the planet bar none" (Interview SGA4). In referencing "it's just knowing which, which strategy or tactic to apply at which particular time" (Interview SGA4, above) he suggests a political passion that is, at least partially driving this type of communication.

Many climate scientists describe feeling fear in response to their science, a fear which generates a desire to communicate this to others. As another scientist described at a CXC workshop, "not much shakes me, but the recent news on sea ice makes me shudder; I need to communicate how I feel" (RN: CXC-UW). Communicating fear mobilises emotional connections as legitimate science-communication. Legitimacy is always precariously achieved, and this carries some risk of failure – of delegitimising the individual, the organisation or science itself (although the risk to science is minimised through the designation of communication as "science communication" not science itself; see Chapter 5). Conscious of this risk, he suggests that organisationally

"we need to be quite careful about our vires and what powers and duties and responsibilities and functions we have laid on us by, by Government through statute and, there's some critical phrasing in our management statement... which interprets for us what is meant by the legislation and the way we should run ourselves as a business, and one element in there that says we should base all our decisions on sound science it doesn't say base any of your decisions on ethics or morality! Its sound science... we look at the evidence, we assess risks and we take action or intervene, within our legal powers, on the basis of that evidence and risk" (Interview SGA4, emphasis added).

The notion of 'vires' or 'ultra-vires' meaning 'within' or 'out-with' designated powers, is common terminology within public sector discourse, describing the legitimate scope or remit for organisational action and stepping beyond this remit. Miller has highlighted that acting within appropriate jurisdiction is important in the construction of legitimacy

for science and for policy (Miller, 2001a: 493). This constructs procedural legitimacy, which is at times convenient for an organisation in closing down political debate:

“We're a very technocratic organisation... statute requires us to do that, and on many occasions that is really helpful, because we have the evidence here's the argument, that's our decision, Attack us wherever you like along that pathway... as soon as you start introducing ethics and morals, that's quite difficult” (Interview SGA4).

In this way particular policy actions become legitimated through adherence to process, not political debate. Reference to internal criticism suggests that some colleagues felt that his approach interpreted organisational remit with too much flexibility, and perceived risks to legitimacy were being felt.

To manage this risk, during the interview when attention was drawn to it through questioning, the scientist leaned heavily on a personal/professional distinction. Despite clearly mixing his personal and professional identities – describing a personal-professional boundary that was regularly transgressed when he spent “a lot of my free time, personal time as well as some business time... going around just giving presentations... on climate change” (Interview SGA4) – he firmly emphasised personal and professional distinctions when attention was drawn to boundary blurring around the neutrality of science. In order to distance himself from the organisation he suggests:

“That's my personal position. The Agency itself is obviously controlled by statute and we, we mustn't do anything that is ultra vires” (Interview SGA4).

A strong boundary between personal and professional capabilities served to bolster the legitimacy of the scientific organisation, reconstructing the value neutrality of the organisation and reallocating value rich commitments of communicating through fear firmly to the personal domain. A number of authors have indicated that boundaries around categories may harden either through repeated institutional practice (Halffman, 2003) or through data infrastructures (Beaulieu, 2001: 368). Here boundaries, like borders, may be seen to become hardened during moments of attention, contestation or potential controversy. This hardening occurs through the construction of parallel, but associated, boundaries that are evoked to bolster any perceived risk to legitimacy that might be incurred when attention is directed to boundary blurring – such as through the deployment of fear.

With values during the interview bounded to the personal domain his description of work at the organisational level continued. Whilst official statutory powers and duties to address climate change are described as “rather limited” (Interview SGA4) flexible interpretation of the role of this scientific organisation means that “we do have certain areas where we operate” (Interview SGA4) and “as the Government’s advisor on the environment we can sometimes be helpful, if you like behind the scenes” (Interview SGA4). The organisation’s climate change plan was described as a space where “our intentions to be persuasive” are laid out (Interview SGA4). In a conversation about a new data resource network managed by the organisation the connection between science and persuasive argumentation was continued when it was suggested “we're not particularly good at presenting persuasive, highly publically accessible arguments around climate change. We are very actively trying to change that now with the new [web platform]” (Interview SGA4). This demonstrates the inability to extract knowledge from questions of value, or the passion to influence from professional practice, despite temporary hardening of this boundary during our interview.

When the focus of our interview then touched on the distinction between personal and private boundaries, the construction of legitimacy switched back to boundary work around organisational neutrality and specifically to the role of science as an information provider. It is simply the provision of information that was seen to engage people, through choice, not by “bullying” (Interview SGA4). It was suggested political attention can be drawn to value implications by simply laying out moral or ethical arguments without expressing any preferred option:

“We can in a kind of dispassionate, independent party way, sometimes raise the ethical and moral arguments and indicate to people that there is probably an ethical or moral argument to be addressed... it's very hard for us to kind of take moral positions, we're on a dreadfully slippery slope when it comes to taking cases to court... if we're adopting moral positions I, I think we can't. But, in the sense that we're technocrats and scientists, we can expose moral arguments, and just lay them out for people to make their own judgements on” (Interview SGA4).

Moral positions cannot be held explicitly but can be inferred for others to identify with politically. This distances both science and policy from explicit value stances constructing their neutral status. Laying out options for others to decide between also reproduces the valuing of individual liberty of choice – a characteristic Rose (1999) has described as

central to governance under advanced liberalism, even though this freedom is highly regulated.

While a government agency (a public sector organisation that by definition was set up to serve various notions of public good), the organisation appears unable to construct its legitimacy in value terms but able to have at the heart of its management structure the clause that it should 'act like a business' (Interview SGA4). Throughout the interview acting like a business seemed to refer to operational processes – managing workloads through targets, focussing on business efficiency and basing decision making on 'sound evidence' (Interview SGA4). Here, the neutralisation and naturalisation of acting like a business is contrasted with the denial of the legitimacy for acting on the public values in the quotation above – public values that Weber referred to as a 'bureaucratic ethos' (Weber, 1978) and Du Gay describes as a 'regime of values' (Du Gay, 2000). Whilst public values are deemed non-legitimate in this public-sector organisation, neoliberal values of operating like a business – efficiency, target based management and decision-making based on evidence appear naturalised and neutralised as principles for operation.

In summary, while the principles of value neutral scientists are relaxed to allow discourses of fear to be mobilised, the boundaries between personal and professional are then strengthened to 'shore up' this boundary transgression. When focus moves to the personal and professional boundary then the demarcation around science is made in terms of neutrality and laying out choices for others to evaluate. This alternating terrain of boundary work produces a cumulative (yet not discrete) distinction between science and policy, between personal and professional and between values and neutrality that do not map directly onto each other but serve to construct legitimacy in different ways when attention to the blurring of one or more boundaries becomes the subject of attention. Swyngedouw argues that discourses of fear and apocalyptic images are integral to a neoliberal capitalist logic by displacing the possibility of social redemption and political differentiation. Management of fear becomes "an integral and vital part of the new cultural politics of capitalism (Boltanski and Chiapello, 2007)" (Swyngedouw, 2010: 219). Whilst this scientist was consciously evoking fear as a political strategy to challenge the urgency of a climate response, according to Swyngedouw, these strategies of fear "foreclose a proper political framing" (2010: 219) because "ideological or dissensual contestation and struggles are replaced by techno-managerial planning, expert management and administration" (2010: 223). The form of political subjectivity

this scientist creates is not counterhegemonic but enables a political voice that appeals to individual liberty through evoking fear in ways that further reproduce technological and managerial approaches.

7.2.2 Opening up spaces of challenge through personalisation

The Met Office Chief Government Advisor for Scotland and Northern Ireland uses forms of science communication that seek to engage people on a personal level. Analysis is based on an online video of a presentation given to the University of Highlands and Islands Climate Change Conference 2010 (UHI Inverness, 2010) which was noted to be indicative of a wider strategy he employs (Interview Met Office) and became the focus of interview discussion in 2012. In this public address he begins with a personal apology to the young people in the audience:

“The first thing I normally do, is apologise, and I apologise for two reasons: the principal one being that my dad’s to blame, and the second is that I’m to blame or at least my generation my dad’s generation are the ones to blame. We’re the ones who have created this society.... the things we expect... we’ve relied upon... plenty of oil, plenty of work done elsewhere, and reliance on cheap energy” (UHI Inverness, 2010).

Throughout the presentation, he sought to personalise climate change – from emphasising friends in Norwich in relation to rising sea levels, to problematizing the addictions and habits of the baby-boomer adults in the audience. Starting with everyday objects such as a disposable razor, tracing its carbon footprint through circulation networks and assemblages and comparing it to the cut throat razor that his grandfather used for his whole lifetime, he emphasises our changed relation with goods and services and the exportation of supply chain carbon from our footprint accounting. This strategy for communicating climate change was not unusual. Personalisation is commonly promoted in presentation training courses as a way to make communication more engaging. It was suggested by the CXC secretariat that making communication personal involves us in what we do, whereas scientific language pushes responsibility away (RN: CXC-PAW2). One policy official increasingly described talking about climate change in terms of her grand nephew “I think talking about future generations is... a cop-out because it distances you from it, whereas actually mentioning somebody by name, yeah, then you realise that you have to act” (Interview SG6).

In discussing his decision to take a personalising approach during interview, he suggested the approach responds to a need to make complex multi-scalar information meaningful to everyday decision makings whose usual frame of reference, is short term and immediate (especially during periods of recession) (Interview Met Office). Science he argued, “doesn't get through to people”, further describing:

“Communication was *always* the problem area; how do you make it real to people? And *that's* what I try to do as much as possible... by giving them examples that are comprehensible within their own lives... how do you relate that to the human being? That to me is the crucial link” (Interview Met Office, original emphasis).

This passion to generate action on climate change developed in relation to the predictions from models and datasets he was working with (Interview Met Office) demonstrating values held as emergent and constructed through these engagements, not predating them. While he describes the “scariness” of the 2002 climate modelling output (Interview Met Office), he chose personalisation over fear as his preferred mode of communication. Fear nevertheless retains an important role as he creates a striking mental image of the four horseman of the apocalypse (a reference to the Christian Book of Revelation interpreted to represent pestilence, war famine and death). This image is present just long enough to introduce a sense of fear before verbally dismissing appeals to fear in favour of more ‘solution orientated’ approaches and presenting science over such religious imagery. In this way fear haunts the conversation, more powerful perhaps by sensed absence. Tracing consumer assemblages, confessing personal culpable responsibility and deploying passionate appeals to encourage people to act go far beyond the provision of information that he simultaneously indicated to be the role of science (Interview Met Office). During interview, he framed climate change as

“about the way that we interact with the rest of the planet... increasingly and certainly in the Climate Change Act for Scotland, there has to be a move towards consumption based carbon accounting... and hence trying to bring it into peoples' cognisance so they see that actually everything they do has a different impact” (Interview Met Office).

In these acts of science communication the boundary between science and science communication plays a strong function in enabling this passionate address without threatening the supposed value neutrality of science. During our interview, the boundaries around science were again reinforced like in the interview extracts presented in section 7.2.1, by emphasising a separation between the personal and the professional,

despite this distinction obviously being blurred during professional presentations. He suggested:

“There's a moral imperative for me in some ways, and this is *purely personal* in that the people who suffer most in Scotland in fact, the people that suffer most across the world... are those that have the least already... it's the weak and the poor that suffer most... for me anyway, purely personal... it's about getting people to think along those lines.” (Interview Met Office, original emphasis).

He described the biggest challenge in his role as

“keeping a balance... a perspective of what I believe is going on as a person, as an individual, right, and my reading around climate change - I still need to keep that balance... It's about keeping that ability for people to think for themselves, I'm only providing information in that sense and trying to put it in a context for people to understand” (Interview Met Office).

Here boundary construction between the personal domain and the professional domain is important in reconstructing legitimacy for communications that may otherwise be seen to transgress the boundaries of legitimate scientific work.

Personalisation is one way in which this scientist found to carve out an address to his audience that went beyond the distancing language of science in an attempt to inspire and generate behaviour change. The political emphasis on responsibility not possible through the language of science is legitimated through addressing the audience on a personal level. With value judgements as legitimate questions within the personal domain, personalisation becomes a way in which questions of value become legitimately addressed and enable him to conclude his presentation with an imploring personal address for action based on his recurrent trope, a LP Hartley quote: “The Future is a foreign country; they do things differently there. My suggestion to you as a whole is that that's what you have to do, you have to learn to do things differently, to change the world around you. Make as much noise as you can” (UHI Inverness, 2010).

However, as with fear, personalisation emphasises individual behaviour change. Personalisation of responsibility generates a particular form of action that has been heavily criticised within academic literature firstly for avoiding structural change, and secondly, taking a Foucauldian approach, for ignoring the way in which subjectivities are produced through discourse (Paterson and Stripple, 2010). Many boundary practitioners in Scotland too were highly critical of such individualised approaches (Interviews: SG2,

CXC-S1) observing that individual messaging affects the wrong group of people – making people who care feel bad, whilst people who don't remain unaffected (Interview CXC-S1), asking people to operate against a tide of opposing incentives, and distracting attention from questions of broader structural (Interview CXC-S1) or system change (Interview SG2) and being unjust:

“We can make every car... every fridge, as fuel efficient as possible, why is it up to *me* as an individual consumer because it's just too hard, it's too much!... I'm not saying we don't have personal responsibility of course we have personal responsibility but one of the things that I think is really important for... someone like SNIFFER or... ClimateXChange is to say to the government look... there are some institutional framework changes here, that that would make *much* bigger impact” (Interview CXC-S1, original emphasis).

Multiple references to the importance of freedom (c.f. Rose, 1999) were encountered in Scottish policy narratives, for example increasing emphasis on governing through behaviour change (Interviews: SG1, SG3, SG4, Met Office) and rewarding the development of particular subjectivities (Interview CXC-S1). As one policy official suggested,

“it's only going to work if you change the behaviour of the people of Scotland... Government cannot tell people what they should do... they can give incentives, they can do fines etc. but they cannot say this is what you should be doing with that particular piece of land... that's still the prerogative of the owner” (Interview SG6).

This construction of policy boundaries to limit the extent to which Governments can infringe on individual property ownership liberties is echoed in the Met Office Advisor's emphasis on personal choice:

“I'm not a moral philosopher I'm not in a position of being able to make value judgements, directly, I can do it personally for myself that's fair enough, doing it on behalf of other people I don't think is my task... they have to think about it for themselves” (Interview Met Office).

With this form of science communication allowing the public to ‘think for themselves’ and ‘make their own value judgements’ was an important way in which legitimacy was constructed for a scientific voice that was advocating particular forms of action. Opening up onus and responsibility for action through personalisation, like fear, frames particular forms of action that once again resonate within current politico-economic approaches valuing sanctity of individual freedom of choice.

During interview discussions with the scientist in question, his personalisation approach appeared not to be a political aware or clearly defined position over responsibility for action. Despite all his emphasis on personalisation he suggested, “I’m not sure that we really understand. I certainly don’t understand... entirely how we as individuals have an impact on the globe as a whole” (Interview Met Office), and at one point he explicitly expressed unease with the ‘think global act local’ focus of the WWF on account uncertainty about the role of individuals. Yet this was juxtaposed a few moments later with repeated emphasis on his purpose “to bring it down to an individual scale to let them see where they sit in the great big scheme of things” (Interview Met Office). He also encouraged attention to SDC’s Sustainability Without Growth Report, expressing a strong emphasis on questions of equity and anti-market led approaches, which might be considered rather at odds politically with an individualistic approach:

“my one hope... was that... the 2007-2008 banking crash would have been a chance to begin to change a global system, but... all the major politicians around the world said go for growth... It was a chance perhaps to begin to tone that down a bit but I don’t think we took it” (Interview Met Office).

This suggests that such commitments are not coherent and cohesive and illustrates the way in which people’s value systems are often cognitively dissonant (Festinger, 1962). However rather than causing discomfort as Festinger suggests, such dissonance is instead a mundane character of the balancing of plural values and subject positions that can never reach closure (Mouffe, 1993: 77).

7.2.3 Summary of scientific passions

These two narratives demonstrate scientists constructing alternative and multiple subjectivities through boundary work that legitimise different forms of political voice. They both attempt to redress the difficulty that Swyngedouw identified that “climate change... does not call a political subject into being” (Swyngedouw, 2010: 224). Such passionate accounts of scientists are not unusual, as Majone highlighted: “many outstanding scientists have not been loath to use persuasion when the situation seemed to require it” (1989: 37) and Latour and Woolgar described scientists as a tribe (1986: 17) “not very different from any other tribe... they have beliefs. They have practices. They work, they gossip, and they worry about the future” (Law, 2004: 19). In constructing legitimate political subjectivities, flexible multiple boundary working particularly between the personal and professional domain (Interviews: CXC-R4, CXC-D2, CXC-R11)

and between science and science communication (Interview Met Office) enabled the boundary around science to be reconstituted along different lines. Construction of legitimacy and subjectivity relies on the cumulative interaction of many boundaries that are not always consistent or coherent but through alternating sharpening and blurring, serve to strengthen and defend the science policy boundary from attack by diffusing the site of boundary dispute. However, the types of discourse enabled are often still aligned with dominant discursive value framings that emphasise individual freedom and responsibility. Mouffe understands subjectivities as always constituted through specific discursive relations between legitimacy and power, as discussed in Chapter 6. Given her emphasis on the role of hegemonic discourse in setting the terms through which legitimacy is claimed, these scientific articulations may have been able to achieve legitimate political expression precisely because they reproduce an emphasis on individual responsibility for action and do not challenge hegemonic power.

7.3 Collective political voice: Resistances within boundary work

In contrast to scientists who appeared able to legitimate strong value positions in a personal capacity (as long as distinctions between their personal and professional roles are performed) for many boundary actors a division between personal and professional conduct appeared more difficult to uphold. During the self-identification exercise (described in Chapter 3) one boundary actor challenged division of personal and professional capacities suggesting that for many working in the climate change field: “This is personal for a lot of people” (Interview CXC-S1). For boundary actors passionate voices of scientists are important for communicating a powerful message and for challenging policy. One boundary actor described with puzzlement the way that scientists often exclude passions from their professional written reports, but would speak about it during personal conversations:

“You know *me*... I go to people and I ask them so what did you do, when did you do it, why did you do it, who did you do it with, what happened? ((laughs))... that’s how I get my information... because, I find that most people write texts that aren’t very inspiring... there’s a lot of *personal motivation* in this and that often gets lost you know *people try and hide it!*... and for me to be able to communicate the *importance* of things or

the *relevance of things* having some of that, you know, that *fire in their belly* coming through and that very often doesn't come through, if I ask them to send me a page of notes" (Interview CXC-S1, original emphasis).

Here passion and fire find voice in personal verbal communication in a way that appears not legitimate for scientists to include within formal written reports (Van Dijk, 1989: 42).

The third party nature of these passionate voices is important in distancing value positions from the boundary actor who retains his/her own claim to neutrality and impartiality. This generates different processes through which spaces of challenge might be constructed from those of scientist orators. Instead of personal enunciations, boundary actors often used their multiple positions to enable these third party voices to be heard, or worked subtly behind the scenes to reframing the types of questions being asked. This mobilises and circulates marginalised passions without risking the perceived neutrality of the boundary actors themselves. These two approaches will be discussed by drawing from three examples taken from both CXC and Sniffer.

7.3.1 Utilising the voice of others – C2020 and difficult issues

A recurrent feature of boundary work highlighted in Chapter 5 was the multiple affiliations of boundary actors. Among other benefits, this enables key individuals to speak with different 'hats' on behalf of third party communities who remain absent. Employing the voice of these third parties enables boundary actors to represent particular discourses and values in debates, whilst retaining their own neutrality by positioning such values as those of others distanced (temporarily) from the speaker. This extends the reach of particular discursive framings into spaces not otherwise able to be accessed by these communities directly thereby enabling their discursive circulation. One example of this can be seen in the cross-interaction between CXC and the C2020 private sector business group upon which the CXC Policy Director sits.

The wearing of multiple hats by the CXC Policy Director is mutually beneficial for both groups. It allows CXC and ECCI to have a seat at the C2020 table, providing organisational interest driven benefits as well as the possibility for influencing the meaning of discursive nodes - injecting wider sustainability discourses into conversations of C2020 that tend to be narrowly carbon focused (RN: C2020-M). It also allows the C2020 to have a useful catalyst for activity. The CXC Policy Officer described his involvement in the group:

“I got invited on last year, partly because it was seen to be a talking shop and there were two or three of us... invited on specifically so that we kept on kicking people... we’re being treated... as a useful delivery function... they’ll say to me, can you just go off and do it... I’ve got various bits of funding that I can sort of draw on to do stuff like that... it means you’re starting to produce activity which people then spin off and do other things around” (Interview CXC-D1).

One such task and finish activity involved the production of a series of papers on ‘difficult issues’ produced under the remit of the C2020 group but written by the CXC policy director. Here, utilisation of voices from elsewhere is operating on a number of levels. Firstly, the C2020 is a useful third party voice for the Scottish Government. The CXC Policy Director explained how the Chair of the C2020 Group “was very aware that the Scottish Government... is in a very weak place” (Interview CXC-D1) to enforce social behaviour change partly because political buy-in to such programmes is weak and the Government are “very sensitive to the fact that if you have the government of the day continually hammering on ‘you’ve got to stop doing this, you’ve got to do this... that you immediately set up a resentment and a fight back” (Interview CXC-D1). In the interests of securing greater public buy-in the Policy Director describes:

“The aim was to say on some of these difficult issues, we don’t want it to be the Government Minister who is saying why aren’t we doing x, y or z, you actually want some of the leading businesses to be saying why don’t we do x, y or z, because that actually gives a huge amount of political space for the politicians to be saying ooh actually look... leading businesses are talking about this can we have a conversation about it so it’s not seen to be the Government telling people what to do” (Interview CXC-D1).

Using the voice of C2020 provides the Government with a way to explore such questions through utilising the voice of the C2020 business community. Secondly however, using the ECCI/CXC lead with external affiliation outside the C2020 group provides a third party voice for C2020. While members of the C2020 identified the ‘difficult issues’, not all discussions would necessarily be considered acceptable by C2020 members for publication in their name (C2020-M). Asking the CXC Policy Director to draft the reports on behalf of the C2020 group that can then be signed-off, or not, distances C2020 members from any report recommendations. This legitimates the C2020 group in the eyes of its members, whilst allowing these difficult issues to be pursued on behalf of the Scottish Government. As was suggested at the meeting attended,

“this is not the C2020 endorsing any position but endorsing the need for debate so on that basis we’re happy to support public debate” (RN: C2020-M).

Thirdly, the production of such reports would not necessarily be seen as within the legitimate remit of CXC (concerned with utilisation of science directly in Government), or of ECCI (concerned with generation of low carbon business opportunities). Conducting such a report on behalf of the C2020 group legitimates the Policy Director’s involvement outside his two primary organisational roles.

Exactly where the push for this type of political discussion around difficult issues originated – the Scottish Government, the chair of the C2020, or the Policy Director – remained unclear, but the effect is to create “a dialogue within society, which allows some of these really tricky issues... (and) trade-offs... to come to the fore” (Interview CXC-D1). It appears that while debates around more political aspects of socioeconomic change are desired by a number of different actors, there are difficulties over legitimating this debate using ones’ own voice. This collective use of the voices of others elsewhere opens space for political debate in ways that the Scottish Government, C2020, the ECCI or CXC would have been unable to do on their own. Utilising third party voices is understood not as building consensus in this case but as ensuring the distancing and always elsewhere nature of passionate voices, that can be mobilised whilst the claim to neutrality of the speaker is maintained. This enables boundary and policy actors to stage particular political debates, lubricating the flows of particular knowledges and enabling difficult issues or challenges to established values to be raised without the responsibility of owning them. Creating a dispersed third party voice from which one can personally distance oneself is one way to stake claim to a fantasy of neutrality or what Haraway has referred to as the God trick (1997: 285). This undermines any notion of a contained, intentional actor and instead suggests that such political challenge can only be produced collectively and in the presence of an absent other.

7.3.2 Trust and reframing the question

A second way in which boundary actors opened up political challenge to the particular framings of climate change within policy was through slowly establishing sufficient trust to start reframing the questions being asked, which Goerminne describes as “the irreducible political moment that is situated at the point of determining what ‘the issue

at stake' is" (2012: 161). The RESAS Manager within Scottish Government described the importance of "stepping back and asking you know asking about the rationale behind things" (Interview SG2) when providing analytical services to policy teams whose information requests generally focus on "asking about numbers... how can we best justify the policy... what are the costs and benefits" (Interview SG2). This process of questioning the assumptions that frame questions was emphasised within CXC primarily around reshaping questions to enable scientists to be able to better respond. However, these reshapings also offer the potential for subtle challenge and influence of the types of questions being asked. As the knowledge manager described informally after a workshop to a colleague who expressed concern that CXC were overly reliant on the Scottish Government "but we won't [name removed], we tell them what their need is and then they come to us to do it" (RN: CXC Away-Day).

Importantly for CXC, this ability depends on an established relation of trust, beyond immediate call-down responses, to enable a relationship that includes challenge. As the CXC Policy Director described:

*"To me is all about person to person trust... if you trust the person opposite when they say something you'll listen, if you don't trust them or you don't know them particularly well it's just another bit of paper and you've got lots of bits of paper... so an awful lot of what we're trying to do is actually build trust, and *once you've got that trust then they start to come to you... that's fantastic... because at that point you've then got... control of knowledge exchange... you can start to, operate the other way... we can start to shape the questions... you can start to shape policy... but you've got to get that trust first so you've first of all got to deliver the product the service properly and only then will they trust you and then you can start to shape going forwards*" (Interview CXC-D1, emphasis added).*

Demonstrating a desire to exert influence on policy beyond just responding to the needs of policy makers, this quote exemplifies the important role that trust is seen as playing in enabling spaces and relations of challenge to be sustained within the scope of organisational legitimacy – challenge too much and trust and legitimacy fail. It is worth noting that in this instance, an actor who uses the term translation perhaps most prolifically, chooses the language of 'knowledge exchange' when describing a more challenging relationship with policy. For the CXC knowledge officer such trust was built on a history of demonstrated value for the audience, without which "you just shout from the side-lines and nobody will listen" (Interview CXC-S3). Managing this critical distance

was a challenge for which a balance had to be carefully negotiated between traction and proximity to the concerns of stakeholders and the need to not being sucked in but keep a distance (Interview CXC-S3-2). In the ability to challenge, trust and legitimacy are thereby held in relational tension. Owens suggests trust is not simply given, but carefully constructed through boundary work building legitimacy and reputation (2012: 14). The time required to develop such trust might account for the lack of overt challenge during CXC's first two years of operation. Rein and Shon observe that individuals with strong relational trust may use this to resolve controversy (Rein and Shon, 1993: 159) but in this case, trust is positioned as essential for generating subtle disruption through challenge. Again in this case the legitimation of political voice is both dispersed and achieved, not given, and something emphasised as distinctive to CXC "as the Government's advisor" (Interview CXC-S1).

7.3.3 Alliances of the willing and political collectives

Accounts of political challenge encountered so far demonstrate a plethora of ways in which particular passionate actors are finding ways to legitimate a form of political voice through boundary working. However, empirical research also encountered passionate yet frustrated voices like that of the scientist that opened section 7.2 who are not finding ways to construct legitimacy for a political voice within their professional context. For these individuals and organisations, Sniffer plays an important role in creating a networked collective, an "alliance of willing" (Interviews: Sniffer 1, Sniffer 2) and hosting and staging events and forums through which these voices might be heard. During the empirical research there were several examples of events and workshops which Sniffer catalysed in partnership with other organisations to create forums for discussion around issues that are not always profiled within mainstream public or private sector decision making. Examples include a Scottish Government hosted conference on climate justice organised jointly with Sniffer and Joseph Rowntree Foundation (held in 2012) (discussed in Chapter 5) and a workshop on the role of values in transformational change (held in 2015). Sniffer described their networks of professionals in different public private and community sectors across Scotland as a network of "lonely people in need of support" (Sniffer 2). The communications manager elaborated:

"The people we work with within Sniffer... a single planner here within that local authority or some, community group enthusiast, I mean, some of these people are very lonely... they have, hhhh a lot of passion and not

enough *support* a lot of the time and you cannot support people by making written text available to them, you know, you support people by , making them feel good, making them feel like this is worth keeping on doing and... they will very often *say* you know, yeah I want the science, I want the climate information, but *actually* that's not what they need, what they *need* is a pat on the back and someone saying I *totally agree with you* this is *really really important*, you know, because it isn't the climate science that's going to persuade people out there or the community group or the rest of the council... we act on *feelings*" (Interview Sniffer 2, original emphasis).

This account brings home the extent to which Sniffer takes seriously the psychological consequences of being a marginalised voice within structures which frame value priorities differently. Sniffer support goes far beyond science provision but addresses the emotional support of marginalised voices, providing both its employees and its network a sense of belonging and a collective that counters the alienation felt. Sniffer also stages forums through which these voices can be heard more widely – reproducing and widening the circulation of marginalised discourses. For example, at the Climate Justice conference, one social scientist that works within CXC challenged the Scottish Government over their focus on behaviour programmes, rather than growth in industry and private sector induced high carbon lifestyles. She described allocation of responsibility to a lay public as an injustice that was missing from the conference agenda (RN: Sniffer-CJ). Whilst in this instance this challenge was dismissed from further discussion, repeated circulation of such discursive frames and debates through normalisation at events start to build legitimacy and traction within what policy actors and politicians come to expect are the concerns of the electoral public. The work of Sniffer therefore helps to support the development of political collectives and to stage opportunities for discursive disruptions to hold voice. This is a role that Sniffer is able to perform in ways that CXC are not.

7.3.4 Summary of boundary actors passions

In summary, boundary actors are constructing channels through which spaces and subjectivities for political challenge can be opened up through using or enabling third party voices and reframing the questions others are asking, without threatening their own claim to value neutrality. This is a way of legitimating the circulation of alternative discursive value framings and finding ways to open up subjectivities and forms of

legitimation that enable and support wider political voices and the formation of alternative collectives.

One important finding is the way in which different boundary organisations studied had differences between them in terms of the type of work or discursive framing perceived as legitimate. During one interview this was expressed through the idea of ‘organisational personality’:

“I call it organisational personality but it’s to do with who you are because that informs so many of the choices about how as an organisation you behave ...who do you speak to, what kind of language do you use, and that is quite different for Sniffer as a you know as a charity, ClimateXChange, Adaptation Scotland, Urban Nexus, you know they all have their different little...(tailing off)”
(Interview Sniffer 2).

There is significant crossover in terms of shared staff, shared premises and or shared projects among boundary organisations in Scotland, with particular people often holding multiple different roles and affiliations. It is suggested that such blurring of organisational boundaries offers more than straightforward financial and knowledge sharing benefits: it is also strategic, enabling flexibility in boundary working and providing access to different forms of science–policy interaction that may be considered legitimate for one organization but not another. Understanding these different ‘organisational personalities’ as legitimating different types of discursive engagement deepens the understanding of why many boundary actors have multiple affiliations. As Miller notes in the case of boundary organisations “differences and interactions with each other may be just as important as their interactions with science and politics, per se” (Miller, 2001a: 484).

7.4 Analysis of cases of resistance – reclaiming Political subjectivity

The five examples profiled in sections 7.2 and 7.3 demonstrate ways in which scientists and boundary actors are finding ways to open up new spaces and subjectivities through which they can exert political influence (Table 7.1).

	Case 1 Utilising Fear	Case 2 Personalisation strategies	Case 3 – Utilising third party voices	Case 4 – Reframing questions asked	Case 5 – Supporting development of political collectives
Boundaries Navigated	Personal- Professional Neutral- Values rich Information provision - persuasion/ advocacy Organisational legitimate remit - non legitimate remit	Personal- Professional Neutral-Values rich Information provision - persuasion/ advocacy	Personal- Professional Neutral-Values rich Information provision - persuasion/ advocacy Self - Others	Personal- Professional Neutral-Values rich Information provision - persuasion/ advocacy	Personal- Professional Neutral-Values rich Information provision - persuasion/ advocacy
Political voice enabled	As advocator of action	As advocator of action	Enabling the raising of difficult issues	Challenging the political framing of climate problem	As a political collective
Discursive value framing circulated	Addressing climate change is more urgent than public or government are conceiving	Addressing climate change is based on personal responsibility and individual choice	There are some difficult political issues to address requiring political debate	(unclear as yet until CXC is more established)	Addressing climate change is social and environmental sustainability - especially questions of resilience, justice and diverse values
Organisation Affiliation	Government Agency	Met Office	CXC	CXC	Sniffer

Table 7.1: Summary of the five empirical cases of alternative boundary workings.

These cases demonstrate that boundary work is not just occurring between a singular science – policy boundary but through multiple boundaries that are constructed and transgressed differently. Both STS and Mouffian literatures highlight the contingency of such boundaries. Where Latour’s approach pushes agency onto the scientist, Mouffe’s work focuses attention on the construction of the possibility for these alternative

subjectivities and moments of re-articulation as temporary fixings within discursive relations of power (Mouffe, 2013: 73). With subject positions created through discursive openings, this helps to understand why the process of re-articulation is both difficult (requiring complex boundary working) and dependant as much on the ability to create such openings, as on expression of agency itself, however collective. Mouffe's account of passions, and the inability to fully reach any constructed identity, helps to account for the motivational forces for political identification. The plurality of value positions in relation to knowledge, provide the discursive fixation around which these identities and passions become mobilised. This section builds on empirical findings to consider some of the implications raised from these findings, arranged in three themes: the emerging nature of subjectivities, values and forms of legitimation; the role of neutrality and values in boundary work; and the affectual implications of these interactions on subjects themselves.

7.4.1 Producing values, subjectivities, and legitimacy alongside knowledge

The first point to emphasise is the multiple forms of subjectivity, legitimacy and discursive value framings that are constructed during the processes of boundary work. These are outcomes from boundary processes in ways not necessarily pre-envisaged. In the five examples profiled, actors constructed themselves – as heroic, active, passionate, and charismatic subjects - through their relational encounters and performances that create orientations towards particular forms of action. As Throgmorten identified, “by our choice of how to write and speak, by our choice of tropes, we create images of the kinds of characters we are or want to become” (1993: 121). While sometimes there is strong awareness of political implications (as in the example of fear), at other-times the political implications are less clear to actors (as in the case of personalisation), demonstrating the way that meaning always exceeds the intentionality of actors. However, in these narratives scientists are redefining their subjectivity – what it means to be a scientist and where its boundaries are drawn.

Likewise, legitimacy emerges in these processes as an outcome of boundary work (Jasanoff, 1990). These empirical findings suggest that rather than any single site of science–policy separation, such legitimacy is produced through the cumulative interaction of multiple interacting instances of temporary boundary hardening that

construct alternative forms of science–policy boundaries in the face of parallel boundary transgression. Mouffe suggests “the drawing of the frontier between the legitimate and the illegitimate is always a political decision, and that it should therefore always remain open to contestation” (2005: 121). In this chapter several examples of the stretching, contesting and redefining of the boundaries of legitimacy have been presented. These include boundary crossings of 7.2 to the subtle (re)framing of questions and mobilising voices in 7.3. Emerging from these accounts are ways that multiple boundaries interact, are hardened (simultaneously or a posteriori) in response to perceived weakening of legitimacy during transgression, or are softened to accommodate boundary work.

Values, like subjectivities and legitimacy, are seen to emerge *through* the production of knowledge, not in advance of it, particularly illustrated by sections 7.2.1 and 7.2.2. As the Met Office Government Advisor describes, “fifteen years ago the last thing in the world I would have believed in was climate change” (UHI Inverness, 2010). Values emerge relationally through the entanglements of experience, models, projections, actions, relations with other actors and events. Neither pre-existent nor contained in a discrete individualist sense, values instead come into being and effect discursively. Each of the accounts profiled in sections 7.2 and 7.3, like other narratives of boundary work, demonstrate the inability of separating knowledge and values (Miller, 2001a: 496; Backstrand, 2003: 28; Jasanoff, 2003a: 160), disrupting the official value neutrality of science to draw attention to the plurality of boundary workings that legitimate value engaged political voices at the science–policy interface. Neither Latour’s nor Mouffe’s notion of values is essentialist, pointing back to a pre-existent essence, but instead is an articulation, pointing forwards to active relational interactions with future states - political outcomes about which subjects become passionate. Similarly, each actor *becomes* a passionate voice through his performative boundary interactions.

Mouffe’s focus on the relationship between legitimacy and power is useful in understanding why scientists and other actors do not rise immediately to Latour’s request to stand behind their values. With legitimacy constituted through hegemonic discursive structures – “within a particular system of meaning and values” (Howarth, 2000: 115) and subject positions, never given but needing to be articulated through struggles of power within these discursive structures (Mouffe, 1993: 78) – these scientists only have limited capacity to rearticulate forms of subjectivity and legitimate articulations within the scope of hegemonic discourse. These empirical accounts both

draw attention to the way in which actors are actively constructing forms of subjectivity and legitimacy but also the ways in which these are constrained through the relationship of legitimacy and hegemonic power.

7.4.2 Neutrality and legitimation through boundary work

The performance of neutrality appears important for all science–policy actors in legitimation of their work. In some cases neutrality is managed through emphasis on one boundary instead of another, for example the professional/personal, and in others through the mobilisation of third person narratives ensuring value-based voices are always held elsewhere. In section 7.2, where boundaries between the personal and professional were clearly blurred through presentations, these boundaries were strengthened when attention was cast to blurring of other boundaries such as those around value neutrality. In section 7.3 the mobilisation of voices elsewhere through all three strategies of boundary actors – utilising third party voices, encouraging the reframing of questions and supporting the development of political collectives – enabled boundary actors to circulate more overtly value rich discourses whilst retaining a claim to their own neutrality.

Beneath the surface of these narratives of science, of civil service and of boundary work as neutral, impersonal, detached spaces, science–policy interaction can be seen to be undertaken by passionate people for whom not only is the separation of values and facts difficult to maintain, but for whom such values matter. Exploring discursive associations with climate change, through the self-identification and drawing exercises during interviews, started to unpack the diversity of these values among scientists, boundary and policy actors in Scotland. The recurrence of passionate narratives suggests that there is a much bigger iceberg of unheard voices, excluded from constructing legitimacy at the science policy interface, prompting questions of what public discourses on climate change would sound like if these voices were able to be heard? It seems ironic that many of the ‘experts’ to whom Scottish Government is turning for knowledge and solutions to climate change are unable to express their value positions developed in relation to their knowledge in full recognition of the hybridity of knowledge. Further, these accounts draw attention to the relations between boundary work, values and legitimation which are allowing other values to be naturalised in public climate change discourses.

Sayer suggests that equating values with personal bias (as many participant narratives did) has the effect of encouraging values to be discounted in our assessments as “personal biases that one ideally should confess to, so that others will at least be able to ‘take them into account’, that is, to discount them” (2011: 10). This resonated with policy actor narratives in which one of the many ways that legitimacy was constructed in the Scottish Climate Change Adaptation Programme was through consulting a plurality of values such that different values cancel each other out (Interview SG3), and was echoed by other policy makers, who described legitimate policy making as involving consultation of “a range of experts and then taking the balance of opinions, it’s never consulting one expert” (Interview SG6) and those who emphasised getting “a wide spread of expertise” (Interview SGA2). This need for multiple views arose from the explicit association of values with bias – “everyone’s expertise is coloured by value... so, you don’t want to have just one... we would tend to use a range” (Interview SG4). Seeking neutrality through abstraction from competing values draws from a Habermasian understanding of ideal discourse in which personal values are eliminated from collective rational debate. Engagement with Sayer is useful in drawing attention to the way in which claims to public neutrality are made through this ‘discounting’ of values.

Sayer also suggests the demarcation of values to the private sphere, “protects them from challenge” (2011: 28) and is an obstacle to considering how such values influence day-to-day practices. This was clearly demonstrated in one interview where a policy maker described the views of a middle manager as causing significant difficulties in generating a strong climate policy response (Interview CXC-R1) and another who described the way in which the “personal biases of officials” was recurrently felt as a blockage to activity (Interview SG4). While it is tempting to use Sayer’s critique to understand relegation of values to the private sphere as a form of hegemonic boundary practice regulating which values are able to circulate within public discourse, in the examples profiled in section 7.2, scientists were able to use simultaneous boundary transgression and construction between the personal (private) and professional (public) boundary more creatively to enable the voicing of discursive value framings. Further, section 7.2.2 also highlighted that not all values are treated the same. Where environmental values are positioned as legitimate only within the personal sphere, business values appear to be constructed as neutral and legitimate within public decision-making. This suggests that as well as protecting values from critique boundary work around what is positioned as a value and

what neutral or value free contributes to a practice of hegemony through which some values are naturalised and others denied discursive circulation.

Neutrality, is a complex term understood as the opposite of values but also of bias (impartiality), interests (disinterestedness) and passion (dispassionate). These oppositions to values are often conflated in a “logic of equivalence” but in disarticulating these chains of equivalence it is possible to consider how values might be re-articulated with politics (Mouffe), with reasoning (Sayer and Jasanoff) and with knowledge (STS). Drawing from Mouffe’s definition of hegemony as a “mutual collapse – between objectivity and power” (2000: 24) legitimacy may be understood to be produced for some values within public discourse through claims to objectivity and neutrality. This can be seen in the instance of business values in section 7.2.1 and through consumer logics of change in section 7.2.2, whilst throughout both examples it was maintained that values were being kept out of articulation. It is precisely in drawing attention to the value dimensions of such discourses that the contingency of their hegemonic status might be profiled.

7.4.4 Affectual dimensions and the legitimisation of political voice

One final notable observation in Scotland was that those who were able to construct legitimacy for their voices demonstrated optimism and positivity about the challenges of addressing climate change, whereas those who had not, displayed a sense of disempowerment and a loss of hope. The scientist using fear in his communication (section 7.2.1) suggested:

“If I didn't feel that I was doing *some* good in an organisation that does some good, I wouldn't be here. I'm absolutely clear about that, I'd be straight out the door” (Interview: SGA4, original emphasis).

The scientist taking a personalisation approach (section 7.2.2) stated:

“What keeps me awake at night?... not a lot – largely because I'm getting out there and doing things about it; if I wasn't doing things about it then it very well might keep me awake” (Interview: Met Office).

Finally, in section 4.2.5 the Policy Director of CXC whose utilisation of ‘different hats’ enabled the construction of a distributed political voice through the voices of others,

described the experience of working in Scotland as refreshing in comparison to England – stating that “there is a genuine belief that you can achieve something here. And that is so, so refreshing I have to say” (Interview CXC-D1). This positive atmosphere was not suggested to be the result of any radical difference in environmental thinking, but more to do with Scotland’s smaller size and density of networks enabling more sense of making a difference (Interview CXC-D1). This can be interpreted as more capability for political voice. Participation in public discourse through legitimated forms of political expression appears to play an important part in this optimism.

In contrast, in cases where legitimate political voice is unable to be secured, estrangement between existing identities and those of the professional discourses in which they work generate a sense of disempowerment and a loss of hope. This is manifest in Sniffer’s narratives of lonely people (Interview Sniffer 2), accounts of these isolated people themselves (Interview Climsave 3), in Scottish Government policy narratives that suggested the inability to tackle entrenched interests or population growth means “the most likely outcome is the destruction of most of nature as we know it” (Interview SG2). It was also observed in voices of scientists not finding ways to construct political voice (Interview CXC-R10) and among boundary actors who, having had legitimate political expression in the SDC, felt confinement in the scope of political challenge enabled within CXC (AMB). One CXC boundary actor described the weariness and despair of the constant difficulty of fighting for systemic change:

“It’s about our current, economic, or socioeconomic structures... we're kind of locked in at present, we haven't managed to work out a way of unlocking the system... we are where we are kind of thing (.2) ((sighing)) societally, globally... from a personal point of view I kind of feel that, we've brought it on ourselves and we kind of perhaps deserve it because we're a species that doesn't seem to be able to actually look after itself or the planet on which we live, and historically we've been pretty good at killing each other and not so good at many other things” (Interview CXC-S3).

A whole host of passionate actors at the science–policy interface are becoming weary of the endless effort of battling against a carbon intensive socio-economic headwind.

Another boundary actor described:

“It’s difficult to do because we are living in the system that we’re living in and very often I feel ((weary and shaky)) that all this kind of this you know the Scottish Government Go-Greener and all these things its *asking* people to go against the system, swim against the tide it’s *very hard* to do

on a personal, there's a lot of talk of you know, we need behaviour change, we need people to insulate their lofts, and turn off their lights but *actually* what we *need* is political will or business will or you know, to say this system is not the only system. You know?" (Interview CXC-S1, original emphasis).

A conversation with one policy actor (economist) started by describing the challenge as a personal problem of "discipline and mindfulness" to achieve personal behaviour change but his account quickly bled into emphasis on the need for more systemic change:

"it's about behaviour change, personal behaviour change, er but really it's about changing the system in which we which we work... really the whole economy geared towards growth, it doesn't work... it's not enough you know to believe that... we can tweak the current system" (Interview SG2).

Whilst the Scottish Government are focussing on addressing behaviour change programmes that target individuals, these accounts communicate a frustration amongst practitioners around the lack of structural change. What these narratives indicate is that the feeling of active political participation is generating a positive feedback in energising boundary actors in their work of opening up alternative political discourses, spaces and subjectivities, where those who are not finding spaces to create these opportunities are becoming despondent and apathetic.

In the face of climate change there are no subjectivities waiting to be uncovered (Mouffe, 2012) rather these have to be re-articulated and constructed through oppositional identities (Mouffe, 2012) in ways that are discursively produced but can never be closed nor exhaust their possibilities (Howarth, 2000). This struggle for re-articulation however demands energised and passionate, not weary subjects. An area for further research is the extent to which such weariness is related to not finding opportunities for expressing political subjectivity. Supporting re-articulation is therefore dependant on hearing voices that are not able to express themselves (Mouffe, 2012). As such, Mouffe's approach provides a source of hope to those marginalised voices who Braidotti claims require 'new frameworks for the identification of common points of reference and values in order to come to terms with staggering transformations we are witnessing' (2013: 196). But how might these agonistic expressions take shape in the absence of public reasoning? Jasanoff argues that openings and alternatives will always have interaction with scientific knowledge and so, like Sayer, suggests attention should focus on the "politics of public reason" (Jasanoff, 2012b: 27). Both Sayer and Jasanoff makes a clear distinction between rationality and reason (Sayer, 2011: 61-62; Jasanoff,

2012b: 281). Rather than being an impasse, it is suggested that this is an area for fruitful interaction between the three theorists, and is a debate that is revisited in Chapter 8.

7.5 Multiple boundary working and constructing subjectivity

In contrast to the previous two chapters that described a restrictive role for boundary work in which the possibility of challenging policy values was described as limited, this chapter draws attention to ways in which scientists and boundary actors are opening up spaces for constructing political voice through alternative forms of boundary work that construct subjectivity and legitimacy differently. In these instances multiple boundaries interact, to construct legitimacy and subjectivity in different ways; serving as a reminder that processes of legitimation are discursively contingent and foregrounding the contested politics of boundary work.

Examples of reclaiming political subjectivity – profiled through narratives of personalisation, fear, employing the voices of others, reframing the questions and supporting generation of political collectives – have brought to the fore different processes through which political challenge to the lack of political action on climate change is becoming legitimated. In each case, these examples contest, stretch and redefine both where and how this boundary of legitimacy is drawn, and in so-doing re-politicise boundaries of legitimation. Reconstructing alternative boundaries involves interplay between multiple interacting sites of boundary work such that when one boundary is breached, attention is directed to another that becomes emphasised and hardened in an attempt to reconstitute a clear science–policy boundary. As a result the way that legitimacy is constructed differs, but the overall distinction between science and policy becomes resistant to attack precisely through the shifting sites of boundary work. This illustrates Jasanoff’s argument that:

“The robustness of policy-relevant knowledge... is constituted, in my view, by a cluster of highly specialized, routinized, opaque, and unreflexive micro-practices, which may add up to hegemonic formations” (Jasanoff, 2011b: 310).

Multiple, cumulative, overlapping but not coherent or discrete, boundaries serve to protect inconsistencies that would reveal their contingent construction. The way in which these boundaries interrelate and mutually construct a science policy boundary

further illustrate the cumulative interrelating micro-boundaries introduced in Chapter 4 and constitutes the work that Miller referred to as hybrid management (2001).

These accounts indicate a more vibrant, active and resistant people than the previous chapters allowed, with boundary actors achieving some success in opening up points of challenge through mobilising the voices of third parties, emotionally supporting political collectives and subtly reframing questions being asked. The scientific narratives profiled too demonstrate differences in approach, from neoliberal characteristics such as demanding individual responses and promoting change through purchasing power, to utilising fear to mobilise civil acquiescence to potentially unpopular policy decisions. Although implying greater regulation, this last narrative is also mixed up with prioritising private sector modes of operation within the public sector and mobilising imaginaries of fear that Swyngedouw after Boltanski and Chiapello suggest is indicative of the cultural politics of capitalism (Swyngedouw, 2010). As such they do not appear to escape hegemonic discourses of neoliberal governance. Litfin suggests that because “networks of resistance... [and] counter discourses are always entwined with the hegemony they oppose, the two stand in a relation of ‘conflicted intimacy’” (1994: 38). This prompts the recollection of Crowder’s critique of Mouffe in Chapter 2 that suggests that “even the most radical normative alternatives we could imagine must be in some way complicit with existing structures” (Crowder, 2006: 12). The empirical examples profiled in this chapter therefore attest to the difficulty of constructing alternative subjectivities against the sedimentation of a non-neutral playing field of discursive relations. Furthermore, in the big picture of science–policy interaction, these voices are still relatively small, there are many voices remaining unheard. New forms of boundary work are constructing divisions between the personal and professional sphere as boundaries around value-free science are breached that construct legitimacy in equally restrictive ways. Although resisting translation as a process of science–policy interaction, these particular framings and subjectivities are still dependant on achieving legitimation through their discursive alignment.

In this process of constructing subjectivities, values and forms of legitimation, results are unpredictable, and always escape the subject’s intent – the outcomes of confrontation are not pre-figured (Mouffe, 2013: 28). This chapter has sought to complicate the rather sterile picture of translation presented in the previous two chapters, by paying attention to the diversity of alternatives which Mouffe suggests are always present within any

hegemony. Where some actors have been successful in constructing a political voice, and appeared hopeful about the future, other voices encountered during interviews had not secured a public hearing and were often expressed as frustrated, angry or antipathetic. The extent to which hope is related to perceived legitimization of a political voice warrants further investigation. Mouffe's attention to alternatives, exclusions and marginalised voices helps to profile these more contested approaches and her emphasis on expanding the discursive space to enable political debate around alternative discursive value framings nurtures hope for widening the legitimacy of political engagement with climate change.

Chapter 8.

Drawing the Thesis to a Close: In Search of the Elephant and Elpis

The question of values in science–policy interaction might be described as the elephant in the room – with formal narratives of scientists, boundary actors and policy-makers alike, upholding narratives of neutrality with respect to their own practices. While many recognize values to be important in general, few find values easy to discuss in relation to their own work. This thesis has focused attention on the practices of boundary work and the complex interactions between values, boundary work and legitimation. This final chapter reflects on the findings of research first in relation to the research questions posed through the three themes of *translation*, *legitimation* and *values*, which structured the research. It then discusses the usefulness of Chantal Mouffe’s conceptual approach to science–policy analysis, beginning with what Mouffe’s work enables, and then considering what her approach tackles less well and ways in which benefits of theoretical dialogue with STS may work both ways. Theoretical and methodological contributions made by the research are then set out alongside the research’s limitations, and the implications for science–policy practice are discussed. The chapter concludes with three areas identified for future research.

8.1 Reflections on research findings

This thesis began with an aim to explore the value politics of boundary work at the Scottish climate science–policy interface. Conceptualizing the problem of climate change not as a scientific problem but as a values–based problem, it sought to utilize Mouffe’s political theory to complement STS approaches in examining the types of discursive value

framings that were enabled or disabled from circulating during science–policy interaction. With relations between values and hegemonic power in particular focus, foregrounding values was perceived to offer a potential way of contesting hegemony, through de-articulating the collapse between objectivity and claims to power (Mouffe, 2000: 14).

The research was structured through three research questions:

1. How do values and knowledge interact during processes of boundary work at the climate science–policy interface in Scotland?
2. Through what processes is legitimacy constructed for particular discursive value framings through boundary work?
3. What effects do different processes of boundary work have on the types of policy action being considered in response to climate change?

Reflections on these research findings are structured according to the three conceptual themes – *values*, *legitimation* and *translation* – that evolved through the research. In each case, key findings are outlined then discussed. The specific research questions are then briefly addressed by way of a section summary.

8.1.1 Translation

Translation within CXC is a particular process of boundary work, one among several approaches that CXC uses. Empirical examination of this process suggests that CXC translation involves particular political relations expressed through knowledge that encourage the reproduction of existing policy discursive value framings.

Key finding 1: Translation may be understood as an extension of a ‘logic of equivalence’ and thereby a practice of hegemony

Chapter 5 described the way that policy and CXC actors who described the science–policy boundary work undertaken as a process of translation, envisaged CXC translation as a process of conversion, through which meaning for scientific knowledge is constructed in policy terms. Although STS narratives of translation capture the political nature of translation as a process that does the work of difference (Law, 2007), involving change in knowledge during circulation (Law, 2007; Callon, 1986) and the marshalling of power as a passage point (Callon, 1986), the specificity of emphasis on the audience in the way CXC

are using the term is not well captured by STS accounts. In such accounts, translation could equally apply to any of the various forms of boundary working encountered. Laclau and Mouffe's concept of expanding the chain of equivalence (Laclau and Mouffe, 1985: 143-144) enables interpretation of CXC's translation as a hegemonic practice through which the claim to power of particular dominant discourses is reproduced. Translation as a claim for equivalence seams together particular discursive value framings in an attempt to fix meaning in ways that accord with hegemonic discursive value framings. The focus on boundary work as translation within CXC helps to shape particular processes of interaction that privilege dominant policy discursive value framings. The concept of translation within CXC thereby performs discursive work in the reconfiguration of science-policy interactions in Scotland – putting policy values in the driving seat. Understanding translation within CXC as an extension of the logic of equivalence between policy meaning and scientific knowledge that establishes what scientific knowledge on climate change means in policy terms helps to capture the politics at play in this form of boundary working.

Key finding 2: Legitimacy in science-policy boundary work is being constructed through translation as well as purification

Examining translation across chapters 5 and 6, suggests that legitimacy is not just a product of the purification function of boundary work as Jasanoff first suggested (Jasanoff, 1990; see also Owens, 2012) but is also being constructed through processes of translation via the naturalization of claims to meaning in policy terms. Given the crisis for legitimacy arising through the inability to maintain purification of fact and value (outlined in chapter 2.4), proliferation of interest in demand-led science (in both theoretical and practitioner narratives), and reference to understanding legitimacy in policy terms (after Cash *et al.*, 2002), it is perhaps unsurprising that the research found legitimacy for knowledge being constructed through translation. This thesis demonstrates empirically the way in which knowledge legitimacy is being constructed through these 'connections' with policy (understanding translations in STS terms). It also signals the politics of constructing legitimacy for scientific knowledge through discursive value framings of policy (understanding translation through Laclau and Mouffe). This opens up a new focus for thinking about legitimacy at the science-policy interface and prompts the need for critical attention to the work conducted in the name of translation. This is especially important given what some authors have argued is a 'translational turn' in social science

(Bachmann-Medick, 2009; Bassnett, 2011; de Lima Costa and Alvarez, 2014) for as Asdal et al suggest, translation does not just describe but brings about the world in particular ways (Asdal *et al.*, 2007: 29).

Impact of thinking about translation

While not all Scottish science is about translation as CXC deploy the term (CXC scientists do work outside CXC and Scottish Government has wider programmes of funding 'strategic research') increasing pressure from the academic impact agenda of the UK's Research Excellence Framework (REF) was cited by the CXC Science Director as an important determinate on extending the pressure for meaning to be established through policy framings to all scientists:

“Given the importance of pathways to Impact in research council funding, same with the EU... I think that the days of the ivory tower scientist are numbered, so you need to be thinking about how you're going to get that Impact out there and how that's going to be translated into something that makes a difference” (Interview CXC-D2).

Critical engagement with the notion of translation becomes an important question more widely within academia as the REF becomes increasingly focused on demonstrating a “*translational pathway*” through which HEIs should demonstrate impact (RN: CXC-AGM 2013). Although there is a proliferation of critical engagement around the REF process (Watermeyer, 2014; Pain *et al.*, 2011; Rogers *et al.*, 2014), there is little attention to the concept of translation, which is often uncritical deployed (Watermeyer, 2014: 6; Matt *et al.*, 2015). This chapter suggests that translation as a boundary process performs political work. This section suggests the implications of considering science–policy interaction as a process of translation are not just confined to processes of CXC.

8.1.2 Legitimation

Mouffe's attention to the relation between legitimacy and power and attention to discursive value framings has demonstrated two additional findings about constructing legitimacy for knowledge that complements understanding translation as a process of legitimation.

Key finding 3: In translation, legitimation is not necessarily equally important on both sides

Star and Greisemer (1989) emphasized the need for accountability for boundary objects on both sides of the science–policy boundary. The predominance of policy discursive value framings in the construction of meaning outlined in chapter 5 seemed to run counter to this suggestion and so chapter 6 focused on constructing legitimacy for knowledge during CXC’s translation process, through call-down briefings as boundary objects. One option could be to think of these briefings not as boundary objects in Star and Greisemer’s terms but as *translational objects*. However, at this stage there was insufficient reason to move away from the boundary object concept. Instead, through tracing three call-down examples, it was suggested that while legitimation was required on both sides, longer histories of discursive alignment with policy objectives appeared more significant in constructing knowledge legitimacy under CXC’s model of translation, than the more immediate respecting of epistemic values of science. The requirements for legitimation are therefore not necessary equally weighted on both sides. This accords with Miller’s suggestion that emphasis for legitimacy is on policy while emphasis for credibility lies more with science (2001a).

Key finding 4: Passionate science–policy actors are legitimating political expression through flexible and multiple boundary working

Where chapters 5 and 6 sought to understand translation as a form of hegemonic practice, chapter 7 sought to pay attention to exclusions and attempts to re-articulate discursive value framings differently. Attention to the multiple micro-sites of boundary work introduced in Chapter 4 and the way in which these interact cumulatively to produce an understanding of a science–policy boundary at a macro scale opened up attention to the different ways in which legitimacy and subjectivities at the science–policy interface might be constructed. Alongside the restrictive demands of CXC’s translation, a proliferation of openings are also being constructed through alternative forms of boundary working that construct legitimacy differently, and enable discursive challenge and political subjectivities to be expressed in a range of different ways. Flexible and alternating boundary work, across multiple interacting boundary sites enable alternative configurations of legitimacy and subjectivity. As well as opening up new configurations, the defensibility of any science–policy boundary is increased - for as one boundary is transgressed, another may be emphasized such that the target of attack is

constantly changing, plural and even contradictory. This hybrid management (Miller, 2001a) indicates that closure is never complete.

Mouffe's approach draws attention to the diverse plural passions of vibrant subjects who align and act in politically collective ways signalling fractures that reveal possibility for contestation reveal the contingency of hegemony. This complements STS approaches, which Jasanoff describes have a long history in showing "the dividing line between forms of political engagement is not fixed in advance but continually shifts in the process of knowledge making" (Jasanoff, 2008: online). Together they have jointly enabled attentiveness to these multiple and contingent boundary workings. Without Mouffe's notion of passions there is little to animate these openings, and her attention to the relations with hegemonic power are a reminder of the difficulty such attempts face. While the alternatives outlined in chapter 7 should not be underestimated, it is nevertheless important to recognize the scale at which these attempts operate in comparison to mainstream emphasis on translation through CXC, and while they do diversify discursive space, they often do not manage to escape the hegemonic values of neoliberalism as Crowder and others suggest (Crowder, 2006; Carvalho and Burgess, 2005: 1467). This is perhaps no surprise for, with no Archimedean standpoint outside of discourse, "the ground on which hegemonic interventions occur is never neutral... it is always the product of previous hegemonic practices" (Mouffe, 2014: 151). The dominant discursive value frameworks of policy through which legitimacy is constructed, include a pressure for legitimacy to be demonstrated in private sector business terms and private sector coalitions appeared to play a strong role in constructing or undermining legitimacy for policy action. Where Cash *et al.* highlight respecting different values in constructing legitimacy (2002), their approach naturalizes which values are respected and which excluded. Mouffe's recognition of the relation between legitimacy and power in conditions of value plurality, and its contingency, makes legitimation always more political, more contestable and more conflictual than Cash's narrative allows. Mouffe's own attention turns to how the relationships with such alternatives are envisaged – as legitimate adversaries or antagonistic enemies, in recognition that relations of hegemony of one kind or another will be ever-present.

8.1.3 Values

“Can certain of the concepts that we have learned to cherish be offered the opportunity for a type of development that the much too narrow framework of modernization has not given them?” (Latour, 2013c: 8).

Such is the theoretical question with which this research has ended up engaging. In many ways this was accidental, for when designing and planning the research the ability to refer to values was taken for granted. Where, when and how values operated during boundary work was to be the focus of research, but the concept of values per se was naturalized not critically engaged. However, the degree to which a notion of values as traditionally conceived is problematic within a post-structural framework soon became a quagmire in which the research was left with only a hollowed out void for subject matter. The thesis could not practically proceed without some conceptualization of ‘values’ as the object of attention.

A strategic decision was made to stick with these difficulties around the concept of values, as section 3.6 described. This was partly on account of the unavailability of alternative language to capture the sticky affectual attachments of discourse that the language of discourse, framing, rationalities and norms did not seem to capture. Rationalities as ‘ways of thinking’, for example, do not account for why things matter to people and why some ways of thinking become the subject of conflict. These are not only ways of *thinking*, but also concerned passionate investments that go beyond rational selection. As Sayer suggests, we set up a theory-practice contradiction when we bracket off values, normativity and connectedness in a vain attempt to project a disconnected rational and objective analysis because we are not treating the subjects of our research as we know we act ourselves (Sayer, 2011: 13). Latour’s call for climatologists to answer who they are representing and what are they fighting for (Latour, 2013a) is therefore not just a question for climatologists, scientists, or those concerned by climate change. If as Mouffe suggests, political identification occurs not only through rational thought but also through passions, the value orientations of discourse provide the substance through which such collective passions are invested. A narrative devoid of values is a discourse devoid of meaning and leaves nothing around which a passionate political conscious might develop. However, re-emphasizing values needs to be careful not to undo the valuable work that discourse theorists achieved in moving away from essentialist

thinking and highlighting the distributed constitution of power. Instead, there is a need to build forwards a post-structural understanding of what values are, and what they, or their absence, claim to be.

There are several place-markers set theoretically for a more relational understanding of values, not only in the science policy literatures reviewed in chapter 2 but also in wider geographical literatures. Harvey suggests:

“Values... are not imposed as universal abstractions from outside but arrived at through a living process... embedded in forms of praxis and plays of power attaching to the exploration of this or that potentiality” (Harvey, 1996: 56)

STS scholars such as Wynne emphasise the role of science in generating values suggesting that “political activity not only expressed pre-existent values, but it also creates them, using even (perhaps especially) scientific knowledge as a medium” (Wynne, 1982: 161). For Jasanoff greater trust in science comes from reaffirming questions of attachment and interactions with our normative concerns (Jasanoff, 2010: 237). With Latour encouraging a re-opening of questions of values (2013c: 481) and van de Sluij suggesting that “the political climate debate would benefit from clarification of the political values and visions that are at play in climate change” (van der Sluijs *et al.*, 2010: 413), it is suggested rethinking values is both necessary and timely.

Key finding 5: Mouffe’s notion of values as politics opens up the possibility of theorizing values in non-essentialist terms

Mouffe moves the concept of values away from morality or ethics, which rely on essentialist understandings of right and wrong, towards political positions around which there can be political debate. Her anti-essentialist approach and defence of value plurality provides a non-essential understanding of values as discursively constituted, collective, and ultimately political. As a key post-structural theorist, Mouffe offers a way of understanding values as contingent, relational and stabilized (temporarily) in claims to what matters. Although *not* essentialist, values may come to be perceived as stable through fixing through relations of power. While existing engagements with Mouffe’s work from STS have focused on questions of conflict and legitimacy, this thesis suggests her work is also relevant to the rethinking of values. For Mouffe, an anti-essentialist stance is necessary for enabling agonistic debate amongst legitimate adversaries in ways that encourage recognition of the political resolve of conflict (retaining contingency).

This thesis suggests her anti-essentialist view of values bypasses many of the difficulties raised against notions of values in argumentative literatures, and therefore helps rethink values in anti-essentialist ways.

In many senses this thesis has been about problem re-framing rather than problem solving. The contribution of the thesis lies in theoretically opening up the possibility for reframing how we might think about values and the empirical chapters develop only a limited contribution to exploring this empirically. Nevertheless, the way in which values were encountered in the scientist and boundary narratives profiled in Chapter 7 support the theoretical concept of values outlined in the opening chapters – as relational, produced through knowledge encounter, through re-articulations orientated to future political outcomes. The discursive value framings set out in Chapter 4, and referenced through chapters 5 to 7, also offer clear (and conflicting) value orientations that make both an epistemic and ontological claims to what is important in Scotland. Further empirical work to explore how a post-structural concept of values might survive further empirical interrogation is encouraged in the first of three areas identified for future research.

Key contribution 6: A post-structural understanding of values could contribute towards hegemonic critique through destabilizing claims to neutrality and universality

Expanding chains of equivalence constitute a claim to universality (Rear, 2013) that seeks to fix claims to meaning beyond values and beyond debate. Mouffe's definition of hegemony as the collapse of objectivity and power opens up the possibility for a contestation of hegemony based on foregrounding the value commitments within all discourses – even those that claim hegemonic power. Although it is important not to conflate objectivity and neutrality, there is commonality in the way that values are set in opposition to both, such that hegemonic values claim both neutrality and objectivity as part of their claim to power. Foregrounding the situated, partial and value-rich orientations of discourses enables an unsettling of these claims to speak for the whole. It is precisely the foregrounding of 'values' within stabilised hegemonic discourses that allows critique of how such discourses secure their universal, rational and objective claim as natural and neutral. Considering hegemonic discourses such as economic growth, or the neutrality claims of normal science, as 'values' disrupts their claims to neutrality. Rather than seeing social order as inevitable, it is in emphasising the contingency and historicity of social objectivity (Howarth, 2010: 311; Bridgman, 2007: 481) and the partial

fixation of hegemony that generates scope for resistance (Mouffe, 2009: 312; Bridgman, 2007: 481). This is not just about power, but also about passion, partiality and the fostering of agonistic relations – even under conditions of unequal power. This research has contributed towards a critical politics of values by combining STS and Mouffian approaches to foreground values within discourses that claim to neutrality, and interrogate processes and practices through which fixation of values takes place. This understanding helps to explain the naturalization of particular values over others, and expose the value-laden basis of hegemony as one way in which to contest its claim to power.

8.2 Evaluation of theoretical framework

This thesis has explored the applicability of Mouffe’s political theory to science–policy boundary work, to complement and extend STS approaches. This section presents some reflections on what Mouffe’s approach offers, where problems arise, and where the benefits of dialogue with STS might work the other way.

8.2.1 Mouffe’s contributions to researching values legitimation and boundary work

When Danial Bell proclaimed the end of ideology in 1960 this echoed moves to try and make politics scientific. Mouffe demonstrates why questions of politics cannot be reduced to questions of science, and are more than mere “technical questions” (Mouffe, 2005b: 10). What she does *not* do in making this argument, is to fall back on structuralist notions of ideology or values that stand outside of discursive relations of power, but instead argues for the intimate relation between values, legitimation and power and the contingency of hegemonic relations in order to defend the possibility of a plurality of values around which there can be political debate. Torphing highlights the implications of taking a Mouffian discourse theory approach is the radical change in the form that critique takes that foregrounds the types of values achieving discursive circulation:

“It is not enough to show the contingency of essentialist claims... We should pay special attention to the processes through which this ethical substance is constructed” (Torphing, 2005: 169).

It is suggested in this thesis that emphasizing the inability to separate fact from value does not go far enough in attending to the politics of discourse, there is also need to pay attention to the types of values enabled to circulate. Laclau and Mouffe's focus on discourse highlights the way that meaning is 'fixed' through politics, power and boundary struggles (Iverson, 2012: 58) and empirical attention to science-policy boundary work in Scotland have explored the way that particular discursive value frameworks are opened up or closed down which "offers insights into the normative implications of such demarcations" (van Egmond and Bal, 2011: 112).

In her emphasis on the contingent and political nature of hegemonic claims, Mouffe contests the closure of hegemony and stresses that meaning could always be otherwise. As such her work "has been key to exposing (the limits of) dominant narratives and critiquing dominant theories... pivotal as a springboard of critique... a most useful lens to challenging and disarticulating mainstream modes of thought" (Tambakaki, 2014: 1). Hegemonic discourses such as economic growth, or positivist science, stake a claim to neutrality that positions them as outside of politics, as stable, natural and universal - speaking for the unified collective. Interrogating hegemony through foregrounding values, by positioning these discourses as 'discursive value framings' enables such claims to be problematized by demonstrating their contingency and drawing attention to exclusions, which opens up analysis of the politics of power at play in such interactions. In this process of attending to exclusions it is important not to over-romanticise "'voices from the margins' as somehow more authentic, less corrupt, and therefore more revolutionary" (Harvey, 1996: 100) but to create a border place, that provides a standpoint from which to think and speak critically (Harvey, 1996: 101-104). Positioning neoliberalism as a values-laden discourse is not new in our collective lay imaginary, but what Mouffe offers is the evocation of values without essentialism to further dispute the necessity of its claims.

Further, a Mouffian understanding of legitimacy insists that legitimacy is constructed, is inseparable from relations with hegemonic power, and cannot be grounded in claims to rationality or morality if the possibility for plurality and difference is to be retained. This offers two important implications for considering the legitimation of value positions. Firstly, rather than relying on normative understandings of input and output legitimacy, Mouffe's descriptive approach to legitimacy (shared with argumentative theory), avoids essentialist reference points and emphasises discursive frameworks of reference. This

ensures that the political nature of legitimacy remains in focus – “*always a political decision... open to contestation*” (Mouffe, 2005b: 121). In this way the construction of legitimacy for Mouffe is more political, more contestable and more conflictual than either argumentative theories or STS suggest.

This thesis has been concerned with the multiple ways in which particular values come to be rendered legitimate or illegitimate through boundary work. It has built on STS approaches to consider multiple interacting boundary workings that enable legitimacy to be constructed in different ways, but always through relations of power. Emphasising these relations of power is important in understanding why scientists and other actors face an uphill struggle in expressing clearly what they are fighting for, and in rendering these relationships with hegemonic power visible and contingent. Sciarto suggests that Mouffe’s approach to legitimacy opens up, but leaves under-developed, the contestability and spatial unevenness of legitimacy (Sciarto, 2008: 410) – a dimension geography is well placed to develop. Finally application of the logics of equivalence as a practice of hegemony helps to understand the specific politics of the way CXC are drawing on translation to perform a particular kind of boundary work – one which reproduces hegemonic power.

Mouffe’s work is often read only in the context of her post-Marxist political project of radical democracy, yet her approach of agonistic pluralism also offers strong analytical tools to denaturalise hegemonic claims without foreclosing the types of re-articulation that might result. While Mouffe’s own project is for a radical political-economic shift which may or may not be a vision politically shared, her approach is also helpful in focusing attention on broadening the conceptual space in which a broader range of value orientations can participate, as adversaries not as enemies. As Tambakaki suggests “Mouffe’s work sets out a challenge. It challenges the readers to reflect on what it means to work with (in) *and* against politics” (Tambakaki, 2014: 3, original emphasis). However, it is in this moment of dearticulation that Mouffe urges greatest attention to re-articulation, a position that sets her apart from other agonistic political theorists such as Arendt or Connolly (Mouffe, 2012), for it is these moments of disarticulation that there is greatest opportunity for re-articulations by others, and in Mouffe’s particular concern, greatest vulnerability to non-democratic re-articulations. In this sense, the question is perhaps whether we can afford not to re-articulate a post-structuralist concept of values, in order to ensure any re-articulation is politically not essentially forged?

8.2.2 Problematics of Mouffe and the role of reasoning

At the same time, Mouffe's approach poses some difficulties. Firstly, she does not offer a specific post-structural definition of values, and much of the argument made in this thesis has relied on interpreting the way she uses the term. This demands both wider interrogation of values in her work, and further and more detailed analysis of the empirical application of her approach. Secondly, taking a Mouffian approach also foregrounds authoritative and hegemonic understandings of power, which could be complemented by broader considerations of the way that power operates through a variety of other means (Allen, 2011). Thirdly, the fact that Mouffe's anti-foundationalist stance offers no privileged criteria outside of discourse that can "safeguard either Truth or Science" (Torping, 2005: 155) challenges certain perceptions of science and her attack on rationality provokes important questions about possible roles for scientific knowledge. This challenges application of her approach in a science-policy domain where reasoning plays a strong role.

Mouffe's reaction against the historic dominant emphasis of rationality in political theory, means her adamant opposition to rationality sometimes conflates rationality and reasoning (see Mouffe, 2000: 4). Yet both Jasanoff and Sayer seek to separate reasoning from rationality. If their distinctions between rationality and reason hold, bringing values within what it means to reason, does not necessarily imply that values are rationally resolved. In evoking values, Sayer, like argumentative theorists such as Healey and Fischer, (Healey, 1993: 238) evoke notions of right and wrong. Mouffe's approach is important in moving away from grounding values in right and wrong to think values politically in order to preserve the possibility of their plurality. In concluding this thesis, it is suggested that Jasanoff's approach provides a useful correction to Mouffe's tendency to collapse rationality and reason, reminding us that there are more diverse forms of reasoning that might contribute to agonistic politics in ways that are more humble than the claims of modernist rationality.

Jasanoff argues for wider forms of public reasoning, suggesting:

"I see reasoning as one of the essential virtuous practices of modern democracy, provided that it remains conscious of its limits and mindful of its shortcomings... the challenge is not to let imperialist definitions of reason and rationality crowd out the voices of the margins from our painstakingly crafted spaces of reasoning" (Jasanoff, 2012b: 281).

In emphasising reasoning Jasanoff does not restrict public reasoning to the application of rationality, but includes diversity in forms of reasoning and contestation – with wider participation being pursued precisely to enable questioning of expert frames (Jasanoff, 2003a). In restoring “important value conflicts to the public sphere” (Jasanoff, 2011a: 637) Jasanoff is not simply advocating for the obeying of rules of Rawlsian deliberative democracy, but is instead enquiring critically into the practices through which reasoning in the public interest occurs, de-naturalising what it means to reason and highlighting its contingency by foregrounding the historically contingent social practices through which reasoning takes place (Jasanoff, 2012b: 5-6). For Mouffe “the very future of democracy” (Mouffe, 2002: 16) is at stake in rethinking the role rationality plays, but this does not imply there should be no process of public reasoning, if conducted agonistically. Without some form of reasoning it is difficult to see how agonistic debate could occur. Mouffe explicitly states that “this is not to say that reason and rational argument should disappear from politics; rather, that their place in it needs to be rethought” (Mouffe, 2002: 16). Jasanoff shares Mouffe’s concerns over the way in which rational argument generates exclusion (Jasanoff, 2012b: 280) and her thinking about plural of modes reasoning might help the development of Mouffe’s agonistic rethinking of the role of reason, and with it a more modest role and expectation for science. While at the same time Mouffe’s theoretical argument for why conflict cannot be resolved through rational consensus may extend Jasanoff’s powerful critique.

8.3 Contributions of the research

This section presents the theoretical and methodological contributions made by the research, through reflection on the findings presented in sections 8.1 and 8.2. This is followed by a review of the limitations of the research.

8.3.1 Theoretical contributions

The thesis makes a theoretical contribution to understanding science–policy interface by drawing attention to differences in the political implications of different forms of boundary working. Translation, as used within CXC as one particular form of boundary work, has been presented as a practice of hegemony – extending claims to equivalence

that privilege hegemonic policy discursive value framings (Key finding 1). These multiple sites and forms of boundary working enable or constrain different forms of political subjectivity and involve different processes through which knowledge is constructed as legitimate (Key finding 4). One way in which legitimacy for knowledge is being constructed in the case of CXC is through the translation as well as purification function of boundary work (Key finding 2). In CXC's translation work, legitimacy as a constructed characteristic of knowledge is not necessarily equally important on both sides (Key finding 3). This attention to the differential politics of different forms of boundary work are important in drawing attention to the different types of knowledge being enabled or disabled from circulating and, this thesis argues, to the different discursive value orientations that are entailed.

In this process, the possibility of theorizing values post-structurally is opened up. Drawing from Chantal Mouffe's political understanding of values, values are conceived discursively, collectively, relationally and as contingent stabilisations of meaning that claim what matters. This claim is not essentialist but political, and therefore open to contestation (Key finding 5). Further, it is argued that understanding values post-structurally may contribute towards hegemonic critique through destabilizing claims to neutrality and universality in ways not currently captured by post-structural concentrations on power (Key contribution 6).

In so doing, the thesis makes an argument for greater dialogue between STS accounts of boundary work and Mouffe's political theory. As sections 8.1 and 8.2 outline in detail, Mouffe's political theory brings out relations with hegemonic power in science-policy boundary work which often, aside from Jasanoff's writings (2010; 2003b; 1990; 2004; 2012a; 2012b), remain under-developed in STS accounts. This has enabled narratives of translation in CXC to be understood as an extension of logics of equivalence that seek to extend claims to meaning according to dominant policy terms. It has also enabled the claims to neutrality and universality of hegemonic claims to be contested through foregrounding the value-commitments of their discourse and has focused attention on alternative spaces subjectivities and forms of legitimacy that have been cleaved open within these discursive relations. STS accounts of boundary work focus on the role of boundary work and boundary objects in particular as *managing* and *concealing* conflict (Star and Griesemer, 1989; Guston, 1999). In contrast, Mouffe's approach argues that space must be made for conflict, to avoid the development of antagonistic relations. It is

suggested that STS needs to embrace this space for difference and disagreement and not to develop blindness to the politics of hegemonic power in the discussion of demand led science. Bringing Mouffe into dialogue with STS offers scope to retain this critical edge. Simultaneously, Jasanoff's wider forms of reasoning and more humble role for science could enrich Mouffe's rather singular opposition to rationality and increase her applicability to science–policy debates.

8.3.2 Methodological contributions

Researching values and legitimacy empirically has presented several challenges that speak to a methodological community interested in researching sensitive topics or themes that are difficult to assess through front stage narratives. Interview tools that sought to 'opened up' interview conversations to explore contested meanings through self-identification exercises and using drawings with elite actors, experimented with changing the atmosphere of interview conversations. This experimentation with the flexibility of discursive space during interviews recognizes boundaries as fluid, relational and open to constructive careful expansion in ways that could contribute to other areas of sensitive research. Building on the work of Renzetti and Lee (1993), Ratcliffe (2002) and Kezar (2003) who critique approaches to elite actor interviews that focus on reverence and expert knowledge, the approach to interviews in this thesis argues that elite actors also have non-elite knowledge and respond to interpersonal cues which limit their boundaries of discursive engagement in ways that are usefully subject to critical study. However, at the same time, strategies that gently push up against, and feel for the boundaries of legitimate discussion, are successful only to the extent that they examine the way these boundaries are constructed in that space and through that encounter. Making any sensing of legitimacy, only the starting point for further discussion.

8.3.3 Theoretical and methodological research limitations

In evaluating the usefulness of Mouffe's approach in section 8.2, three limitations to utilizing her approach were identified – a lack of definition over key terms in her work demands high levels of interpretation over how key concepts such as values are deployed; her foregrounding of hegemonic power downplays other understandings of the way in which power operates; and her problematisation of reason poses challenge in application to a science–policy domain where reasoning plays a strong role. The latter

concern is somewhat overcome through further dialogue with STS approaches that distinguish reasoning and rationality, and take a broader understanding of the role of reasoning. However, the lack of definitions and the limited conception of power remain limitations in deploying Mouffe's approach.

In addition to the challenges brought forward from using Mouffe's conceptual approach, there are theoretical limitations within the thesis itself. The most significant is the extent to which values are theoretically conceivable through a post-structural theoretical lens. In seeking to foreground the value orientations of discourse it is necessary to ask whether a return to the language of values outweighs its difficulties, and whether the language of values is the best way to articulate these affective attachments to discourse. As described in Chapter 2, much post-structural social science has moved away from the language of values because of its associations with intentionality, discrete subjectivity and pre-existent meaning that were considered not constructive to foregrounding discourse and more distributed understandings of power and agency. It is precisely the necessity of these associations that this thesis contests, and through which it is argued a post-structuralist view of values is possible. However, this interpretation could itself be contested and the necessity of an essentialist definition argued. It might also be considered that using the language of values differently might be outweighed by disadvantages and risk implying essentialism. There is more work to be done before it can be suggested with sufficient confidence that values can escape their essentialist associations, but following post-structural emphasis on the non-necessary connection between language and meaning, it is argued that there is space for values to be thought differently.

Methodologically, it is suggested "Mouffe's theories operate on a level of abstraction that makes it difficult to apply them directly to empirical research" (Karppinen *et al.*, 2008: 18). Interpretation of Laclau and Mouffe's discourse approach has been much assisted by the work of Howarth (2000; 2010; 2006). The mixed methodology enabled research to focus on processes (of boundary work and constructing legitimacy), points of contest/conflict, and began to indicate exclusions. However in many ways the methodologies were insufficient in accessing exclusions and omissions, instead providing only frustrating glimpses at exclusions, indicating limitations in research design that are difficult to address. For example, research would have benefitted from greater in-depth research of the call-down process including a greater number of cases, wider

interviewing on the process and the ability to shadow processes end-to-end. Access to call-downs occurred only late in the period of empirical research. Unfortunately end-to-end analysis was not possible without more extended participant observation with CXC, which was constrained by personal circumstances outside the research. The CXC secretariat had already provided generous access to email exchanges and draft iterations of reports and so there was a limit to the demands that could be made. Further participatory observation of call-downs, wider interviewing, and or access to more draft iterations of documents may have enabled greater interaction with exclusions and ability to distinguish legitimation from other forms of acceptability, which proved challenging in this part of the research.

Similarly, during interviews, the self-identification exercise and drawings revealed significant differences between personal and professional framings of climate change that offer potential for considering which discursive value framings are enabled to circulate in the professional climate change discourses. With greater time, for example in a second interview, these could open up further discussions over how and why these differences arise, and whether they constitute exclusions. Instead they were insufficiently robust in their current form to be presented as part of the thesis. A problem for any further research into discursive exclusions is how to be attentive to these informal narratives, to take seriously the affective workings of perceived legitimacy, and to formally narrate the work of passions that lie under the formal radar (and may rely on remaining so for their success). This thesis prompts the question what would happen if these voices could be heard as an area for further, more focused, research. Further, it would be useful to assess the four discursive value framings identified in Chapter 4 – economic growth, outcomes orientated policy, Scottish Independence and left leaning politics – within a more extensive documentary analysis of Scottish policy documentation and develop a stronger analysis of the types of discourse that are dominant within Scottish policy-making.

Other difficulties in research provided moments of learning and creativity, particularly around positionality struggles, reflexive challenges during interviews and approaches to working with sensitive subjects. Firstly, being better prepared for supporting and sticking with emotionally sensitive and fragile narratives, as described in section 3.6, may have enabled more prolonged interpersonal discussion and would undoubtedly have generated more ethically sensitive practice. Secondly, while less breadth would

undoubtedly have allowed more time to be spent on intensive shadowing of call-downs, it would have restricted a comparative perspective on CXC's work. Finally, while transitioning my own positionality from practitioner to researcher was at times perhaps un-necessarily complicated, it produced a particular kind of engagement during interviews that brought its own interpersonal benefits. Recognising what the research method allowed and disallowed has meant learning to live with imperfections and the messy process of conducting research - to tell a story, situated, rich and sticky in methodological contingency.

8.4 Contributions to science-policy practice

For the CXC secretariat, as practitioners, the challenge is how to better serve policy. It is difficult to speak to this challenge when the goal of uncritically responding to policy is itself being problematized. Throughout the course of this PhD research, an on-going dialogue with CXC has been opened on how these doctoral research findings might constructively support CXC moving forwards into their next funded phase 2016-21. This has involved several reports and presentations of findings to CXC, most recently a Summary of Findings for CXC Report presented at the CXC AGM 2015 (see Appendix F), and there has been agreement that these research findings will feed into an internal reflections paper to be developed by CXC in spring 2016 based on CXC's first five years of operation and forward trajectory.

This tension over delivering within policy goals or challenging policy gets at the very heart of an internal tension within the organization, characterized by the debates around best policy possible/best possible policy discussed in chapter 5. Challenging policy framings is not outside the interest of both scientific and boundary actors involved in CXC and at the 2013 AGM a conversation between CXC directorate and research scientists erupted over the extent to which CXC could be seen to be critical of Government (RN: CXC-AGM 2013). Although scientists more often articulated concern with independence from policy, the secretariat also raised similar concerns in conversation with me over co-production. There were clearly fears among the secretariat not to become "instruments of political rationality, whose epistemic authority is used primarily as legitimising discourse in policy conflicts and decisions" (Owens, 2012: 6). A contribution of the thesis

to practitioners at all levels might be the highlighting of questions of power and exclusion faced by scientific and boundary voices and in participating with a political voice by highlighting the contingency of present relations and in doing so offering some hope to these unheard voices.

However, being critical of policy frameworks is also not necessarily seen as desirable, especially by members of the directorate, either in the interests of helping the Government deliver against its carbon mitigation targets, or for the future of CXC. Given that the climate change policy commitment has been set, attention is focused on providing policy with pragmatic help in delivering these commitments, not further political challenge. Given this focus on delivery, working within the proposed policy framework is understandable. However, there are reasons to remain cautious of this approach.

Firstly, as Chapter 6 began to indicate, the types of knowledges CXC is being encouraged to provide (e.g. quantifiable costs, volumes and areas) fill existing pragmatic and logistical gaps within current approaches, rather than considering the way that problems are being structured within the wider functioning of the socioeconomic system. This might be seen as an attempt to 'carry water in a sieve' both in a sense that such gaps are un-fillable, and that the vehicle itself is considered by many not fit for purpose. Many practitioners (Interviews: CXC-S3, CXC-S1, SG2, CXC-R10) as well as academics (Warner, 2010; Paterson, 2010; Newell and Paterson, 2010; Parr, 2014; Bailey and Wilson, 2009; Newell, 2011) point to the limitations of responding to climate change without more systemic consideration of political-economic frameworks. There are also political questions raised by the current emphasis on individual behaviour change rather than structural change (Paterson and Stripple, 2010). The problem of responding to climate change is therefore seen as a more radical question of what kind of socio-political and economic society is brought about, which becomes a problem of values, not just technical implementation.

Secondly, one scientist suggested policy are now listening to science but throwing ethical and political questions back to science (Interview CXC-R11) and commented on the need to engage with these questions of perceived independence from policy over the longer term:

“It’s a real issue I think for ClimateXChange and we haven't really fully faced this... but it’s going to come soon... one of these issues is going to come up where, what we say in terms of the science really challenges policy, and yet we're funded by The Scottish Government... we're meant to be independent so we should be challenging policy and yet that's really difficult position to be in... you see that now... in England with... Natural England and The Environment Agency are being reviewed because... they challenge the development process to be more sustainable... there's going to be really difficult decisions to make... and that challenges vested interests” (Interview CXC-R11).

As Owens et al comment at a UK level in the drive for policy responsive science “what scientists should do when their findings are politically inconvenient is not very clearly explained” (2006: 638).

8.4.1 Specificity of CXC

Establishment of ClimateXChange re-envisioned the relationship between science and policy in Scotland to put policy in the driving seat and make science more responsive to policy needs. However, CXC was positioned in Chapter 4 as a product of a wider reconfiguration of the science–policy relationship at UK level. At the 2013 CXC AGM several senior figures in the Scottish and UK science–policy sector situated this move within wider changes in the science policy relationship over time – from first generation knowledge diffusion, dissemination and transfer, to second generation two-way knowledge exchange, and now third generation knowledge integration, mobilisation and uptake focused around translation (RN: CXC-AGM 2013). These wider dynamics increasingly encourage what is referred to as “mode 2” knowledge – “shaped by the needs and interests of some, at least of the potential users” (Gibbons *et al.*, 1994: 54). In this sense CXC is not unique, the model of policy orientated interaction is increasingly seen as “central to the future of science globally” (RN: CXC-AGM 2013). This indicates that rethinking of models of science–policy interaction go beyond arrangements between RESAS and its main research providers and raising broader societal questions, over why these changes in science policy interaction are happening now, at this moment?

Nevertheless, ClimateXChange is positioning itself at the front of this change (RN: CXC-AGM 2013, RN: CXC-AGM 2015) and is both responsive and proactive developing a policy led model. CXC directors and secretariat are playing a proactive role in shaping the mode of interaction by describing policy as CXC’s ‘customers’, emphasizing translation and

focusing on policy needs. As a result CXC is being looked to as a pilot, at least within the UK context. The policy director describes a proliferation of interest from elsewhere in how CXC operates and suggests, “it could be a blueprint for how you could do this elsewhere” (Interview CXC-D1). The current CSA for Scotland is championing the Centres of Expertise as a good model for replication UK-wide (Interviews: SG3, CXC-D2) and there is consciousness of many eyes watching the model of CXC to appraise its effectiveness (RN: CXC-AGM 2013) with one director suggesting that “the journey we’re on is being looked at as the way to go” (RN: CXC-AGM 2013). This makes CXC an important organization through which to study the potential implications of these changes.

Being responsive to wider movements in science–policy limits the extent to which research findings on the political relation envisaged can be attributable to CXC as an organization. In Chapter 6, CXC was seen to be only the tip of much bigger boundary work iceberg and emphasis on translation only one useful tool in a wider emphasis on policy discursive framings achieved through longer histories of boundary work. A strong caveat to any critique of CXC’s limited ability to overtly challenge the Scottish Government is also CXC’s status as a new actor at the science–policy interface in Scotland. Need to establish trust with the Scottish Government was recurrently emphasized by the CXC Secretariat and Directorate, especially given increasing funding pressures for without trust and demonstrable policy benefit, CXC and investment in Scottish climate related science, could easily be seen as a non-essential luxury in the context of UK austerity policy. CXC therefore tread a delicate line in balancing the perceived legitimacy of the organisation in policy as well as scientific terms. Chapter 7 described the importance of timing needed to develop trust to enable greater challenge. In recognition of these pressures it is still argued that it is important to examine the types of knowledge and policy action that are being brought about through the processes of science–policy interaction chosen.

8.4.2 Specificity of Scotland

In some senses Scotland’s commitment to early high carbon reduction targets has allowed climate change to be high on the agenda and Scottish Independence has provided a momentum and energy for change. In other senses discursive alignment of climate change within business as usual narratives of economic growth have rendered climate change policy at best convenient, often ancillary to, and at worst detracting from

more significant challenge of the neoliberal economic growth agenda. During the period of research, the specific ‘Scottishness’ of the research context did little more than provide a Scottish civic epistemology (mapped through the four policy discourses of Chapter 4) and the smaller tighter scale of operations which many actors interviewed suggest provided a specific context for science–policy interaction - making interpersonal interactions denser (in frequency and connections) and encouraging greater energy and bravery to be ambitious in target-setting. However, with CXC being looked to as a pilot and a model of best practice in science–policy interaction (Interviews: CXC-D1, SG6, Climsave1), this calls for wider attentions within the science–policy community over what types of knowledge translation enables to circulate.

8.4.3 Summary of recommendations

Recommendations made to CXC in the feedback reports produced in 2013 and 2015 suggested that CXC should remain attentive to the politics at stake in the types of boundary work engaged, and be reflexive over the different roles that the organization might potentially play at different times. As Barry suggested, science can be political or nonpolitical (Barry, 2007: 290) and “it is partly an empirical question whether scientific work opens up or closes down the space of political contestation” (Barry, 2007: 295; see also Hajer and Versteeg, 2005). While chapters 5 and 6 point to a narrowing role for science through CXC’s translation, Chapter 7 indicated a more expansive role where boundary actors in Scotland are finding ways to reclaim a political subjectivity and open up political debate, albeit in minor ways. Translation is not CXC’s only mode of interaction, and more agonistic exchanges between science and policy occurred at the WAW and UW events (although this is not an easy resolve, as highlighted by Lövbrand (2011) in section 5.4.4). Where CXC translation seeks to dominate meaning through equivalence with existing policy framings, CXC could also develop approaches that value differences and offer opportunities for policy at all levels to explore greater values based debates and construct legitimacy for a range of possible approaches that could be the focus for wider political discussion.

Science–policy boundary work holds an important role beyond encouraging greater use of science within policy making. Owens suggests that a more nuanced understanding of boundary work understands boundary actors as “cognitive or discursive agents, whose advice and ideas might have real effect, though without the simple linearity” that is often

assumed (Owens, 2012: 7). Boundary actors have real capability, with consciousness to the politics of their work, to “shape the kind of science, and related, the kind of social and political theories about the world, that is effectuated” (van Egmond and Bal, 2011: 108). As a result there is need to be attentive to the politics of different forms of boundary work (and the different work achievable through the organizational personalities of Sniffer vs. CXC) in contributing towards or shortcutting political debate (Litfin, 1994: 13; van Egmond and Bal, 2011: 124; Nelkin, 1992; Swyngedouw, 2010).

8.5 Future Research

The journey of the thesis has opened up several further questions in its search for answers. Firstly there is a need to further explore the robustness of an anti-essentialist notion of values. Secondly, questions remain over potential roles for science in responding to climate change. Thirdly, the thesis has in many ways been haunted by notions of affectual encounters opening up a further set of questions that would benefit for engagement with affect literatures.

8.5.1 Empirical attention to post-structurally conceived values

Mouffe’s post-structural values appear to withstand preliminary critiques of falling back on essentialism theoretically (see section 2.6) and empirical attention in this thesis to the way that values are relationally and discursively constituted, provisionally affirms the possibility of a post-structural notion of values. However this thesis has only begun to explore whether this theoretical understanding of values can be sustained empirically, and a more focused series of analytical and interpretive empirical studies of values would be needed to argue this with any greater confidence. This could also explore in more depth what it means to take seriously the problem of the pluralism of values at the science policy interface through more focused research on excluded voices as well as greater attention to the hegemonic value framings and their implications for addressing climate change.

8.5.2 Role of science

Potential for further dialogue has been identified between the work of Jasanoff and Mouffe (in section 8.2.2), which could benefit both approaches. There are unanswered questions around visualizing practical roles for science in policy if not to resolve value differences, and in achieving the more humble epistemological claims that encapsulate its situated and conditional validity (Wynne, 2010: 301; Jasanoff, 2003b; Latour, 2013b). Chapter 7 began to identify different reasons that practitioners in Scotland were turning to science some of which extended beyond Pielke's 4 role model (2007). Potential roles for science warrant both further empirical and conceptual analysis, which would be of benefit to both theoretical and academic communities.

8.5.3 Affect in the governance of climate change

When Pandora opened up the jar in Hesiod's Greek myth, and let evil spirits into the world – Elpis – the spirit of hope was left clinging to the lid. Elpis, understood ambiguously as either (optimistic) hope or the anticipation of disaster, was variously encountered in the empirical narratives of science–policy actors in Scotland. Chapter 7 suggested that hope concurs with the ability to express political subjectivity. In contrast, participant frustration appeared indicative of antagonistic relations – where the realization of a particular outcome was prevented not just from outside, but also inside (Laclau and Mouffe, 1985). Hope is an important characteristic of a Mouffian political theory for it is her ferocious refusal to abandon hope, and emphasis on contingency that the irrevocable possibility to be otherwise resides. As Goeminne has suggested, for Mouffe “exclusion represents the condition of possibility of inclusion (and vice versa) to argue for the very possibility of counter-hegemonic practices” (2012: 160). Hope becomes central to the possibility of imagining a radically different world order (Teruelle, 2012: 46) and as Howarth suggests it is “when the void or undecidability at the heart of any social order is made visible by events, new forms of political agency are made possible” (2010: 314). For Mouffe, revival of the political is grounded in cherishing and opening up alternative spaces and subjectivities – which it is suggested are both a necessity for, and constituted through, hope.

In addition, legitimacy was often felt, not imposed, as forms of ‘anticipated acceptability’. This thesis has sought to attend methodologically and conceptually to the

tacit, experienced, affectual boundaries that mark out legitimate territories - of science and of policy, of boundary actors and of politics, of limits to discourse and possible action. Such boundaries and territories are not objective realities, unanimously identifiable and fixable at specific geographic co-ordinated, but experienced subjectively and affectually. However, this makes such boundaries and territories no less real, no less powerful and no less affective or effective. Finally where Hajer emphasizes an arbitrary picking up and putting down of values according to the practices in which they engage (Hajer, 1995: 69-70), Laclau and Mouffe, and Barad separately draw on notions of sedimentation to provide a sense of connection across encounters (Barad, 2007; Laclau and Mouffe, 1985) While values are not fixed, there is a certain viscosity to things that are held to be important, which means that identification is not arbitrary. This too is envisaged as an affectual relationship that would benefit from further development through engagement with contemporary affect literatures such as Anderson (2006), Gregg and Seigworth (2010), Anderson (2011) and Pedwell (2012).

* * * * *

This thesis argues that we miss much of the politics at the knowledge-policy interface if we do not concentrate enough on the claims to objectivity and neutrality that are achieved through engagement with scientific, technical or expert knowledges and through which objectivity and power becomes collapsed. As Jasanoff argues, claims to neutrality of policy are, like science, “painstakingly constructed, contested, reaffirmed and performed in the routine practices of social actors and institutions” (Jasanoff, 2012a: 21).

Back in 1972 Weinburg suggested that “science alone cannot adequately answer policy relevant questions” (Jasanoff, 2003a: 160). This thesis concludes by following Sarewitz in his suggestion that “progress in addressing environmental controversies will need to come primarily from advances in political process, rather than scientific research” (2004: 399) and suggests that Mouffe’s approach offers one important lens through which to bring political processes around values into focus. Reframing approaches to climate change away from questioning of scientific evidence towards political questions around

how we respond as a collective that will always be divided and hold plural values (both multiple and simultaneous) is a task from which politics is being distracted by those whose interests are threatened by such 'trans-valuation'. Responding politically to climate change will inevitably involve struggle between different values as policy responses are developed. Evoking values-based questions deserves values-based debates – not in ways that fall back on pre-existent notions of right and wrong or as external arbitrators to decide disputes once and for all, but to attend to whose values are being heard, debated and mainstreamed and whose are excluded. Understanding processes of legitimation through which particular discourses are legitimated and others marginalized, and the role science plays in this process, is important in understanding the politics of values at the climate science–policy interface. To take seriously value pluralism requires a capability to value different things, and to value things differently. Neoliberalism reduces a plurality of values to market values and this performs violence to other forms of values. Let us start to have greater agonistic political debate about the types of values we might pursue in the face of climate change.

Appendix A

Climate Change Related Policy Events Attended and Additional Documentary Sources

Climate change related policy events attended

Identifier	Event	Lead organization	Type	Location	Length
Broad - Climate Science–policy Exchanges in Scotland					
RN: MH-CII	Connect Inform and Influence	Mackay Hannah	Delegate Conference	Edinburgh	1 day
RN: MH-2	Housing, Carbon Reduction and Climate Change: the cost, sustainability and supply challenge	Homes for Scotland Conference/ Mackay Hannah	Delegate Conference	Edinburgh	1 day
RN: C2020-M	Climate2020 Group Meeting	Climate2020	Main Group Meeting	Edinburgh	2 hours
RN: SG-FCM	Scottish Government Finance Committee Meeting 5-11-12	The Scottish Government	Parliamentary Committee	Hawick	2 hours
RN: SGMP	Scottish Government Meeting of the Parliament 12-12-12	The Scottish Government	Meeting of Parliament	Edinburgh	2 hours
RN: MH-EPM	Ethics and Policy Making	Mackay Hannah/Church of Scotland	Delegate Conference	Edinburgh	1 day
RN: SSN	SSN Annual Conference	Keep Scotland Beautiful	Sustainable Scotland Network Annual Conference	Edinburgh	2 days
RN: C2020-BESG	Climate 2020 - built environment sub group	Climate2020	Sub-Group Meeting	Glasgow	2 hours
RN: Sniffer-CJ	Climate Justice Conference	Sniffer/Joseph Rowntree Foundation	Scottish Government Conference	Edinburgh	1 day
RN: SG-PB	TSG Parliamentary Business	Scottish Parliament	Parliamentary Meeting	Edinburgh	2 hours
RN: Sniffer-CJ	Climate Justice Conference: Delivering Socially Just Adaptation in Scotland	Sniffer/Joseph Rowntree Foundation	Conference	Edinburgh (Scottish Government)	1 day
In-depth Climsave					
RN: Climsave	Climsave final workshop	Climsave	Final Workshop	Edinburgh	2 days
In depth CXC work Shadowing					
RN:	CXC Policy	CXC	Workshop	Edinburgh	1 day

CXC-PAW1	Awareness Workshop 1				
RN: CXC-PAW2	CXC Policy Awareness Workshop 2	CXC	Workshop	Dundee	1 day
RN: CXC-PAW3	CXC Policy Awareness Workshop 3	CXC	Workshop	Edinburgh	1 day
RN: CXC-WAW	CXC Woodlands Workshop	CXC	Workshop	Edinburgh	1 day
RN: CXC-UW	CXC Uncertainty Workshop	CXC	Workshop	Edinburgh	1 day
RN: CXC-CDCCF	Work Shadowing - Climate Challenge Fund Meeting	CXC	Meeting	Edinburgh	1 hour
RN: CXC-CDCCF2	Climate Challenge Fund Progress Meeting	CXC	Telephone conference		20 mins
RN: CXC Away-Day	Skype Observation of CXC Secretariat away day	CXC	Meeting	Edinburgh	1 day
RN: CXC-CDWT	Work Shadowing with Ragne CXC progress meeting with TSG on wind turbines	CXC	Meeting	Edinburgh	2 hours
RN: C2020PESG	Work Shadowing with Ragne C2020 - Public Engagement sub-group	C2020	Meeting	Edinburgh	2 hours
RN: CXC-AGM 2013	CXC Annual Meeting 2013	CXC	Meeting	Dundee	2 days
RN: CXC-AGM 2015	CXC Annual Meeting 2015	CXC	Meeting	Edinburgh	1 day

List of Additional Empirical Documents referenced

(This refers to call-down requests, informal communications and draft reports that are referenced as empirical sources in the thesis. It excludes published government grey literatures, which are included in the references list)

Identifier	Document	Author/ Organization	Type	Purpose
D: CXC-Peatland-CDR	Enquiry Text Potential Peatlands Abatement	Scottish Government (Natural Assets & Flooding Division)	Email	Formal Request for Information
D: CXC-Peatland-CD	CXC Call-down Report Carbon Savings from Peat Restoration	CXC	Report	Formal Response
D: Email 1	Email from secretariat	CXC	Email	Providing clarification on Information Request
D: CXC- MACC-CDR	Call-down Request MACC	Scottish Government (Climate Change Team - RPP2)	Email	Formal Request for Information
D: CXC- MACC-CD1	Call-down Report MACC1	CXC	Report	Formal Response
D:CXC- MACC-CDF	MACC Call-down Feedback Report	Scottish Government (Climate Change Team - RPP2)	Questionnaire	Providing Feedback on Call-down
D: CXC-Extreme weather-CDR	Call-down Request Extreme Weather	Scottish Government (Climate Change Adaptation Team)	Email	Formal Request for Information
D: CXC-Extreme weather-CD	Call-down Report Extreme Weather	CXC	Report	Formal Response
D: Email 2	Email to secretariat from Research scientist	CXC	Email	Clarifying changes to report
D: CXC-Extreme weather-CD draft Dec 2012	Draft Call-down Report Extreme Weather Dec 2012	CXC	Report	Early Draft Response
D: Email 3	Email to CXC research secretariat from Research scientist	CXC	Email	Providing Scientific support/advice

Appendix B

Research Interviews
Conducted

Interviews were conducted between May 2012 and October 2014
(Names have been excluded to preserve confidentiality)

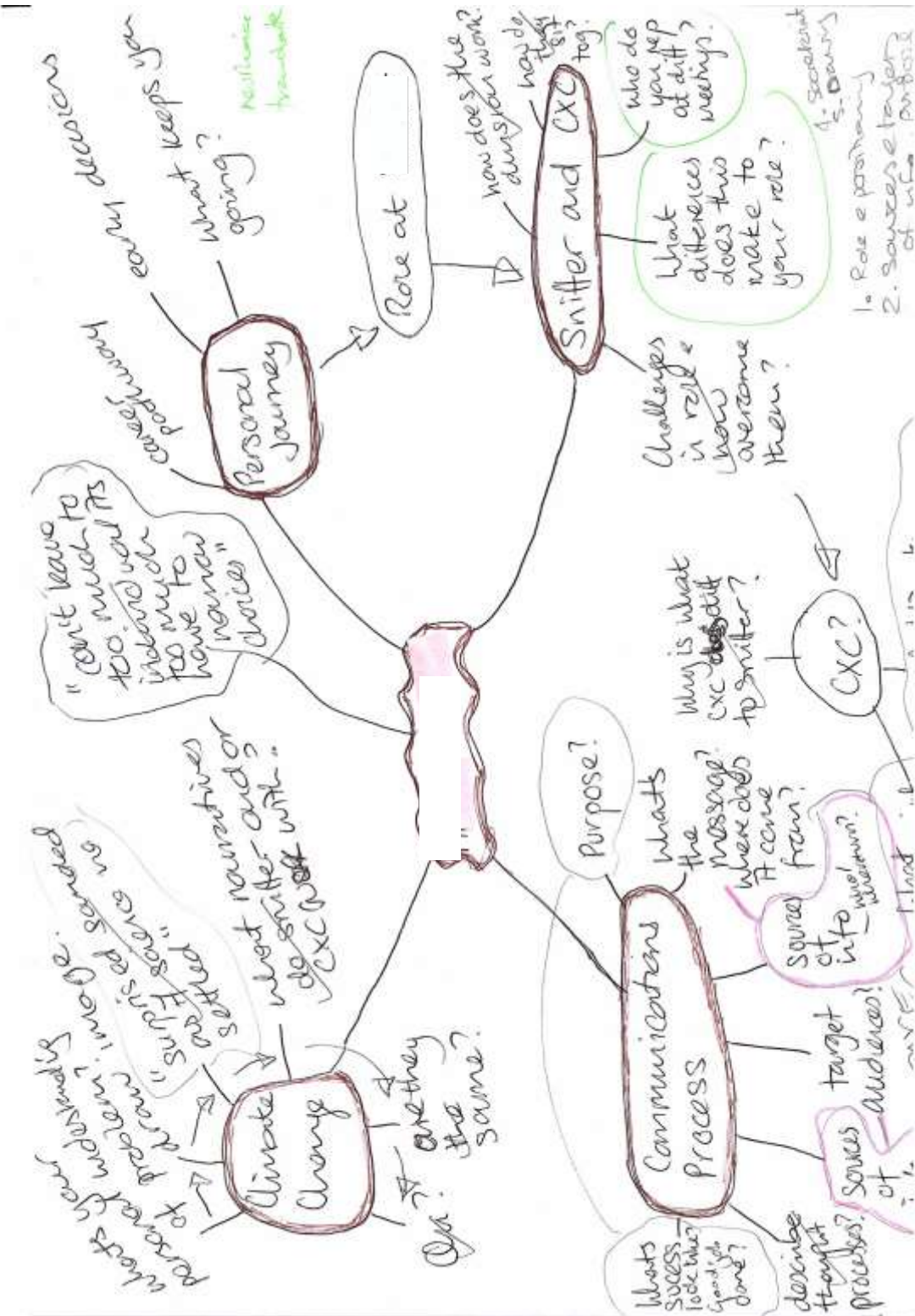
Identifier	Role	Organization	Type
Interview CXC-R1	Research Scientist (biological scientist)	CXC	Face to face recorded
Interview CXC-R2	Research Scientist (climate modeler)	CXC	Face to face recorded
Interview CXC-R3	Research Scientist (statistician)	CXC	Face to face recorded
Interview CXC-R4	Research Scientist (physicist)	CXC	Face to face recorded
Interview CXC-R5	Research Scientist (social scientist)	CXC	Face to face recorded
Interview CXC-R6	Research Scientist (economist)	CXC	Face to face recorded
Interview CXC-R7	Research Scientist (social scientist)	CXC	Face to face recorded
Interview CXC-R8	Research Scientist (behavioural scientist)	CXC	Face to face recorded
Interview CXC-R9	Research Scientist (ecological scientist)	CXC	Face to face recorded
Interview CXC-R10	Research Scientist (ecological scientist)	CXC	Face to face recorded
Interview CXC-R11	Research Scientist (climate modeler)	CXC	Face to face recorded
Interview CXC-R12	Research Scientist (economist)	CXC	Face to face recorded
Interview CXC-S1	ClimateXChange Secretariat - One of five with responsibility for day to day management and delivery of CXC's organisation activities and services.	CXC	Face to face recorded
Interview CXC-S2	ClimateXChange Secretariat - One of five with responsibility for day to day management and delivery of CXC's organisation activities and services.	CXC	Face to face recorded
Interview CXC-S3	ClimateXChange Secretariat - One of five with responsibility for day to day management and delivery of CXC's organisation activities and services.	CXC	Face to face recorded

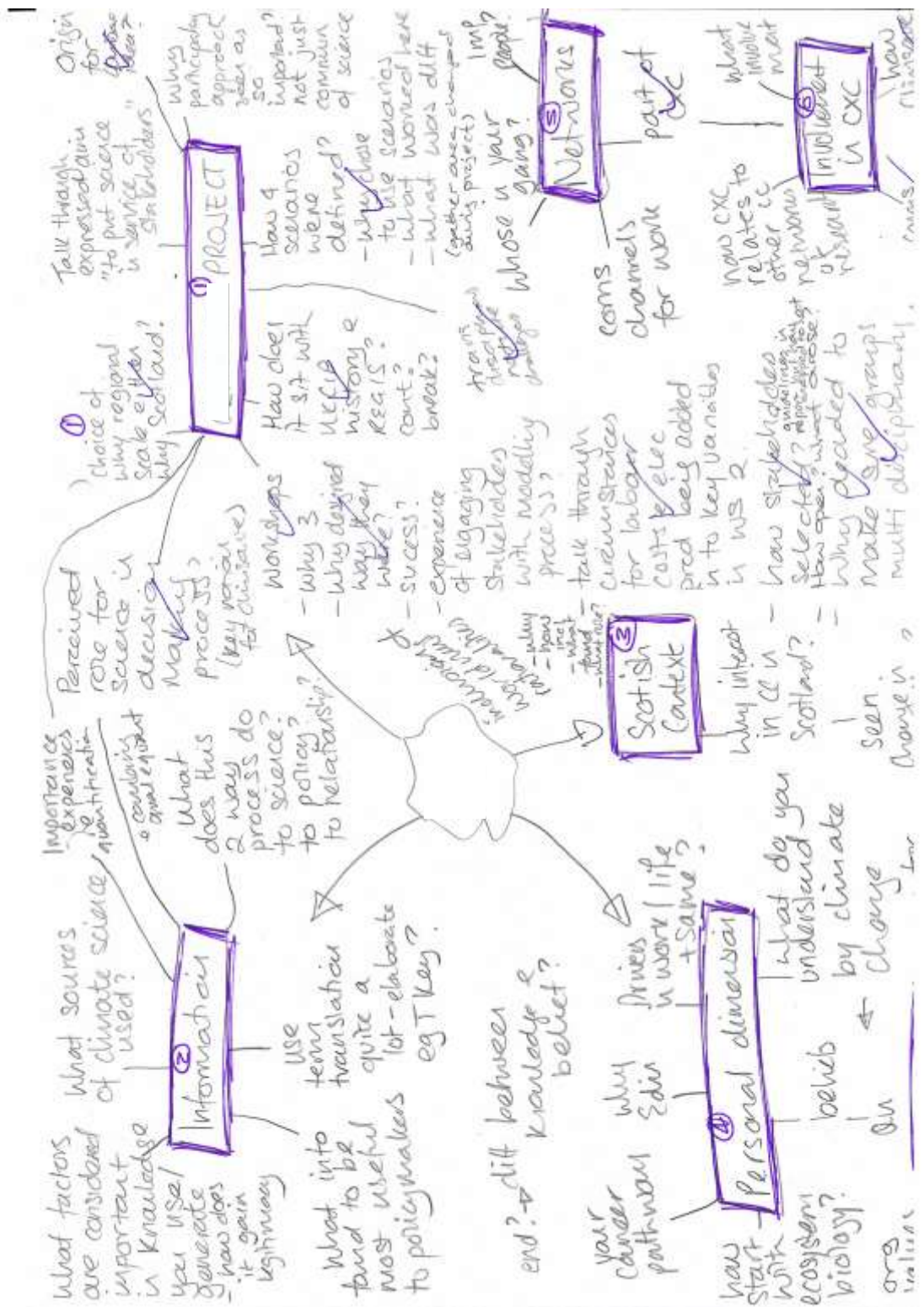
Interview CXC-S3-2	ClimateXChange Secretariat second interview	CXC	Telephone
Interview CXC-D1	ClimateXChange Director - One of three directors of CXC responsible for organisational direction and management.	CXC	Face to face recorded
Interview CXC-D2	ClimateXChange Director- One of three directors of CXC responsible for organisational direction and management.	CXC	Face to face recorded
Interview SG1	Scottish Government Civil Servant (Public Sector Reform)	Scottish Government	Face to face recorded
Interview SG2	Scottish Government Civil Servant (Rural Environmental Science and Analytical Services)	Scottish Government	Face to face recorded
Interview SG3	Scottish Government Civil Servant (Climate Adadptation Team)	Scottish Government	Face to face recorded
Interview SG4	Scottish Government Civil Servant (Climate Mitigation Team)	Scottish Government	Face to face recorded
Interview SG5	Scottish Government Civil Servant (Public Sector Duties)	Scottish Government	Face to face recorded
Interview SG6	Scottish Government Civil Servant (Chief Scientific Advisor)	Scottish Government	Face to face recorded
Interview SGA 1	Scottish Government Agency Civil Servant	Scottish Government Agency	Face to face recorded
Interview SGA 2	Scottish Government Agency Civil Servant	Scottish Government Agency	Face to face recorded
Interview SGA 3	Scottish Government Agency Civil Servant	Scottish Government Agency	Face to face recorded
Interview SGA 4	Scottish Government Agency Civil Servant	Scottish Government Agency	Face to face recorded
Interview Sniffer 1	Sniffer Staff	Sniffer	Face to face recorded
Interview Sniffer 2	Sniffer Staff	Sniffer	Face to face recorded
Interview Sniffer 3	Sniffer Staff	Sniffer	Face to face recorded
Interview Sniffer 4	Sniffer Staff	Sniffer	Face to face un-

			recorded
Interview C2020 1	Member of C2020 Group	Climate 2020 Group	Face to face recorded
Interview C2020 2	Member of C2020 Group	Climate 2020 Group	Face to face recorded
Interview C2020 3	Member of C2020 Group	Climate 2020 Group	Face to face recorded
Interview Met Office	Chief Scientific Advisor	Met Office	Face to face recorded
Interview Climsave 1	Climsave Scientist	University Of Edinburgh	Face to face recorded
Interview Climsave 2	Climsave Scientist	University of East Anglia	Face to face recorded
Interview Climsave 3	Climsave Stakeholder	Local Government Officer	Face to face recorded
Interview NGO 1	Scottish Environmental NGO Professional	Advisor on Sustainable Development	Skype Recorded
Interview NGO 2	Scottish Environmental NGO Professional	Stop Climate Chaos Scotland	Face to face recorded
Interview IUCN	Peatland Programme's Research Manager	International Union for Conservation of Nature	Telephone Recorded

Appendix C

Samples of Interview
Schedule Mind Map





Appendix D

Interview Excerpt:
detailing a model to policy
for predicting the needs of
migrating species under a
changing climate

Extract from transcript with Scottish Government Civil Servant on experience of previous engagement with science

- Showing a typical scenario of bad communication from the Scottish Government's perspective

CIVIL SERVANT: When we have done these things internally you know organised meetings with researcher's from the MRPs...the expectation on the scientists is to actually either to be there to talk through an issue, and you know have a discussion, rather than just a presentation, or if its presentations then it's not about, well, it is about the science, but not about how science is done, or you know new developments in science, but it's more about, you know, what is policy relevant about this ... looking at a topic from the policy side ... things that we have organized have been a success, and I think things that MRP's have organized are probably less so... they want to talk about science when they do something ((laughing)) um, which is fine you know, but it's not necessarily anything to do with what we are interested in

RM: yes yeah

CIVIL SERVANT: um so (.1) it's yeah it's about I think it's very much about you know defining the issue properly, and selecting the right people to do the presentation. We had one presentation on biodiversity networks so the question is you know how big, how big do the areas have to be or it doesn't make sense to connect up you know nature reserves corridors and so on and what and (.2) ...the real question well the real question was is it useful or not? It was a bit 'sciencey', and you know basically ... the question ultimately that we had, really had, was (.1) is this cost effective? Of course it's very difficult to say if it's cost effective you know, cost effective compared to what? ((laughing)) er but that wasn't, that wasn't the question they were really interested in or weren't or perhaps they hadn't been really asked to to look at or think about (.) so I didn't think that that was a good example of, that

wasn't really a good example of interaction, although people did find it interesting ((laughing))

RM: mmm, was that question explicit?

CIVIL SERVANT: no it [wasn't explicit]. It wasn't.

RM: [yeah yeah]

CIVIL SERVANT: It wasn't very well posed, so it was our fault um but

RM: but in one sense, but I guess that's quite a difficult question to pose

CIVIL SERVANT: it's a difficult [question] and difficult to answer, but um I didn't feel that from the science side... they didn't really have a think from their side as to you know what does that mean, what does that mean for policy? Why are we talking about this? You know, because it was self-evident for them to them because they're working in the field that you know that is interesting ((laughing))

RM: yes, yeah

CIVIL SERVANT: important ((laughing)), but you know, for example they had some model you know, so an entirely theoretical model of an animal wandering about in the theoretical landscape you know, there are obstacles, and is it meeting another animal, you know to mate

RM: right ((laughing))

CIVIL SERVANT: you know and you can put different decision rule rules on that animal to say how likely it is to cross a river or a road you know, um and you know, just by random movement with certain decision rules, you get them to meet right? The question is how long does it take? These kinds of things are very interesting things... er and ...if you play around with decision rules they've got, you can mimic natural behaviour um which is also interesting um (.2) Next step then, lets apply this. right let's how do you apply this to the real world and tell me which obstacles do we really need to take out to allow this movement you know in order to maintain genetic diversity for example. That

question (.1) that was the next question then, they didn't, weren't really interested in

RM: they stopped there yeah

CIVIL SERVANT: they [stopped there] you know so for us, or for me, the question was, how does that translate then for us you know what does it tell us? You know, does it tell us that we need bigger areas. Does it tell us that you know that we need to remove obstacles? Does it tell us that actually these ladders work across roads? ... as an economist I know people play around with models and never apply it to reality and they are not interested in doing that, so fair enough ((laughing))

RM: yeah yeah

CIVIL SERVANT: but but that's that is the question we **are** interested in! you know how does it relate to reality you know and what can we learn you know? ... what does it tell us you know what does it tell us on a larger scale? So you find out something about biodiversity in a certain species alright! So you know something about this moth. Is there something bigger we can say? And scientists generally will say, well no we did, well we were only looking at the species. I can't extrapolate now for you to tell you anything about any, not even another insect right which is fair enough yes! ok but arghhh!

RM: what do I do with it?

CIVIL SERVANT: yeah. Why do you tell me that? You know if this is only applicable to to that moth you know and nothing else. Actually pffff its it's irrelevant for me! ((laughing)) so it's that kind of kind of translation so you're going for evidence and then that's now the hunch aspect right? So you've got the scientist that says, no no this is this is just this species that I can tell you anything about. Ok that's fair enough. Scientifically ok. yeah but! Tell me, what is your expert judgement? how that relates to behaviour of other insects, you know, and what are the key determinants of this behaviour that is, that are relevant, to the policy issues at hand. That is the kind of thing that is required.

Appendix E

Policy Awareness Workshop
Sample Agenda

Policy Awareness Workshop

19 September 2012

AGENDA

- 09:00 Introductions and context – what do you want to get from today?
- 09:30 What is policy and how is it made? A participatory exercise and discussion
- 10:40 Coffee break
- 10:50 Feedback from the exercise
- 11:20 How to be better engaged - Understanding the policy cycle
- 12:00 Writing for Policy
- 12:40 Lunch – networking and free discussions
- 13:25 Policy documents you should be familiar with and how legislation is developed
- 13:40 Real-world policy development: Case study and discussion. Taking a relevant policy as an example, we will discuss the rocky road from idea to policy
- 14:20 Coffee break
- 14:30 Developing research plans to address policy requirements – exercise
- 15:00 Feedback from the exercise
- 15:20 Summing up discussion - what are you taking away from today? How does this match Your expectations?
- (latest 16:00) Finish

Appendix F

Summary of Findings for CXC

REFLECTIONS ON CXC PRESENTED TO CXC AGM 11/11/2015

Ruth Machen

INTRODUCTION AND METHODS

This presentation and report draws together reflections on the model of science-policy interaction being developed by CXC following research with the organisation since inception in 2011. The research findings are drawn from interviews, participation and documentary analysis conducted with CXC between 2012 and 2014 as part of doctoral research at Durham University. This doctoral research itself is less interested in how CXC can do what it does better, and more interested in attentiveness to the politics associated with conducting science-policy interaction in this way. However, recognizing CXC's interest in using the work as a critical friend for organizational development, this report seeks a balance between providing practical comments to improve practice and reflections to provoke more reflexive debate about CXC's overall direction.

TRANSLATION

CXC's work – especially the call-down service - was often described as 'translation'. The language of co-production was also used in relation to medium-and-long-term work. This stood in contrast to other ways of describing science policy interaction encountered at the science-policy interface in Scotland – such as knowledge brokerage or science communication. Further exploration of the concept of translation revealed two things. Firstly that the language of translation was being employed by CXC secretariat and directorate staff and Scottish Government policy officials much more than CXC's research scientists. Secondly, the process of translation envisaged by CXC's scientists and CXC's secretariat/directorate showed significant differences during exploration of the concept during interviews – these differences resonated with a natural/social-science divide with scientists understanding the process of translation more as a process of (continuous) filtration from a larger whole and policy/CXC staff understanding translation more as a process of (discontinuous) conversion from one domain to another that is not the same. A practical point of conclusion is that this difference in understanding of what translation involves may be hindering the practical task of encouraging scientists to perform conversion of information into a new context. However, there are other implications that grow out of this finding that are also worth noting.

1. TRANSLATION AS DISCURSIVE WORK

Understanding the push among CXC and Policy for science-policy interaction to be thought of as conversion of meaning into a new domain draws from lay understandings of translation originating within linguistics as the construction of meaning for a target audience. In this process, emphasis is placed on the frameworks of meaning of that target audience into which meaning is constructed. Emphasis on translation can therefore be seen to perform discursive work – encouraging through language a particular form of interaction process that prioritises the meaning of policy, as audience.

2. EXPERT OPINION

This pressure for conversion can be seen in the move to ask scientists for expert opinion in the absence of evidence. A typical quote from a policy maker went along the lines of – ‘we know you haven’t got evidence and can’t be certain but you know a lot more than we do, so tell us, give us your expert opinion’. Rather than distilling directly from an evidence base, scientists are being asked to convert what they know in one area into opinion on what might be the case in another. This asks scientists to go against their epistemic training and encourages a new subjectivity for many scientists as experts with opinions, rather than voices of scientific evidence. Whilst the resistance of scientists is often seen as being stubborn, difficult or backward, such demands evoke questions of scientific identity. This problem is not unique to CXC - Climate change as a ‘post-normal’ condition for science demanding knowledge in conditions of high uncertainty, high urgency, high value contestation (Funtovich and Ravetz 1992) demands a move away from logical positivism that puts traditional markers of scientific knowledge and traditional subjectivities of some scientists in threat. This poses a challenge to all involved in CXC. Understanding the social and subjective dimensions of this cultural change might help work through some of these tensions.

3. SERVING POLICY – REPRODUCING THE STATUS QUO

One implication of emphasizing policy framings of meaning is that knowledge is shaped through particular framings of understanding – over what the problem of climate change is, what solutions are available and the scope of possibility for change. These framings may be good or bad, right or wrong in different people’s eyes, but the act of translating takes these meanings as fixed points – naturalizing their claims to speak for what is valued and what is possible. Conducting boundary work as translation therefore enables the circulation of particular types of knowledge that speak well to these existing understandings.

COMPARING CO-PRODUCTION, KNOWLEDGE BROKERAGE AND SCIENCE COMMUNICATION

Comparing the processes being described as translation to other processes of science-policy interaction undertaken by others in Scotland suggested there are differences in the types of relationship between science and policy being encouraged in each case.

Science-Communication – describes a one directional process of providing existing scientific knowledge to new audiences. It envisages a strict boundary between science and policy where knowledge may be used to challenge policy but any challenge of the knowledge itself is resisted. Responsibility for what is done with knowledge is distanced from the communicator and in the hands of the audience

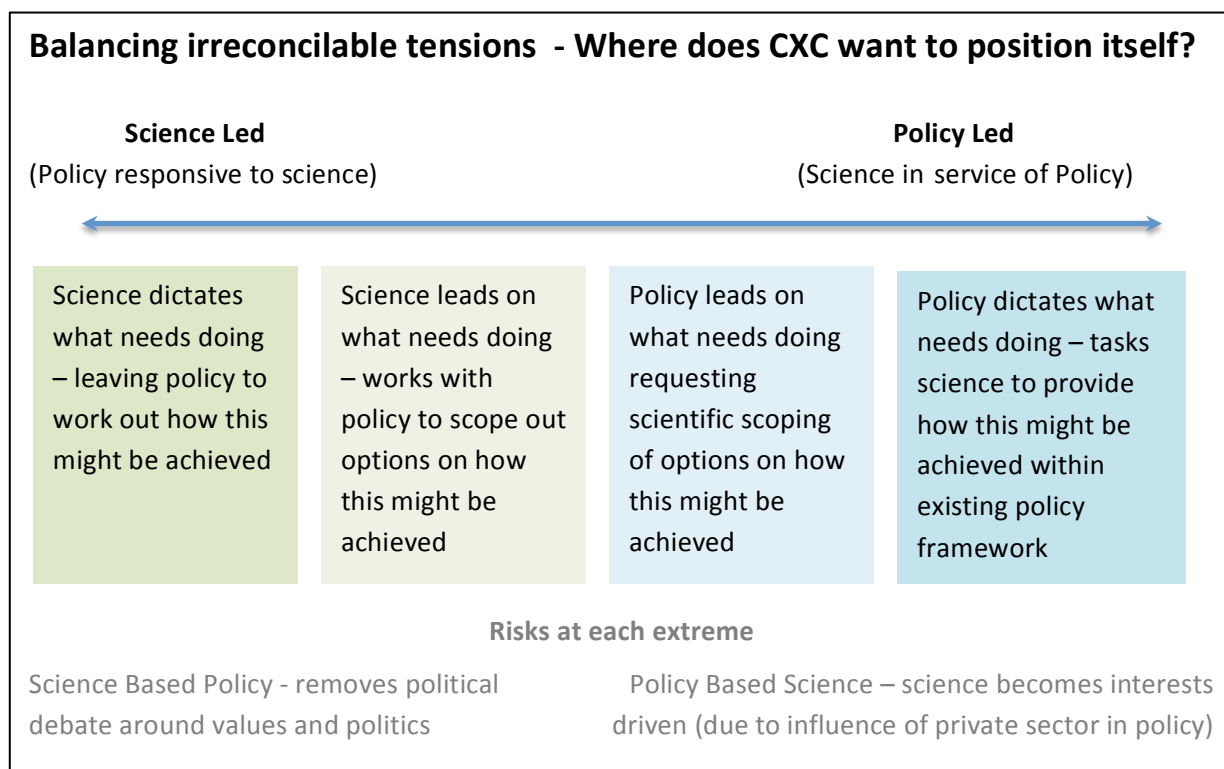
Knowledge Brokerage – describes the bringing of people and knowledges together by a broker who is independent from both science and policy. In the case of Sniffer (but not necessarily in wider brokerage literature) there is an emphasis on being a facilitator and a catalyst for action. In such cases while there is debate around application of knowledge in new contexts knowledge

itself is relatively fixed, and science is not challenged. There is scope for policy challenge but this occurs through empowering the voices of those within policy to take forward that challenge.

Translation – describes the framing of knowledge into the frameworks of meaning of policy, interaction between the scientific and policy communities is mediated through the translator who is seen as a member of both communities and therefore able to speak the language of both. In the interests of establishing meaning there is a non-conflict approach to policy although there may be some conflict with science. Success and responsibility for translation is in the hands of those acting as translators (CSC secretariat and scientists involved). There is a boundary between science and policy, and interest in maintaining it (not least to require the services of a translator) but the boundary is less definite with push back on science to enter into the mindset of policy.

Co-Production - Knowledge is shaped jointly by scientists and policy makers. There is direct interaction of each community with or without facilitation and Success for communication in hands of both science and policy communities jointly. There is mutual challenge by each community of each other although, that is subject to struggles of power and too much conflict could be detrimental to the process. This produces a much weaker boundary between science and policy.

POLITICS OF BOUNDARY WORK



FURTHER INFORMATION:

Please contact me on: k.r.machen@durham.ac.uk . As this is a draft summary prior to thesis submission - please do not reproduce without consent.

References

- Abels G. (2007) Citizen Involvement in Public Policy-making: Does it Improve Democratic Legitimacy and Accountability? The Case of pTA. *Interdisciplinary Information Sciences* 13(1): 103-116.
- Adamson S and Holloway M. (2012) Negotiating sensitivities and grappling with intangibles: Experiences from a study of spirituality and funerals. *Qualitative Research* 12(6): 735-752.
- Adger WN, Paavola J and Huq S. (2006) Toward justice in adaptation to climate change. In: Adger WN, Paavola J, Huq S, et al. (eds) *Fairness in adaptation to climate change*. Cambridge, MA: MIT Press, 1-19.
- Ahmed S. (2010) *The promise of happiness*: Duke University Press.
- Allen J. (2011) *Lost geographies of power*: John Wiley & Sons.
- Anderson B. (2006) Becoming and being hopeful: towards a theory of affect. *Environment and planning D* 24(5): 733.
- Anderson B. (2011) Affect and biopower: towards a politics of life. *Transactions of the Institute of British geographers* 37(28-43).
- Antonesa M, Fallon H, Ryan AB, et al. (2006) *Researching and Writing Your Thesis: A Guide for Postgraduate Students*: National University of Ireland, Maynooth.
- Asdal K, Brenna B and Moser I. (2007) The politics of interventions. In: Asdal K, Brenna B and Moser I (eds) *Technoscience: The politics of interventions*. Oslo: Oslo Academic Press, 7-56.
- Aspinall R. (2010) Geographical Perspectives on Climate Change. *Annals of the Association of American Geographers* 100(4): 715-718.
- Atkinson P and Hammersley M. (1994) Ethnography and participant observation. In: Denzin N and Lincoln Y (eds) *Handbook of Qualitative Research*. Thousand Oaks: Sage Publications., 248-261.
- Atkinson P and Silverman D. (1997) Kundera's Immortality: The interview society and the invention of the self. *Qualitative Inquiry* 3((3)): 304-325.
- Bachmann-Medick D. (2009) Introduction: The translational turn. *Translation Studies* 2(1): 2-16.
- Backstrand K. (2003) Civic Science for Sustainability: Reframing the Role of Experts, Policy-Makers and Citizens in Environmental Governance. *Global Environmental Politics* 3(4).
- Bailey I. (2007) Market Environmentalism, New Environmental Policy Instruments, and Climate Policy in the United Kingdom and Germany. *Annals of the Association of American Geographers* 97(3): 530-550.
- Bailey I, Gouldson A and Newell P. (2011) Ecological Modernisation and the Governance of Carbon: A Critical Analysis. *Antipode* 43(3): 682-703.
- Bailey I and Wilson GA. (2009) Theorising transitional pathways to a low carbon economy. *Environment and Planning A* 41(2324 - 2341).

- Baiocchi G, Graizbord D and Rodríguez-Muñiz M. (2013) Actor-Network Theory and the ethnographic imagination: An exercise in translation. *Qualitative Sociology* 36(323-341).
- Barad K. (2007) *Meeting the universe halfway: quantum physics and the entanglement of matter and meaning*, USA: Duke University Press.
- Bardi A and Schwartz S. (2003) Values and behavior: strength and structure of relations. *Personality and Social Psychology Bulletin* 29(1207 - 1220).
- Barnes TJ and Duncan JS. (1992) Introduction: Writing Worlds. In: Barnes TJ and Duncan J, S. (eds) *Writing Worlds: Discourse, text, metaphor in the representation of landscape*. London: Routledge, 1-17.
- Barraza L. (1999) Children's Drawings About the Environment. *Environmental Education Research* 5(1): 49-66.
- Barry A. (2007) Political Interventions. In: Asdal K, Brita B and Moser I (eds) *Technoscience the politics of interventions*. Oslo Oslo Academic Press, 287-308.
- Bassnett S. (2011) *Reflections on translation*, Bristol: Multilingual Matters.
- Bassnett S. (2014) *Translation*, London: Routledge.
- Bauder H and Mauro ED. (2008) Knowledge grab: corporate appropriation and exploitation of academic geographers. *Antipode* 40(5): 729-735.
- Baxstrom R. (2008) *Houses in Motion: The Experience of Place and the Problem of Belief in Urban Malaysia*: Stanford University Press.
- Bayard C and Clark DL. (1996) On the Itineraries of Democracy: An Interview with Chantal Mouffe. *Studies in Political Economy* 49(131-148).
- Beals K. (2014) Alternatives to impossibility: Translation as dialogue in the works of Paul Celan. *Translation Studies* 7(3): 284-299.
- Beaulieu A. (2001) Voxels in the Brain Neuroscience, Informatics and Changing Notions of Objectivity. *Social Studies of Science* 31(5): 635-680.
- Beck U. (2010) Climate for Change, or How to Create a Green Modernity? *Theory Culture & Society* 27(2-3): 254-266.
- Beetham D. (2013) *The legitimation of power*: Palgrave Macmillan.
- Bendelow G. (1993) Using visual imagery to explore gendered notions of pain. *SAGE FOCUS EDITIONS* 152(212-212).
- Bennett K. (2002) Interviews and Focus Groups. In: Smith PS (ed) *Doing Cultural Geography*. Thousand Oaks CA: Sage Publications, 151-175.
- Bergen RK. (1993) Interviewing survivors of marital rape: Doing feminist research on sensitive topics. . In: Clare Renzetti RL (ed) *Re- searching Sensitive Topics* London: Sage, 197-211
- Berlant LG. (2011) *Cruel optimism*: Duke University Press.
- Bielak AT, Campbell A, Pope S, et al. (2008) From science communication to knowledge brokering: the shift from 'science push' to 'policy pull'. *Communicating science in social contexts*. Springer, 201-226.
- Biesta G. (2011) The ignorant citizen: Mouffe, Rancière, and the subject of democratic education. *Studies in Philosophy and Education* 30(2): 141-153.
- Bijker WE, Bal R and Hendriks R. (2009) *The paradox of scientific authority: The role of scientific advice in democracies*, Cambridge Massachusetts: Massachusetts Institute of Technology.
- Black J. (2008) Constructing and contesting legitimacy and accountability in polycentric regulatory regimes. *Regulation & Governance* 2(2): 137-164.
- Blok A. (2011) War of the Whales: Post-Sovereign Science and Agonistic Cosmopolitics in Japanese-Global Whaling Assemblages. *Science, Technology & Human Values* 36(1): 55-81.

- Bora A and Hausendorf H. (2006) Participatory science governance revisited: normative expectations versus empirical evidence. *Science and Public Policy*, 33(7): 478-488.
- Boycoff M, T. (2007) From convergence to contention: United States mass media representations of anthropogenic climate change science. *Transactions of the Institute of British geographers* 32 (477-489).
- Boycoff MT. (2007) Lost in translation? United States television news coverage of anthropogenic climate change, 1995–2004. *Climatic Change* 86(1-2): 1-11.
- Bracken LJ and Oughton EA. (2013) Making sense of policy implementation: the construction and uses of expertise and evidence in managing freshwater environments. *Environmental Science & Policy* 30(10-18).
- Braidotti R. (2013) *The posthuman*: John Wiley & Sons.
- Braun D. (1998) The role of funding agencies in the cognitive development of science. *Research Policy* 27(8): 807-821.
- Brew A. (2010) Conceptions of Research: A phenomenographic study. *Studies in Higher Education* 26(3): 271-285.
- Brewer JD. (1993) Sensitivity as a problem in field research: a study of routine policing in Northern Ireland. In: Renzetti CM, & Lee, R. M (ed) *researching Sensitive Topics*. California: Sage, 125–145.
- Bridgman T. (2007) Freedom and autonomy in the university enterprise. *Journal of Organizational Change Management* 20(4): 478 - 490.
- Bulkeley H and Schroeder H. (2012) Beyond state/non-state divides: global cities and the governing of climate change. *European Journal of International Relations* 18(4): 743-766.
- Bullock H, Mountford J and Stanley R. (2001) Better Policy Making. In: Studies CO-CfMaP (ed).
- Burawoy M. (2011) Redefining the Public University: Global and National Contexts. In: Holmwood J (ed) *A Manifesto for the Public University*. London: Bloomsbury Academic, 27–41.
- Burns RB. (2000) *Introduction to research methods*, Melbourne, Australia: Longman.
- Callon M. (1986) "Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Briec Bay.". In: Law J (ed) *Power, Action and Belief: A New Sociology of Knowledge*. London: Routledge & Kegan Paul., 196-233.
- Callon M and Law J. (1982) On Interests and their Transformation: Enrolment and Counter-Enrolment. *Social Studies of Science* 12(4): 615-625.
- Carvalho A and Burgess J. (2005) Cultural circuits of climate change in U.K. broadsheet newspapers, 1985-2003. *Risk Anal* 25(6): 1457-1469.
- Cash D, Clark WC, Alcock F, et al. (2002) Salience, credibility, legitimacy and boundaries: Linking research, assessment and decision making.
- Cash DW, Clark WC, Alcock F, et al. (2003) Knowledge systems for sustainable development. *Proc Natl Acad Sci U S A* 100(14): 8086-8091.
- Castree N. (2002) Environmental issues: from policy to political economy. *Progress in Human Geography* 26(3): 357-365.
- Chase SE. (1996) Personal Vulnerability and Interpretive Authority in narrative Research. In: Josselson ebR (ed) *Ethics and Process in the Narrative Study of Lives* Sage.
- Chilvers J. (2008) Deliberating Competence: Theoretical and Practitioner Perspectives on Effective Participatory Appraisal Practice. *Science, Technology & Human Values* 33(2): 155-185.
- Climate Change Commission. (2015) *Global Action on Climate Change*. Available at: <https://www.theccc.org.uk/tackling-climate-change/the-legal-landscape/climate-change-act-and-uk-regulations/>

- Collins M. (2007) Ensembles and probabilities: a new era in the prediction of climate change. *Philos Trans A Math Phys Eng Sci* 365(1857): 1957-1970.
- Commission E. (2015) *Climate Action - EU 2020 reporting (European Semester)*. Available at: http://ec.europa.eu/clima/policies/strategies/progress/reporting/index_en.htm.
- Cook JA and Fonow MM. (1984) Am I my sister's gatekeeper?: Cautionary tales from the academic hierarchy. *Humanity and Society* 8(4): 442-452.
- Corner A, Markowitz E and Pidgeon N. (2014) Public engagement with climate change: the role of human values. *Wiley Interdisciplinary Reviews: Climate Change* 5(3): 411-422.
- Crang M and Cook I. (1995) *Doing ethnographies*, Norwich: Geobooks.
- Crang M and Cook I. (2007) *Doing ethnographies.*: Sage.
- Crang P. (1994) Its Showtime: on the workplace geographies of display in a restaurant in south east England. *Environment and Planning D: Society and Space* 12(675-704).
- Crompton T. (2010) *Common Cause The Case for Working with our Cultural Values* WWF UK.
- Crow DA and Boykoff MT. (2014) *Culture, politics and climate change: how information shapes our common future*: Routledge.
- Crowder G. (2006) Chantal Mouffe's Agonistic Democracy Refereed Paper Presented To The Australasian Political Studies Association Conference. *Australasian Political Studies Association conference*. University of Newcastle Australia.
- CXC. (2015) *Carbon Benefits from Peatland Restoration*. Available at: <http://www.climatechange.org.uk/reducing-emissions/carbon-benefits-peatland-restoration/>.
- Davies CA. (1999) *Reflexive Ethnography.*, London. : Routledge.
- de Lima Costa C and Alvarez SE. (2014) Dislocating the Sign: Toward a Translocal Feminist Politics of Translation. *Signs* 39(3): 557-563.
- DEFRA. (2008) A Framework For Pro- Environmental Behaviours. . In: Unit. EB (ed).
- Demeritt D. (2001) The construction of global warming and the politics of science. *Annals of the Association of American Geographers* 91(2): 307-337.
- Demski C, Butler C, Parkhill KA, et al. (2015) Public values for energy system change. *Global Environmental Change* 34(59-69).
- Deveaux M. (1999) Agonism and pluralism. *Philosophy & Social Criticism* 25(4): 1-22.
- Dexter LA. (1970) *Elite and Specialized Interviewing*, Evanston: North-western University Press.
- Di Gregorio M. (2012) Networking in environmental movement organisation coalitions: interest, values or discourse? *Environmental Politics* 21(1): 1-25.
- Dilling L and Lemos MC. (2011) Creating usable science: Opportunities and constraints for climate knowledge use and their implications for science policy. *Global Environmental Change* 21(2): 680-689.
- Dogon M. (1992) Conceptions of Legitimacy. In: Kogan MHaM (ed) *Encyclopedia of government and politics*. London: Routledge.
- Doran PT and Zimmerman MK. (2009) Examining the scientific consensus on climate change. *Eos, Transactions American Geophysical Union* 90(3): 22-23.
- Douglas H. (2009) *Science, policy, and the value-free ideal*: University of Pittsburgh Pre.
- Dowler L. (2001) Fieldwork in the trenches: participant observation in a conflict area. In: Limb M and Dwyer C (eds) *Qualitative Methodologies for Geographers: Issues and Debates*. London: Arnold, 153-164.
- Dryzek JS and Niemeyer S. (2006) Reconciling pluralism and consensus as political ideals. *American Journal of Political Science* 50(3): 634-649.

- DTI UG. (2003) Energy White Paper: Our energy future - creating a low carbon economy. In: Industry UGDfTa (ed).
- Du Gay P. (2000) *In praise of bureaucracy: Weber-organization-ethics*: Sage.
- Dwyer SC and Buckle JL. (2009) The Space Between: On Being an Insider-Outsider in Qualitative Research. *International Journal of Qualitative Methods* 8(1): 54 -63.
- Eagleton T. (1983) *Literary Theory: An Introduction*, Oxford: Blackwell.
- Edge S and Eyles J. (2013) The socio-spatial (re)configuration of legitimacy, knowledge, and practice in chemical risk governance: integrating boundary-work and scale-frame analytics. *Environmental Politics* 23(2): 282-301.
- Edwards PN. (1999) Global climate science, uncertainty and politics: Data - laden models, model - filtered data, . *Science as Culture* 8(4): 437-472.
- Edwards R. (1993) An education in interviewing: placing the researcher and the research. In: Lee CRaR (ed) *Researching Sensitive Topics*. London: Sage, 181-196.
- Ekins P, Kesicki F and Smith AZP. (2011) Marginal Abatement Cost Curves: A call for caution. UCL Energy Institute commissioned by Greenpeace UK.
- Ellerman DA and Decaux A. (1998) Analysis of Post-Kyoto CO2 emission trading using marginal abatement curves. . *Report 40* Massachusetts Institute of Technology - Joint Program on the Science and Policy of Global Change.
- Elliott B. (2010) *Constructing community: configurations of the social in contemporary philosophy and urbanism*: Lexington Books.
- Executive S. (2006) Changing Our Ways: Scotland's Climate Change Programme. In: Executive S (ed).
- Fabienne P. (2014) Political Legitimacy. In: Zalta EN (ed) *The Stanford Encyclopedia of Philosophy*. Winter ed.
- Fairclough N. (2003) *Analysing discourse: Textual analysis for social research*: Psychology Press.
- Fazey I, Bunse L, Msika J, et al. (2014) Evaluating knowledge exchange in interdisciplinary and multi-stakeholder research. *Global Environmental Change* 25(204-220).
- Festinger L. (1962) *A theory of cognitive dissonance*: Stanford university press.
- Fielding N. (1993) Mediating the Message: Affinity and Hostility in Research on Sensitive Topics. In: CM Renzetti and RM Lee (ed) *Researching Sensitive Topics*.
- Fischer F. (1980) *Politics Values and Public Policy: The problem of methodology.*, Boulder. : Westview Press.
- Fischer F and Forester J. (1993) The Argumentative Turn in Policy Analysis and Planning. London: UCL Press, 318.
- Fischer F and Gottweiss H. (2012) The argumentative turn revisited: public policy as communicative practice. Durham and London: Duke University Press.
- Flyvbjerg B. (1998) *Rationality and power: Democracy in practice*: University of Chicago press.
- Forester J. (1993) Learning from Practice Stories: The Priority of Practical Judgement. In: Fischer F and Forester J (eds) *The Argumentative Turn in policy Analysis and Planning*. London: UCL Press, 186-212.
- Friedman B. (1964) *The feminist mystique*, USA: W.W. Norton and Co.
- Funtowicz S and Ravetz J. (2003) Post-normal science. In: Economics ISfE (ed) *Online Encyclopedia of Ecological Economics*.
- Funtowicz SO and Ravetz JR. (1991) A new scientific methodology for global environmental issues. In: Costanza R (ed) *Ecological Economics*. New York: Columbia University Press, 137-152.
- Funtowicz SO and Ravetz JR. (1993a) The emergence of post-normal science. *Science, Politics and Morality*. Springer, 85-123.
- Funtowicz SO and Ravetz JR. (1993b) Science for a Post-normal age. *Futures* 25(739-755).

- Funtowicz SO and Ravetz JR. (1994) Uncertainty, complexity and post - normal science. *Environmental toxicology and chemistry* 13(12): 1881-1885.
- Gad C and Bruun Jensen C. (2010) On the Consequences of Post-ANT. *Science Technology Human Values* 35(55).
- Galison P. (1999) Trading zone: Coordinating action and belief. *The science studies reader*: 137-160.
- Gambier Y. (2010) Postscript: Public Communications: Beyond Boundaries. In: Schäffner C and Bassnett S (eds) *Political discourse, media and translation*. Newcastle: Cambridge Scholars Publishing, 233-240.
- Gibbons M, Limoges C, Nowotny H, et al. (1994) *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. London: Sage.
- Gieryn T. (1999) *Cultural boundaries of science: credibility on the line*, Chicago: University of Chicago Press.
- Gieryn TF. (1983) boundary work and the demarcation of science from non-science: strains and interests in professional ideologies of scientists. *American Sociological Review* 48 (December): 781-795.
- Gillan K and Pickerill J. (2012) The Difficult and Hopeful Ethics of Research on, and with, Social Movements. *Social Movement Studies* 11(2): 133-143.
- Girod B, Wiek A, Mieg H, et al. (2009) The evolution of the IPCC's emissions scenarios. *Environmental Science & Policy* 12(2): 103-118.
- Goeminne G. (2012) Does The Climate Need Consensus? The Politics Of Climate Change Revisited. *Symploke* 20(1-2): 151-165.
- Goffman E. (1959) *The presentation of self in everyday life*, Garden City, N.Y: Doubleday.
- Goldenberg S. (2013) Secret funding helped build vast network of climate denial thinktanks. *The Guardian* 14(
- Government U. (2006) Climate Change and Sustainable Energy Act 2006.
- Government U. (2008) Climate Change Act 2008.
- Gregg M and Seigworth GJ. (2010) *The affect theory reader*: Duke University Press.
- Guillemin M and Gillam L. (2004) Ethics, Reflexivity, and "Ethically Important Moments" in Research. *Qualitative Inquiry* 10(2): 261-280.
- Guston DH. (1999) Stabilizing the Boundary between US Politics and Science: The Role of the Office of Technology Transfer as a Boundary Organization. *Social Studies of Science* 29(1): 87-111.
- Guston DH. (2001) Boundary Organizations in Environmental Policy and Science: An Introduction. *Science, Technology & Human Values* 26(4): 399-408.
- Haas PM. (1989) 'Do Regimes Matter? Epistemic Communities and Mediterranean Pollution'. *International Organization* 43(3): 377-403.
- Habermas J. (1992) Further Reflections on the Public Sphere. In: Calhoun CJ (ed) *Habermas and the public sphere*.: MIT Press., 421-461.
- Hajer M and Versteeg W. (2005) A decade of Discourse Analysis of Environmental Politics: Achievements, Politics, Perspectives. *Journal of Environmental Policy and Planning* 7(3): 175-184.
- Hajer MA. (1993) Discourse Coalitions and the Institutionalization of Practice: The Case of Acid Rain in Britain. In: Forester FFaj (ed) *The Argumentative Turn in Policy Analysis and Planning*. Durham and London: Duke University Press, 43-76.
- Hajer MA. (1995) *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process*, Oxford: Clarendon Press.
- Halfman W. (2003) Boundaries of Regulatory Science: Eco/toxicology and Aquatic Hazards of Chemicals in the US, England and the Netherlands,. *School of Business, Public Administration, and Technology*. University of Twente, 439-477.

- Halffman W. (2005) Boundaries of Regulatory Science - Synopsis of: Willem Halffman, Boundaries of Regulatory Science: Eco/toxicology and Aquatic Hazards of Chemicals in the US, England and the Netherlands, dissertation, Science Dynamics, University of Amsterdam, 2003, pp. 439-477.
- Hall C. (2005) *The Trouble With Passion: Political Theory Beyond the Reign of Reason*, New York Routledge.
- Hall S. (1997) Discourse, Power, and the Subject. *Representation: Cultural Representation and Signifying Practices*: 41-51.
- Hansen HF. (2010) The Politics of Evidence-Based Policy-Making: The Case of Denmark. *German Policy Studies* 6(2): 87-112.
- Haraway D. (1991) *Simians, Cyborgs and Women: the reinvention of nature*, London: Free Books Association.
- Haraway D. (1997) "The Persistence of Vision. In: Kate Conboy NM, Sarah Stanbury (ed) *Writing on the Body: Female Embodiment and Feminist Theory*,. New York: Columbia University Press, 283-295,.
- Harman G. (2009) *Prince of networks: Bruno Latour and metaphysics*: Prahran, Vic.: Re. press, 2009.
- Harvey D. (1996) Justice, nature and the geography of difference.
- Harvey D. (2005) *A brief history of neoliberalism*: Oxford University Press.
- Hayles NK. (1995) *The life cycle of cyborgs: Writing the posthuman*: na.
- Head BW. (2008) Three Lenses of Evidence-Based Policy. *Australian Journal of Public Administration* 67(1): 1-11.
- Head L and Gibson C. (2012) Becoming differently modern Geographic contributions to a generative climate politics. *Progress in Human Geography* 36(6): 699-714.
- Healey P. (1993) Planning Through Debate: The Communicative Turn in Planning Theory. In: Forester J (ed) *The argumentative turn in policy analysis and planning*. Durham, NC: Duke University Press, 233-252.
- Herbert S. (2000) For ethnography. *Progress in Human Geography* 24(4): 550-568.
- Hess DJ. (2013) Neoliberalism and the history of STS theory: Toward a reflexive sociology. *Social Epistemology* 27(2): 177-193.
- Hinchcliffe S. (2001) Indeterminacy In-Decisions: Science, Policy and Politics in the BSE (Bovine Spongiform Encephalopathy) Crisis. *Transaction of the Institute of British Geographers* 26(2): 182-204.
- Hoffmann MJ. (2011) *Climate governance at the crossroads: experimenting with a global response after Kyoto*: Oxford University Press.
- Hoppe R. (2010) Lost in translation? A boundary work perspective on making climate change governable. In: Driessen PPJ, Leroy P and van Vierssen W (eds) *From Climate Change to Social Change: Perspectives on Science Policy Interactions*. Utrecht: International Books, 109-130.
- Howarth D. (2000) *Discourse*, Buckingham: Open University Press.
- Howarth D. (2006) Space, Subjectivity, and Politics. *Alternatives: Global, Local, Political*, 31(2): 105-134.
- Howarth D. (2010) Power, discourse, and policy: articulating a hegemony approach to critical policy studies. *Critical Policy Studies* 3(3-4): 309-335.
- Howell RA. (2013) It's not (just) "the environment, stupid!" Values, motivations, and routes to engagement of people adopting lower-carbon lifestyles. *Global Environmental Change* 23(1): 281-290.
- Hulme M. (2008) Geographical work at the boundaries of climate change. *Transactions of the Institute of British geographers* 33 (5-11).
- Hulme M. (2009) *Why we disagree about climate change : understanding controversy, inaction and opportunity*, Cambridge ; New York: Cambridge University Press.

- Hulme M. (2010) Problems with making and governing global kinds of knowledge☆. *Global Environmental Change* 20(4): 558-564.
- Hulme M. (2013) *Exploring climate change through science and in society: an anthology of Mike Hulme's essays, interviews and speeches*: Routledge.
- Hulme M. (2015) Why We Should Disagree about Climate Change. In: Neilson RCaB (ed) *Climate Change and Museum Futures*. Oxon: Routledge.
- Hulme M and Mahony M. (2010) Climate change: What do we know about the IPCC? *Progress in Physical Geography* 34(5): 705-718.
- IPCC. (2007) Climate Change 2007: Working Group I: The Physical Science Basis In: Solomon S, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (ed) *IPCC 4th assessment Report: Climate Change*. . Cambridge, UK: IPCC.
- IPCC. (2014) *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands* Available at: http://www.ipcc-nggip.iges.or.jp/public/wetlands/pdf/Wetlands_Supplement_Entire_Report.pdf.
- Irwin A. (2006) The Politics of Talk: Coming to Terms with the 'New' Scientific Governance. *Social Studies of Science* 36(2): 299-320.
- Irwin A, Dale A and Smith D. (1996) Science and Hell's Kitchen: the local understanding of hazard issues. In: Wynne AlaB (ed) *Misunderstanding Science: The Public Reconstruction of science and technology* Cambridge: Cambridge University Press, 47-64.
- Iverson LL. (2012) *Learning to be Norwegian: A case study of identity management in religious education in Norway* Verlag: Waxmann.
- Jackson P. (2002) Making sense of qualitative data In: Dwyer MLaC (ed) *Qualitative Methodologies for Geographers: Issues and Debates*. London: Arnold. , 199-214.
- Janaway C and Robertson S. (2012) *Nietzsche, Naturalism, and Normativity*: Oxford University Press.
- Jänicke M. (2008) Ecological modernisation: new perspectives. *Journal of Cleaner Production* 16(5): 557-565.
- Jasanoff S. (1990) *The Fifth Branch: Science Advisers as Policymakers*, Cambridge, MA: Harvard.
- Jasanoff S. (1996) Beyond Epistemology: Relativism and Engagement in the Politics of Science. *Social Studies of Science* 26(3):393-418.
- Jasanoff S. (1997) NGOs and the Environment: From Knowledge to Action. *Third World Quarterly* 18(3 (Beyond UN Subcontracting: Task-Sharing with Regional Security Arrangements and Service-Providing NGOs)): 579-594.
- Jasanoff S. (2003a) (No?) Accounting for Expertise. *Science and Public Policy* 30(3): 157-162.
- Jasanoff S. (2003b) Technologies of Humility: Citizen Participation in Governing Science. *Minerva* 41(3): 223-244.
- Jasanoff S. (2004) *States of knowledge: the co-production of science and the social order*, London: Routledge.
- Jasanoff s. (2006) Just Evidence: The Limits of Science in the Legal Process. *JOURNAL OF LAW, MEDICINE & ETHICS* DNA FINGERPRINTING & CIVIL LIBERTIES SUMMER 2006(3):28-341.
- Jasanoff S. (2008) Speaking Honestly to Power. *American Scientist* 96 (3).
- Jasanoff S. (2010) A New Climate for Society. *Theory Culture & Society* 27(2-3): 233-253.
- Jasanoff S. (2011a) Constitutional Moments in Governing Science and Technology. *Science Engineering Ethics* 17(6):621-638.

- Jasanoff S. (2011b) The practices of objectivity in regulatory science. In: Camic C, Gross N and Lamont M (eds) *Social knowledge in the making*. Chicago: University of Chicago Press.
- Jasanoff S. (2012a) The Practices of Objectivity in Regulatory Science. In: Camic C, Gross N and Lamont M (eds) *Social knowledge in the making*. Social knowledge in the making. : University of Chicago Press, 307.
- Jasanoff S. (2012b) *Science and public reason*: Routledge.
- Jasanoff S. (2013) A World of Experts_ Science and Global Environmental Constitution. *Boston College Environmental Affairs Law Review* 439 40(2): 439-452.
- Jasanoff SS. (1987) Contested Boundaries in Policy-Relevant Science. *Social Studies of Science* 17(2): 195-230.
- Jasanoff SS. (2005) *Designs on Nature: Science and Democracy in Europe and the United States* Princeton and Oxford: Princeton University Press.
- Jones M. (2014) Chantal Mouffe's Agonistic Project: Passions and Participation. *Parallax* 20(2): 14-30.
- Jordan A and O'Riordan T. (1999) The precautionary principle in contemporary environmental policy and politics. *Protecting public health and the environment: implementing the precautionary principle*. Island Press, Washington, DC: 15-35.
- Jordan A, Turnpenny J and Edward Elgar P. (2015) The tools of policy formulation actors, capacities, venues and effects.
- Jorgensen M and Phillips LJ. (2002) *Discourse Analysis as Theory and Method*, London: Sage.
- Judd CM, Smith ER and Kidder LH. (1991) 'Qualitative research and Participant Observation' In: C.M. J, Smith ER and Kidder LH (eds) *Research Methods in Social Relations (6th Edition)*. London: Harcourt-Bruce Jovanovich College Publishers. .
- Kanuha VK. (2000) "'Being' Native versus 'Going Native': Conducting Social Work Research as an Insider.". *Social Work* 45(439-447. .
- Kaplan TJ. (1993) Reading Policy Narratives, Beginnings Middles and Ends. In: Fischer F and Forester J (eds) *The argumentative turn in policy analysis and planning*. London: UCL Press, 167 - 185.
- Kapoor I. (2002) Deliberative Democracy or Agonistic Pluralism? The Relevance of the Habermas-Mouffe Debate for Third World Politics. *Alternatives: Global, Local, Political*, 27(4): 459-487.
- Karp D. (1996) Values and their effect on pro-environmental behaviour. *Environment and Behaviour* 28(1): 111-133.
- Karppinen K, Moe H and Svensson J. (2008) Habermas, Mouffe And Political Communication A Case For Theoretical Eclecticism. *Javnost - the public* 15(3): 5-22.
- Kelly SE. (2003) Public Bioethics and Publics: Consensus, Boundaries, and Participation in Biomedical Science Policy. *Science, Technology, & Human Values* 28(3): 339-364.
- Kenis A and Mathijs E. (2014) Climate change and post-politics: Repoliticizing the present by imagining the future? *Geoforum* 52(148-156.
- Kezar A. (2003) Transformational elite interviews: Principles and problems. . *Qualitative Inquiry* 9(3): 395-415.
- Kitchin R and Tate N. (2013) *Conducting research in human geography: theory, methodology and practice*: Routledge.
- Kleinman DL and Kinchy AJ. (2003) Boundaries In Science Policy Making: Bovine Growth Hormone in the European Union. *The Sociological Quarterly, Volume* 44(4): 577-595.
- Klepper G and Peterson S. (2003) On the robustness of marginal abatement cost curves: the influence of world energy prices. Kieler Arbeitspapiere.

- Knorr-Cetina K. (1999) *Epistemic Cultures: How the Sciences Make Knowledge*, London, England: Harvard University Press.
- Kronsell A and Bäckstrand K. (2010) Rationalities and forms of governance: a framework for analysing the legitimacy of new modes of governance. *Environmental politics and deliberative democracy: Examining the promise of new modes of governance*: 28-46.
- Kunseler E-M, Tuinstra W, Vasileiadou E, et al. (2015) The reflective futures practitioner: Balancing salience, credibility and legitimacy in generating foresight knowledge with stakeholders. *Futures* 66(0): 1-12.
- Lacey H. (2005) *Is science value free?: values and scientific understanding*: Psychology Press.
- Laclau E and Mouffe C. (1985) *Hegemony and socialist strategy: towards a radical democratic politics*. London: Verso.
- Lanzarotta M. (2009) Sheila Jasanoff on Science, Technology and Society - An Interview with Shielia Jasanoff. In: Lanzarotta M (ed) *Harvard Kennedy School Insight*.
- Larner W. (2003) Neoliberalism? *Environment and Planning D abstract* 21(5): 509-512.
- Latour B. (1983) Give Me a Laboratory and I will Raise the World. In: Knorr-Cetina K and Mulkay M (eds) *Science Observed: Perspectives on the Social Study of Science*. London: Sage, 141-170.
- Latour B. (1993) *We Have Never Been Modern*, Cambridge MA: Harvard University Press.
- Latour B. (2013a) Facing Gaia: A New Enquiry into Natural Religion. *Series of Gifford lectures, Edinburgh*. Available online: <http://www.bruno-latour.fr/node/486>.
- Latour B. (2013b) Facing Gaia: A New Enquiry into Natural Religion (Lecture 2: A shift in agency — with apologies to David Hume). *Gifford Lectures, University of Edinburgh*.
- Latour B. (2013c) *An inquiry into modes of existence*: Harvard University Press.
- Latour B and Woolgar S. (1986) *Laboratory life: The construction of scientific facts*: Princeton University Press.
- Lave R, Mirowski P and Randalls S. (2010) Introduction: STS and neoliberal science. *Social Studies of Science* 40(5): 659-675.
- Law J. (1991) *A Sociology of Monsters: Essays On Power, Technology And Domination*, London Routledge.
- Law J. (1992) Notes on the theory of the actor-network: ordering, strategy, and heterogeneity. *Systemic Practice and Action Research* 5(4): 379-393.
- Law J. (2004) *After Method: mess in social science research*. Oxon: Routledge.
- Law J. (2007) *Traduction/Trahison - Notes on ANT*. Available at: <http://cseweb.ucsd.edu/~goguen/courses/175/stslaw.html>.
- Leiserowitz A. (2006) Climate Change Risk Perception and Policy Preferences: The Role of Affect, Imagery, and Values. *Climatic Change* 77(1-2): 45-72.
- Lemos MC and Morehouse BJ. (2005) The co-production of science and policy in integrated climate assessments. *Global Environmental Change* 15(1): 57-68.
- Lester P and Gay O. (2007) The Scottish Parliamentary elections May 2007: The formation of the Scottish Executive and the election of a Presiding Officer. SN/PC/04372 ed.
- Lewis W. (2005) The Under-theorization of Overdetermination in the Political Philosophy of Ernesto Laclau and Chantal Mouffe. *Studies in Social and Political Thought*: 2-24.
- Li Vigni F. (2013) From Salamander to Servomechanism: For a Distinction Between Weak and Strong Coproductionism. *Intersect* 6(1): 1-15.
- Lister S. (2003) NGO Legitimacy Technical Issue or Social Construct? *Critique of Anthropology* 23(2): 175-192.

- Litfin KT. (1994) *Ozone Discourses: Science and Politics in Global Environmental Co-operation*, New York, Chichester West Sussex: Columbia University Press.
- Liverman DM. (1999) Geography and the global environment. *Annals of the Association of American Geographers* 89(1): 107-120.
- Longhurst R. (2010) 'Semi structured interviews and focus groups' In: Clifford N, French S and Valentine G (eds) *Key methods in geography*. Sage.
- Longino HE. (1990) *Science as social knowledge: Values and objectivity in scientific inquiry*: Princeton University Press.
- Lorenzoni I, Nicholson-Cole S and Whitmarsh L. (2007) Barriers perceived to engaging with climate change among the UK public and their policy implications. *Global Environmental Change* 17(3-4): 445-459.
- Lovbrand E. (2011) Co-Producing European climate science and policy: a cautionary note on the making of useful knowledge. *Science and Public Policy* 38(3): 225-236.
- Lövbrand E. (2007) Pure science or policy involvement? Ambiguous boundary-work for Swedish carbon cycle science. *Environmental Science & Policy* 10(1): 39-47.
- Lovbrand E, Pielke R and Beck S. (2011) A Democracy Paradox in Studies of Science and Technology. *Science Technology Human Values* 36(4): 474-496.
- Lynch M. (1985) Discipline and the Material Form of Images: An Analysis of Scientific Visibility. *Social Studies of Science* 15(1): 37-66.
- Machin A. (2013) *Negotiating climate change: Radical democracy and the illusion of consensus*: Zed Books.
- Maclean F. (2012) *Scotland: A Concise History*, London: Thames and Hudson.
- Majone G. (1989) *Evidence, Argument and Persuasion in the Policy Process*, New Haven and London: Yale University Press.
- Mann ME. (2013) *The hockey stick and the climate wars: Dispatches from the front lines*: Columbia University Press.
- Marchart O. (2007) *Post-foundational political thought: political difference in Nancy, Lefort, Badiou and Laclau*: Edinburgh University Press.
- Marmot MG. (2004) Evidence based policy or policy based evidence? Willingness to take action influences the view of the evidence - look at alcohol. *British medical Journal* 328(906-907).
- Martin J. (2013) *Chantal Mouffe: Hegemony, Radical Democracy, and the Political*: Routledge.
- Matt M, Cilinet L, Gaunand A, et al. (2015) A typology of Impact Pathways generated by a public agricultural research organization. *Working Paper GAEL 2015-03 online*. (accessed 1/07/15).
- Matthews MH. (1992) *Making Sense of Place: Children's understanding of large scale environments* Hemel Hempstead: Harvester Wheatsheaf.
- Mayan M and Daum C. (2014) Politics and Public Policy, social justice and qualitative research. In: Denzin NK and Giardina. MD (eds) *Qualitative Enquiry Outside the Academy*. Left Coast Press 73-91.
- McDowell L. (1992) Doing Gender: feminism, feminists and research methods in human geography. *Transaction of the Institute of British Geographers* 17(399-416).
- McEwen N. (2010) Intergovernmental Dynamics and the Politics of Climate Change in Scotland. In: Nicola McEwen WSanB (ed) *Multi-level Government & the Politics of Climate Change*. http://www.institute-of-governance.ed.ac.uk/data/assets/pdf_file/0012/72120/MLG_and_Climate_Change_briefing.pdf: ESRC/Edinburgh University Institute of Governance, 18-21.
- McGregor PG, Kim SJ and Winning MA. (2011) Scottish climate change policy an overview. *Fraser of Allander Institute Economic Commentary, Special Edition - Energy and Pollution*. University of Strathclyde.

- McKenzie-Mohr D and Smith W. (1999) *Fostering Sustainable Behavior: An Introduction to Community-Based Social Marketing* Gabriola Island, BC, USA.: New Society Publishers.
- McNie EC. (2007) Reconciling the supply of scientific information with user demands: an analysis of the problem and review of the literature. *Environmental Science & Policy* 10(1): 17-38.
- Merton RK. (1972) Insiders and outsiders: A chapter in the sociology of knowledge. *American Journal of Sociology*, 78(1): 9-47.
- MET Office. (2015) *Who We Are*. Available at: <http://www.metoffice.gov.uk/about-us/who>.
- Meyer M. (2010) The rise of the knowledge broker. *Science Communication* 32(1): 118-127.
- Meyer M and Kearnes M. (2013) Introduction to special section: Intermediaries between science, policy and the market. *Science and Public Policy* 40(4): 423-429.
- Mies M. (1999) Towards a methodology for feminist research. *Qualitative Research* 4(66-85).
- Mihai M. (2014) Theorizing Agonistic Emotions. *Parallax* 20(2): 31-48.
- Miller C. (2001a) Hybrid Management: Boundary Organizations, Science Policy, and Environmental Governance in the Climate Regime. *Science, Technology & Human Values* 26(4): 478-500.
- Miller S. (2001b) Public understanding of science at the crossroads. *Public Understanding of Science* 10(1): 115-120.
- Mol APJ and Sonnenfeld DA. (2000) Ecological modernisation around the world: An introduction. *Environmental Politics* 9(1): 1-14.
- Moore K. (1996) Organizing integrity: American science and the creation of public interest organizations, 1955-1975. *American Journal of Sociology*: 1592-1627.
- Moore K, Kleinman DL, Hess D, et al. (2011) Science and neoliberal globalization: a political sociological approach. *Theory and Society* 40(5): 505-532.
- Moran D, MacLeod M, Wall E, et al. (2008) UK marginal abatement cost curves for the agriculture and land use, land-use change and forestry sectors out to 2022, with qualitative analysis of options to 2050. *Final report to the Committee on Climate Change. Edinburgh: Scottish Agricultural College Commercial*.
- Morris CG. (1992) 'Translate' 'Traslation' 'Translational'. *Academic Press dictionary of science and technology*. Academic Press ed. London and California: Academic Press.
- Moser SC. (2010) Now more than ever: the need for more societally relevant research on vulnerability and adaptation to climate change. *Applied Geography* 30(4): 464-474.
- Moss P. (2007) A Bodily notion of research: power, difference and specificity in feminist methodology In: Nelson LaS, J (ed) *A Companion to feminist geography* Hoboken NJ: John Wiley and sons p41-59.
- Moss P and Al-Hindi KF. (2008) *Feminisms in geography: rethinking space, place, and knowledges*: Rowman & Littlefield.
- Mouffe C. (1993) *The Return of the Political*. London and New York: Verso.
- Mouffe C. (1999) Deliberative Democracy or Agonistic Pluralism? *Social Research* 66(3): 745-758.
- Mouffe C. (2000) Deliberative Democracy or Agonistic Pluralism. In: Neuhold C (ed). Institute for Advanced Studies, Vienna -Chantal Mouffe was Visiting Professor at the Department of Political Science of the Institute for Advanced Studies in June 2000.: Reihe Politikwissenschaft Political Science Series.
- Mouffe C. (2002) *Politics And Passions The Stakes Of Democracy*.

- Mouffe C. (2005a) *The Democratic Paradox*, London: Verso.
- Mouffe C. (2005b) *On the Political*, London: Routledge.
- Mouffe C. (2008) Which World Order: Cosmopolitan or Multipolar? *Ethical Perspectives* 15(4): 453-467.
- Mouffe C. (2009) Democracy in a Multipolar World. *Millennium - Journal of International Studies* 37(3): 549-561.
- Mouffe C. (2012) Democratic Politics and Agonistic Public Spaces. Harvard GSD.
- Mouffe C. (2013) *Agonistics: Thinking the world politically*: Verso Books.
- Mouffe C. (2014) By Way of a Postscript. *Parallax* 20(2): 149-157.
- Nairn K, Munro J and Smith A. (2005) A Counter-narrative of a 'Failed' Interview. *Qualitative Research* 5(2): 221-244.
- Nelkin D. (1992) *Controversy: politics of technical decisions*, Newbury Park, CA: Sage.
- Nelson L and Seager J. (2008) *A companion to feminist geography*: John Wiley & Sons.
- Neumayer E. (2000) In defence of historical accountability for greenhouse gas emissions. *Ecological Economics* 33(185-192).
- Newell P. (2011) The elephant in the room: Capitalism and global environmental change. *Global Environmental Change* 21(1): 4-6.
- Newell P and Paterson M. (2010) *Climate capitalism: global warming and the transformation of the global economy*: Cambridge University Press.
- News B. (2012) *Alex Salmond in climate justice call to world leaders*. Available at: <http://www.bbc.co.uk/news/uk-scotland-scotland-politics-16584424>.
- Nida EA. (1977) The Nature of Dynamic Equivalence in Translating. *Babel: International Journal of Translation*.
- Nilsson A, von Borgstede C and Biel A. (2004) Willingness to accept climate change strategies: The effect of values and norms. *Journal of Environmental Psychology* 24(3): 267-277.
- Nord C. (1997) *Translating as a purposeful activity: functionalist approaches explained*, Manchester St. Jerome.
- Nordhaus WD. (1991) To Slow or Not to Slow: The Economics of The Greenhouse Effect. *The Economic Journal* 101(407): 920-937.
- Nutley S, Davies H and Walter I. (2002) Evidence Based Policy and Practice: Cross Sector Lessons from the UK. *ESRC UK Centre for Evidence Based Policy and practice: Working Paper 9*. ESRC Unit for Research Utilisation.
- O'Brien K. (2010) Responding to environmental change: A new age for human geography? *Progress in Human Geography* 35(4): 542-549.
- O'Brien K, Eriksen S, Nygaard LP, et al. (2007) Why different interpretations of vulnerability matter in climate change discourses. *Climate Policy* 7(1): 73-88.
- O'Brien KL and Wolf J. (2010) A values-based approach to vulnerability and adaptation to climate change. *Wiley Interdisciplinary Reviews: Climate Change* 1(2): 232-242.
- O'Mahony S and Bechky BA. (2008) Boundary organizations: Enabling collaboration among unexpected allies. *Administrative Science Quarterly* 53(3): 422-459.
- O'Riordan T and Jordan A. (1995) The precautionary principle in contemporary environmental politics. *Environmental Values*: 191-212.
- Oakley A and Roberts H. (1981) Interviewing women: A contradiction in terms. *Doing feminist research* 30(6): 1.
- Oels A. (2005) Rendering climate change governable: From biopower to advanced liberal government? *Journal of Environmental Policy & Planning* 7(3): 185-207.
- Oreskes N. (2004) The scientific consensus on climate change. *Science* 306(5702): 1686-1686.
- Ostrom E. (1996) Crossing the Great Divide: Coproduction, Synergy and Development. *World Development* 24(6): 1073 - 1087.

- Owens P. (2000) Where has all the wonder gone? In: Bowles R (ed) *Raising Achievement in Geography, London: Register of Research in Primary Geography*. 79-84.
- Owens S. (2010) Learning across levels of governance: Expert advice and the adoption of carbon dioxide emissions reduction targets in the UK. *Global Environmental Change* 20(3): 394-401.
- Owens S. (2012) Experts and the Environment —The UK Royal Commission on Environmental Pollution 1970–2011. *Journal of environmental law* 24(1): 1-22.
- Owens S, Petts J and Bulkeley H. (2006) Boundary work: knowledge, policy and the urban environment. *Environment and Planning C-Government and Policy* 24(633-643).
- Packwood A. (2002) Evidence-based Policy: Rhetoric or reality. *Social Policy and Society* 1(3): 267-272.
- Pain R, Kesby M and Askins K. (2011) Geographies of impact: power, participation and potential. *Area* 43(2): 183-188.
- Parliament TS. (2009) Climate Change (Scotland) Act 2009 (asp 12).
- Parr A. (2014) *The wrath of capital: neoliberalism and climate change politics*: Columbia University Press.
- Parsons W. (2002) From Muddling through to muddling up - evidence based policy making and the modernisation of British Government. *Public Policy and Administration* 17(3): 43-60.
- Pataki G, High C and Nemes G. (2011) Report on the Policy and Governance Context for Adaptation. *Climsave*. 1 Environmental Social Science Research Group (ESSRG), Budapest, Hungary 2 Open University, Milton Keynes, UK 3 Institute of Economics, Hungarian Academy of Sciences, Budapest, Hungary.
- Paterson M. (1996) *Global Warming and Global Politics*, London and New York: Routledge.
- Paterson M. (2010) Legitimation and Accumulation in Climate Change Governance. *New Political Economy* 15(3): 345-368.
- Paterson M and Stripple J. (2010) My Space: governing individuals' carbon emissions. *Environment and Planning D: Society and Space* 28(341-362).
- Peck J. (2004) Geography and public policy: constructions of neoliberalism. *Progress in Human Geography* 28(3): 392-405.
- Pedwell C. (2012) Affective (self-) transformations: Empathy, neoliberalism and international development. *Feminist theory* 13(2): 163-179.
- Peterson TC, Stott P, A. and Herring S. (2012) Explaining Extreme Events Of 2011 From A Climate Perspective. *AMERICAN METEOROLOGICAL SOCIETY* July(1041 -1067).
- Pielke Jr RA. (2009) The British Climate Change Act: a critical evaluation and proposed alternative approach. *Environmental Research Letters* 4(2): 024010.
- Pielke RA. (2007) *The Honest Broker*, Cambridge: Cambridge University Press.
- Pink S. (2001) *Doing Visual Ethnography*. , London: Sage
- Poland B and Pederson A. (1998) Reading Between the Lines: Interpreting Silences in Qualitative Research, . *Qualitative Inquiry*, 4(2): 293-312.
- Polanyi M. (1958) *Personal Knowledge: Towards a Post-Critical Philosophy*. : University of Chicago Press.
- Proctor JD. (1998) Geography, paradox and environmental ethics. *Progress in Human Geography* 22(2): 234-255.
- Prosser J. (1996) What constitutes an image - based qualitative methodology? *Visual Studies* 11(2): 25-34.
- Quick KS and Feldman MS. (2014) Boundaries as Junctures: Collaborative Boundary Work for Building Efficient Resilience. *Journal of Public Administration Research and Theory* 24(3): 673-695.

- Raco M. (2013) *State-led Privatisation and the Demise of the Democratic State: Welfare Reform and Localism in an Era of Regulatory Capitalism*: Ashgate Publishing, Ltd.
- Raco M. (2014) 1 The Post-Politics of Sustainability Planning: Privatisation and the Demise of Democratic Government. *The Post-Political and Its Discontents: Spaces of Depoliticization, Spectres of Radical Politics*: 25.
- Ratcliffe J. (2002) Scenario planning: strategic interviews and conversations. *foresight* 4(1): 19-30.
- Rawls J. (1995) Reply to Habermas. *The Journal of Philosophy* 92(3): 132–180.
- RCEP. (2000) Energy - The Changing Climate, 22nd Report. In: FRS CSTB (ed) Cm 4749 ed. The Stationary Office: UK. : Royal Commission on Environmental Pollution.
- Rear D. (2013) Laclau and Mouffe's Discourse Theory and Fairclough's Critical Discourse Analysis: An Introduction and Comparison. *Unpublished paper*: 1-26.
- Rein M and Schon D. (1977) Problem setting in policy research. *Using social research in public policy making*: 235-251.
- Rein M and Shon D. (1993) Reframing Policy Discourse. In: Fischer F and Forester J (eds) *The argumentative turn in policy analysis and planning*. London: UCL Press, 145-166.
- Reinharz S and Davidman L. (1992) *Feminist methods in social research*: Oxford University Press.
- Renzetti CM and Lee RM. (1993) *Researching sensitive topics*: Sage Publications.
- Richardson T. (1996) Foucauldian discourse: Power and truth in Urban and regional policy making. *European Planning Studies* 4(3): 279-292.
- Richter WL. (2009) Approaches to Political Thought. online: Rowman & Littlefield Publishers.
- Robbins H. (1992) *The Scientific Image: From cave to computer*, New York: Harry N. Abrams Inc: .
- Rogers A, Bear C, Hunt M, et al. (2014) Intervention: The Impact Agenda and Human Geography in UK Higher Education. *ACME*.
- Rose G. (1997) Situated Knowledges: Positionality reflexibilities and other tactics. *Progress in Human Geography* 21(3): 305-320.
- Rose G. (2001) Visual Methodologies.
- Rose N. (1999) *Powers of freedom: Reframing political thought*: Cambridge university press.
- Ross D. (1998) *Scotland History of a Nation.* , Finland: Lomond Books Ltd. .
- Rowan R. (2011) 'A new nomos of post-nomos? Multiparty, space, and constituent power'. In: Legg S (ed) *Spatiality, Sovereignty and Carl Schmitt: Geographies of the Nomos*.
- Sabatier P. (1987) Knowledge, Policy-Oriented Learning, and Policy Change: An Advocacy Coalition Framework. *Knowledge: Creation, Diffusion, Utilization* 8(4): 649-692.
- Salmond A. (2007) Alex Salmond - First Minister acceptance speech
- Sanderson I. (2002) Evaluation, Policy Learning and Evidence Based Policy Making. *Public Administration* 80(1): pp 1-22.
- Sanderson I. (2011) Evidence-based policy or policy-based evidence? Reflections on Scottish experience. *Evidence & Policy: A Journal of Research, Debate and Practice*, 7(1): 59-76.
- Sarewitz D. (2004) How science makes environmental controversies worse. *Environmental Science & Policy* 7(5): 385-403.
- Sarewitz D and Pielke RA. (2007) The neglected heart of science policy: reconciling supply of and demand for science. *Environmental Science & Policy* 10(1): 5-16.

- Sarkki S, Niemelä J, Tinch R, et al. (2013) Balancing credibility, relevance and legitimacy: A critical assessment of trade-offs in science–policy interfaces. *Science and Public Policy*: sct046.
- Sayer A. (2011) *Why things matter to people: Social Science. Values and Ethical life*, Cambridge: Cambridge University Press.
- Schaffner C and Bassnett S. (2010) *Political Discourse, Media and Translation*, Newcastle Upon Tyne: Cambridge Scholars Publishing.
- Scharpf FW. (1998) Interdependence and democratic legitimation. MPIfG working paper.
- Schoenberger E. (1991) THE CORPORATE INTERVIEW AS A RESEARCH METHOD IN ECONOMIC GEOGRAPHY*. *The Professional Geographer* 43(2): 180-189.
- Schön DA and Rein M. (1995) *Frame reflection: Toward the resolution of intractable policy controversies*: Basic Books.
- Schraube E and Sorensen E. (2013) Exploring sociomaterial mediations of human subjectivity. *Subjectivity* 6(1): 1-11.
- Scottish Government. (2007a) The Government Economic Strategy: Wealthier & Fairer Smarter Healthier Safer & Stronger Greener.
- Scottish Government. (2007b) *Our Purpose*. Available at: <http://www.gov.scot/About/Performance/scotPerforms/purpose>.
- Scottish Government. (2010) A Low Carbon Economic Strategy for Scotland: Scotland - A Low Carbon Society.
- Scottish Government. (2011a) *Centre for Expertise on Water (CREW)*. Available at: <http://scotland.gov.uk/Topics/Research/About/EBAR/StrategicResearch/future-research-strategy/EPICCoE>.
- Scottish Government. (2011b) *Centre of Expertise on Climate Change (ClimateXChange)*. Available at: <http://www.gov.scot/Topics/Research/About/EBAR/StrategicResearch/future-research-strategy/CoEClimateChange>.
- Scottish Government. (2011c) *Centres of Expertise*. Available at: <http://scotland.gov.uk/Topics/Research/About/EBAR/StrategicResearch/future-research-strategy/CoE>.
- Scottish Government. (2011d) *EPIC Centre of Expertise -Animal Disease Outbreaks*. Available at: <http://scotland.gov.uk/Topics/Research/About/EBAR/StrategicResearch/future-research-strategy/CoEWater>
- Scottish Government. (2011e) Low Carbon Scotland: Meeting the Emissions Reduction Targets 2010-2022: The Report on Proposals and Policies (RPP1).
- Scottish Government. (2011f) The Routemap for Renewable Energy in Scotland.
- Scottish Government. (2012) Scottish Government Official Report Meeting of Parliament Wednesday 12 December 2012 Session 4.
- Scottish Government. (2013) Low Carbon Scotland: Meeting our Emissions Reduction Targets 2013-2027. The Second Report on Proposals and Policies.
- Scottish Government. (2014) *Scottish Budget Draft Budget 2014-15 Chapter 2 Portfolio Plans*. Available at: <http://www.gov.scot/Publications/2013/09/9971/3>.
- Scottish Government. (2015) Scotland's Economic Strategy.
- Shackley S and Wynne B. (1996) Representing Uncertainty in Global Climate Change Science and Policy: Boundary Ordering Devices and Authority. *Science, Technology & Human Values* 21(3): 275-302.
- Shaw K and Maythorne L. (2012) Managing for local resilience: towards a strategic approach. *Public Policy and Administration*.
- Shön D. (1983) The reflective practitioner. *How professionals think in action*. London: Temple Smith.

- Shove E. (2010) Beyond the ABC: climate change policy and theories of social change. *Environment and planning. A* 42(6): 1273.
- Shurmer-Smith P. (2002) Reading Texts. In: Shurmer-Smith P (ed) *Doing Cultural Geography*. London: Routledge, 123-136.
- Sidaway JD. (2008) The geography of political geography. *The SAGE handbook of political geography*. 21-40.
- Sieber JE and Stanley B. (1988) Ethical and professional dilemmas of socially sensitive research. *American Psychologist* 43(49-55).
- Silverman D. (2013) What Counts as Qualitative Research? Some Cautionary Comments. *Qualitative Sociology Review* 9(2): 48-55.
- Simpson D. (1970) Independence: The economic Issues. In: MacCormick N (ed) *The Scottish Debate. Essays on Scottish Nationalism*. Glasgow: Oxford University Press. .
- Skelton T. (2001) Cross Cultural research: issues of power, positionality and 'race'. In: Lamb M and Dwyer C (eds) *Qualitative Methodologies for Geographers: Issues and Debates*. London: Arnold., 87-100.
- Smith BH. (1997) *Belief and resistance: Dynamics of contemporary intellectual controversy*: Harvard University Press.
- Solesbury W. (2001) Evidence Based Policy: Whence it Came and Where it's Going. *ESRC UK Centre for Evidence Based Policy and Practice: Working Paper 1*. Pre-publication version: submitted to Planning Policy and Practice.
- Stanczak GC. (2007) *Visual research methods: Image, society, and representation*: Sage Publications.
- Star SL. (2010) This is Not a Boundary Object: Reflections on the Origin of a Concept. *Science, Technology & Human Values* 35(5): 601-617.
- Star SL and Griesemer JR. (1989) Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. *Social Studies of Science* 19(3): 387-420.
- Stephan B, Rothe D and Methman C. (2013) Third Side of the Coin: Hegemony and Governmentality in Global Politics. In: Bulkeley H and Stripple J (eds) *Towards a Critical Social Science of Climate Change?. Governing the Climate: New Approaches to Rationality, Power and Politics*.
- Stern PC. (1992) Psychological dimensions of global environmental change. *Annual Review Psychology* 43(269-302).
- Stiglitz J. (2012) *The price of inequality*: Penguin UK.
- Stillman PG. (1974) The Concept of Legitimacy. *Polity* 7(1): 32-56.
- Stirling A. (2009) "Opening Up" and "Closing Down" Power, Participation, and Pluralism in the Social Appraisal of Technology. *Science, Technology, & Human Values* 33(2): 262-294.
- Stoudt BG. (2007) The Co-Construction of Knowledge in "Safe Spaces": Reflecting on Politics and Power in Participatory Action Research. *Children, Youth and Environments* 17(2): 280-297.
- Suchman MC. (1995) Managing Legitimacy: Strategic and Institutional Approaches. *The Academy of Management Review* 20(3): 571-610.
- Sundberg M. (2007) Parameterizations as boundary objects on the climate arena. *Social Studies of Science* 37(3): 473-488.
- Swenden W, McEwen N and Bomberg E. (2009) Intergovernmental politics and climate change: Scotland, UK, EU. *Paper presented to workshop on: Climate Change and Inter-Governmental Relations in Transatlantic Perspective*. Raeburn Room, Old College University of Edinburgh: Draft, not for citation.

- Swyngedouw E. (2010) Apocalypse Forever? Post-political Populism and the Spectre of Climate Change. *Theory Culture & Society* 27(2-3): 213-232.
- Sziarto K, M. (2008) Placing Legitimacy: Organising Religious Support In A Hospital Workers' Contract Campaign. *Tijdschrift Voor Economische En Sociale Geografie* 99(4): 406-425.
- Tambakaki P. (2014) The Tasks of Agonism and Agonism to the Task: Introducing 'Chantal Mouffe: Agonism and the Politics of Passion'. *Parallax* 20(2): 1-13.
- Tannert C, Elvers H-D and Jandrig B. (2007) The ethics of uncertainty. *EUROPEAN MOLECULAR BIOLOGY ORGANIZATION* 8(10): 892-896.
- Teruelle R. (2012) Reconciled to the Belief: Investigating the need for hope. *Social Alternatives* 31(3): 45.
- The Scottish Parliament. (2013) Rural Affairs, Climate Change and Environment Committee Minutes: Session 4 (6th Feb 2013). Edinburgh: Scottish Parliamentary Corporate Body.
- Throgmorton JA. (1993) Survey Research as a Rhetorical Trope: Electric Power Planning Arguments in Chicago. In: Fischer F and Forester J (eds) *The Argumentative Turn in Policy Analysis and Planning*. London: UCL Press, 117-144.
- Tolia-Kelly D. (2007) Participatory art: capturing spatial vocabularies in a collaborative visual methodology with Melanie Carvalho and South Asian women in London, UK. In: Sara Kindon, Pain R and Kesby M (eds) *Participatory action research approaches and methods: connecting people, participation and place*. London: Routledge 132-139.
- Torping J. (2005) *Handbook of Political Sociology, The: States, Civil Societies and Globalisation*: Cambridge University Press.
- Trinder L. (2003) 'Introduction: the context of evidence based practice' In: Reynolds LTaS (ed) *Evidence Based Practice: A critical Appraisal*. Oxford: Oxford Blackwell.
- Trumbo J. (1999) Visual Literacy and Science communication. *Science Communication* 20(4): 409-425.
- Trumbo J. (2000) Seeing Science. Research opportunities in the visual communication of science. *Science Communication* 21(4): 379-391.
- UHI Inverness. (2010) Alex Hill, Met Office Chief Advisor - UHI Climate Change Conference 2010.
- UK Government. (1999) Modernising Government White Paper. Cm 4310 ed.
- UNFCCC. (2011) Report of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol on its seventh session, held in Durban from 28 November to 11 December 2011
- UNFCCC. (2015) *Making those first steps count: An Introduction to the Kyoto Protocol*. Available at: http://unfccc.int/essential_background/kyoto_protocol/items/6034.php.
- Valantine G. (1997) Tell Me About...using Interviews as a research methodology. In: Martin RFaD (ed) *Methods in Human Geography: A Guide for Students doing a research project*. London: Taylor Francis 110-127.
- Van der Heijden K. (1996) *Scenarios, and the art of strategic conversation*. , London: Wiley
- van der Sluijs JP, van Est R and Riphagen M. (2010) Beyond consensus: reflections from a democratic perspective on the interaction between climate politics and science. *Current Opinion in Environmental Sustainability* 2(5-6): 409-415.
- Van Dijk TA. (1989) Structures of discourse and structures of power. *Communication yearbook*, 12(18-59).
- van Egmond S and Bal R. (2011) Boundary Configurations in Science Policy: Modeling Practices in Health Care. *Science, Technology & Human Values* 36(1): 108-130.

- Venuti L. (2008) *The Translator's Invisibility: A History of Translation* Abingdon, Oxon: Routledge.
- Vernon K. (1990) Bruno Latour. *The Pasteurization of France*. London: Harvard University Press, 1988. Trans Alan Sheridan and John Law. Pp. 273. ISBN 0-674-65760-8.£ 23.95. *The British Journal for the History of Science* 23(03): 344-346.
- Vogel C, Moser SC, Kaspersen RE, et al. (2007) Linking vulnerability, adaptation, and resilience science to practice: Pathways, players, and partnerships. *Global Environmental Change* 17(3): 349-364.
- Walker S. (2010) Co-ordinated Agenda for Marine, Environment and Rural Affairs Science (CAMERAS): Aligning science and research.
- Warner R. (2010) Ecological modernisation theory: towards a critical ecopolitics of change? *Environmental Politics* 19(4): 538-556.
- Watermeyer R. (2014) Impact in the REF: issues and obstacles. *Studies in Higher Education*: 1-16.
- Weber EU. (2006) Experience-based and description-based perceptions of long-term risk: why global warming does not scare us (yet). . *Climatic Change* 77(103-120).
- Weber M. (1978) *Economy and society*. Berkeley, CA: University of California Press.
- Weiss CH. (1998) Have we learned anything new about the use of evaluation? *American Journal of Evaluation* 19(1): 21-33.
- Wendt A. (1999) *Social Theory of International Politics*, Cambridge University Press.
- Wesselink A, Buchanan KS, Georgiadou Y, et al. (2013) Technical knowledge, discursive spaces and politics at the science–policy interface. *Environmental Science & Policy* 30(1-9).
- White DD, Wutich A, Larson KL, et al. (2010) Credibility, salience, and legitimacy of boundary objects: water managers' assessment of a simulation model in an immersive decision theater. *Science and Public Policy* 37(3): 219-232.
- Wilhere GF, Maguire LA, Scott JM, et al. (2012) Conflation of Values and Science: Response to Noss et al. *Conservation Biology*.
- Willems W. (2014) How to do things with knowledge: Interview with Sheila Jasanoff. *Krisis* 2014(2): 40-46.
- Wolf J, Allice I and Bell T. (2013) Values, climate change, and implications for adaptation: Evidence from two communities in Labrador, Canada. *Global Environmental Change* 23(2): 548-562.
- Wood D and Fels J. (1992) *The power of maps*. : Guilford Press.
- Wynne B. (1979) Physics and Psychics: Science, Symbolic Action, and Social control in late victorian England. In: Barnes B and Shapin S (eds) *Natural Order: Historical Studies of Scientific Culture*. London: Sage.
- Wynne B. (1982) *Rationality and ritual: The Windscale inquiry and nuclear decisions in Britain*: British Society for the History of Science Chalfont St. Giles.
- Wynne B. (1996) 'Misunderstood misunderstandings: social identities and the public uptake of science'. In: (eds) AIBW (ed) *Misunderstanding Science?* Cambridge: Cambridge University Press, 19-46.
- Wynne B. (2008) Elephants in the rooms where publics encounter "science"?: A response to Darrin Durant, "Accounting for expertise: Wynne and the autonomy of the lay public". *Public Understanding of Science* 17(1): 21-33.
- Wynne B. (2010) Strange Weather, Again: Climate Science as Political Art. *Theory, Culture & Society* 27(2-3): 289-305.
- Yearley S. (2000) Making Systematic Sense Of Public Discontents With Expert Knowledge: Two Analytical Approaches And A Case Study. *Public Understanding of Science* 9(2): 105-122.

- Yearley S. (2009) Sociology and Climate Change after Kyoto What Roles for Social Science in Understanding Climate Change? *Current Sociology* 57(3): 389-405.
- Young D. (1970) A Sketch History of Scottish Nationalism. In: MacCormick N (ed) *The Scottish Debate: Essays on Scottish Nationalism*. Glasgow: Oxford University Press, 5-20.