

The Two Degrees Dangerous Limit for Climate Change

This book is about the history, present and future of one of the most important policy ideas of the modern era – that there is a single, global dangerous amount of climate change. That dangerous amount of climate change is imagined as two degrees centigrade of global warming above the pre-industrial average. Although the two degree idea is based on the value system of elite policy actors, it has been constructed in public discourses as scientific fact. This false representation of the concept undermines opportunities for positive public engagement with the climate policy debate, yet it is strong public engagement that is a recurring aspiration of climate policy discourses and is considered essential if climate mitigation strategies are to work.

Alongside a critical analysis of how the idea of a single dangerous limit has shaped our understanding of what sort of problem climate change is, the book explains how the public have been kept out of that decision-making process, the implications of this marginalization for climate policy and why the dangerous limit idea is undermining our ability to mitigate climate change. The book concludes by exploring possibilities for a deliberation about the future of the two degree limit that allows for public participation in the decision-making process. This book illustrates why, at this critical juncture in the climate policy debate, the two degree limit idea has failed to achieve any of the policy goals intended.

This is the first book dedicated to questioning the issue of the two degree limit within a social science framework and should be of interest to students and scholars of environmental policy and politics, climate change communication, and science, technology and society studies.

Christopher Shaw is a Knowledge Exchange Research Fellow at the Environmental Change Institute at the University of Oxford, and Visiting Fellow at the University of Sussex, UK.

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**Dedication: To my wife, Livi, without whom none of this would
have been possible**

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Abbreviations

AGGG	Advisory Group on Greenhouse Gases
AOSIS	Alliance of Small Island States
CBA	cost-benefit analysis
CDA	critical discourse analysis
CFC	chlorofluorocarbon
DEFRA	Department for Environment, Food and Rural Affairs
EU	European Union
GDP	gross domestic product
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
NASA	National Aeronautics and Space Administration
NGO	non-governmental organization
OECD	Organisation for Economic Co-operation and Development
ppm	parts per million
SEI	Stockholm Environment Institute
TWA	tolerable windows approach
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
WBGU	Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen (German Advisory Council on Global Change)

Introduction

Some like it hot: awakening to the reality of climate change

The end point of climate policy is to prevent the world warming by more than an average of two degrees centigrade, the reason being that more than two degrees of warming would be dangerous (Anderson and Bows, 2008). I first became aware that there might be a problem with the idea of a two degree dangerous limit to climate change during the summer of 2003. Europe was in the midst of a record-breaking heatwave, which caused over 30,000 deaths and was described as the biggest natural disaster in Europe for 50 years (UNEP, 2004). The 2003 European heatwave, which occurred in a world 0.7 degrees centigrade hotter than the pre-industrial average, somewhat short of the two degree dangerous limit, was reported to have ‘severely reduced European grain production, reducing stocks to the lowest level on record’ (Lean, 2003). The River Danube in Serbia fell to its lowest level in 100 years. Reservoirs and rivers used for public water supply and hydro-electric schemes either dried up or ran extremely low. In Portugal 215,000 hectares of forest were destroyed by fires – an area the same size as Luxembourg. It is estimated millions of tonnes of topsoil were eroded in the year after the fires as the protection of the forest cover was removed (Met Office, 2014).

Statistics and science struggle to definitively attribute any one event to climate change. However, two studies determined that human interference in the climate had at least doubled the risk of such a heatwave occurring (Stott et al., 2004; Schär et al., 2004). It has been claimed that the 2003 European heatwave is likely to become an annual event under two degrees of warming (Lynas, 2007: 66). How many consecutive summers like the one of 2003 could Europe survive?

This question was not one uppermost in the minds of the UK news media, which seemed more concerned with celebrating our good fortune to be enjoying such a balmy summer. I seemed alone in my concern about what this meant for the still pervasive sense, amongst the few people who thought about it all, that climate change was a long-term problem, with no immediate consequences for humanity. This indifference extended to friends who worked for national and international environmental campaigning groups, who seemed to be treating climate change

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on a par with localized transient problems such as river pollution. Surveys conducted in the UK shortly after the heatwave confirmed my fears. One study showed 52% of respondents believed climate change will have little or no effect on them personally (BBC, 2004), while a study in the same year found that 85% of UK residents believe the effects of climate change will not be seen for decades (Energy Savings Trust, 2004).

It was the conjunction of these events – a disaster seemingly explicable only in terms of climate change, a news media celebrating our good fortune to be enjoying such weather and a UK public oblivious to the implications of this event – that motivated the research discussed in this book.

A phenomenon without boundaries

Climate change is a very difficult problem to compartmentalize, to draw boundaries around and say, okay, this is part of the problem but that over there is nothing to do with climate change. As such, the only appropriate response is a totalizing one. By totalizing, I mean that any discussion of progressive social change emerges from recognition that one isolated cause or issue, one specific form of injustice, cannot be fulfilled or corrected without eventually drawing the entire web of interrelated social levels together into a totality, which then demands the intervention of a politics of social transformation (Jameson, cited in Kunkel, 2014: 172). There is a growing body of scholarship stressing the need to study the role of culture and politics in the very production of scientific knowledge and associated adjudications (Lahsen, 2008: 204; Hulme, 2009).

So to say that the heatwave and the media reaction were the beginning of this story would be to miss out an important part of the background. Media responses to the heatwave are simply the expressions of a deeper issue, namely the exercise of power and the legitimation of the exercise of power. The spring of 2003 was also the year the West invaded Iraq. This invasion was justified by politicians on the basis of the threat posed by Iraq's weapons of mass destruction. The media offered no serious critique of these incredulous claims, yet in London 2 million members of the public, who could see the weapon of mass destruction claims were a fabrication, marched to protest the impending invasion in the largest political demonstration in UK history. So by the time of the heatwave I was already working on the assumption that the media, far from being a window on the world, was instead little more than an echo chamber for the views of political and economic elites. I was thus alerted to the possibility that the media might be fulfilling the same function in respect of climate change. The claim that there was no need for urgent and drastic precautionary measures because scientists had discovered climate change would not become dangerous until the planet had warmed by an average of two degrees seemed a little too tidy, a little too convenient, to be true. This book will show that indeed, the claim of a scientifically defined single dangerous limit to climate change cannot be supported by the evidence.

Who decides how much warming is too much?

Whatever the science can or cannot tell us about the future impacts of climate change, deciding which of those impacts constitutes an acceptable level of risk is a value choice, to be decided by the citizens of democratic societies. Danger is a contested term (Lorenzoni et al., 2005: 1388), shaped by uncertainties in our knowledge of the future and the acceptability of risk, and vulnerabilities of the individual or community concerned. So, given the diversity of values and vulnerabilities across the globe, and the uneven rate of warming masked by the two degree average, there cannot be one measure of dangerous climate change for the whole of humanity and the planet. Even if we ignore this ontological challenge, we might still reasonably ask, if there is a single dangerous limit, why put in place policies that take humanity to the very precipice of danger, with no margin for error? In what other area of life, where the risks are so huge, would responsible decision makers arrive at such a strategy? This book is not concerned with providing yet another timeline of the evolution of the two degree limit (see, for example Shaw, 2010; Tol, 2007; Oppenheimer and Petsonk, 2005). Instead, I want to show how this concept has been legitimated and sustained within the public sphere. I am as interested in the undemocratic nature of the decision-making process as the fallacies of the target itself. This is where the two degree story told in this book differs from other accounts. Those other accounts begin critically then abandon the critique either to come out in support of the two degree limit or, having recognized the fallacy of the concept, go on to base their subsequent narrative on the assumption of a two degree dangerous limit regardless because there simply is no story to tell without the ‘once upon a time’ of two degrees.

It is important at this historical moment to undertake this analysis, when there is an ever more visible debate taking place within academia about what, if anything, should replace the idea of a two degree limit (e.g. Viktor and Kennel, 2014; Jordan et al., 2013; Krieglner et al., 2014; Shaw, 2015). This book is an attempt to begin getting attention paid to the core question posed by the failure of the two degree limit to prevent the emergence of dangerous climate change impacts. The question is not just what, if anything, should replace the idea of a two degree limit, but *who* should decide what, if anything, replaces it.

One might have thought it obvious that the free citizens of democratic societies might have been given some say in how to respond to the greatest collective challenge facing humanity (Ban, 2009), but in fact comparatively little attention has been paid to issues of procedural fairness in the development of international climate policy (Vanderheiden, 2008: 57). It seems foolhardy to trust the same institutions, motivated by the same values that led to the failure of the two degree framework, to be left to decide what to do next.

However, at the moment the public sphere is characterized by a climate silence (Corner, 2013). Climate change is, as one senior politician recently described it to me, ‘bad politics’. No party is going to campaign for votes on the promise of a programme for the radical reduction of greenhouse gas emissions. Talk of climate change is virtually absent from the media. Instead, the

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talk is of green jobs, green growth, energy security and fuel poverty. Yet climate impacts are accelerating and the need for cuts in emissions of greenhouse gases is increasingly urgent. In March 2015 the UK Secretary of State for Energy and Climate Change suggested that the 80% cuts by 2050 target set out in the UK Climate Change Act may not be ambitious enough (Carbon Brief, 2015). Changes are coming, in terms of efforts to reduce emissions, the impacts generated by existing emissions and the adaptations needed to cope with future changes. Without any narrative about why these changes are happening it is difficult to see how the government will be able to co-ordinate these changes and build public support and involvement with what is going to be required for life in a two degree world.

An end to a symbolic politics of climate change?

The emergence of this climate silence coincided with a shift change in mood amongst political leaders. The end of 2013 saw a flight from the middle ground of climate policy. In Australia, the UK and Canada the governments drew back from previous climate change commitments. Meanwhile, a growing sense of alarm was apparent amongst many researchers, government departments and climate scientists. This alarm reflected a sense that even as the evidence was mounting of the profoundly negative impacts that are being manifested by the changing climate, policy and public opinion were increasingly hostile to the radical action needed to reduce emissions of greenhouse gases.

At the core of this polarization lies the ticking time bomb of the two degree target, a bomb which exploded just at the time of the fifth Intergovernmental Panel on Climate Change (IPCC) report. Whilst two degrees had worked well in making climate change a problem for the future, when the planet warmed by two degrees, the emission cuts needed to achieve that long-term target needed to start being made now. Up to this point the two degree limit had reduced climate change policy to a symbolic politics, a performance (Blündhorn, 2007). However, now the objective reality of the immediate need to reduce emissions radically to meet the two degree limit has arrived; mere performance is no longer sufficient. Moving to a substantive and meaningful way of life that no longer relies on untrammelled use of fossil fuels will require a new, more inclusive and more democratic way of talking about climate change. That means coming to terms with a world in which we can no longer pretend that limiting warming to a global average of two degrees centigrade is going to make all our climate change problems go away.

Methodological questions

This book differs from other analyses of the dangerous climate change question in not being wholly concerned with the legitimacy of that claim, though the research itself is a response to the problematization of the two degree concept. Instead, it is a focus on how the idea that a dangerous limit has been identified

is represented in the public sphere. The public sphere is a loose definition and could include any communication not the preserve of confidentiality agreements. Given that it is not possible to include everything that has been written about the dangerous limit, the intention is instead to include what my research, and other analyses, indicate to be the most significant contributions to the construction of the two degree limit. Establishing what counts as significant will always be arbitrary, but it is possible to establish meaningful criteria for defining which discourses have had an impact on this debate.

In the first instance it is necessary to adjudicate between different types of commentary; for example, comments on a blog may be read by more people than would read an article in an academic journal. A message heard by ten members of the public might be considered less significant than one listened to by ten heads of state. We might therefore ask: What size of audience counts as significant? What sort of audience counts as significant? Is a statement significant simply by virtue of making it into print? A non-academic book on climate change that addresses an audience of engaged actors who might then go on to influence others should be considered significant even if it is not presenting new information in the way academic research does. Another criterion of relevance to this schema regards the intent of the statement: Was the statement designed to influence perception, attitudes and/or behaviour towards the dangerous limits idea? Discourse designed to impact the dangerous limits debate would need to be saying something new, saying something already known but in a different way, in different circumstance or in a different medium (and thus to a new audience). It may be that the significance and potential for affect is the consequence of being said by someone or some group that has not previously engaged in the discourse. Of course, the influence of any statement could be the combination of more than one of the above attributes. The communicative acts analysed are also (excepting some presentations that I attended and the interviews) available to the public in the form of recordings, whether the written word, audio or film.

In summary, significant events, statements and discourses about dangerous limits to anthropogenic forcing of the climate are defined as those which, as a minimum:

- assume that industrial activities are causing changes to the climate which would not otherwise occur;
- are deliberate communicative acts;
- have some persistency; or
- are designed to affect some kind of cognitive or policy change.

Recognizing that different approaches will identify different sources as worthy of analysis, this book will rely largely on interviews and English-language news stories to demonstrate the arguments being made about public representations of dangerous climate change. This information is supplemented, where appropriate, with quotes from popular science books and non-governmental organization (NGO) campaign materials, as these are discourses directed at a

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public audience. Many of the news stories come from the time of the Copenhagen conference, as this was the only time the news media have paid sustained attention to the subject of two degrees (see Figure 5.2, Chapter 5). If it were not for Copenhagen there would be very little data to draw upon. More recent news reports are included where appropriate, and these show that nothing has changed in the intervening years about the manner in which news media report claims of a knowable single dangerous limit to climate change.

Two separate approaches were used to elicit responses from informants: face-to-face semi-structured interviews, and semi-structured telephone interviews. A combination of convenience, snowball and purposive sampling was used to identify informants. The informants were, variously, campaigners for UK and international environmental organizations, social scientists from the UK and Europe, climate scientists from the UK, Europe and USA and one member of the European Parliament. Bryman (2007: 100) describes a convenience sample as one available to the researcher simply by virtue of its accessibility, and is an approach often used in conjunction with snowball sampling (*ibid.*: 304). These sampling techniques were secondary to the initial process of purposive sampling, which is the approach that Bryman considers most commonly recommended for generating qualitative interview data (*ibid.*: 333). Purposive sampling involves identifying people who are relevant to the research questions (*ibid.*: 333–334). I interviewed 27 actors, which is in line with Lowe and Lorenzoni's (2007: 56) examination of expert attitudes to dangerous climate change, which used data from 23 interviews. Interviews took place in two tranches. The initial 15 interviews were conducted between June 2007 and September 2008. The second tranche of 12 interviews was conducted in late 2009 and early 2010. Eight in-person interviews were carried out at the Climate Camp protest at Heathrow Airport in 2007 and a range of conferences between 2008–10. Other interviews were conducted either in the office of the respondent or over the telephone, and ranged in duration from 15 minutes to an hour. Some interviewees made it clear they wanted the interviews to be anonymous. For administrative reasons the decision was taken to anonymize all transcribed interviews. Additional primary data were generated from recordings of talks and panel discussions at various conferences and other events.

Layout of the book

There are three parts to this book. Part I deals with the theoretical background to the two degree limit not as humanity's saviour but an act of power which is actually preventing the development of any meaningful response that reflects the climate risk. Part II moves to a more empirical approach, showing how the structures identified in Part I play out in the public sphere. Part III looks to the present and future of the two degree limit.

Chapter 1 explores the main narratives that populate media, policy and institutional reporting of climate change. Other marginal narratives are also examined, whether from the political right or deep green positions. The

analysis will utilize the lens of knowable dangerous limits to connect these different narratives, and highlight the commonalities and differences that exist between these narratives in respect of the idea of a knowable dangerous limit to climate change.

In Chapter 2 the construction of climate change as a phenomenon with a knowable dangerous limit is explained with reference to the post-World War II history of managing novel risks through the definition of safe and dangerous levels of exposure to the risk. Starting with the attempts to calculate a safe level of exposure to radioactive materials, the chapter takes us through the debates around pesticides in the late 1960s to research into workplace hazards of the 1970s and 1980s. Reference is made to recent controversies surrounding safe radiation levels in Fukushima, Japan, and safe concentrations of ash after the Eyjafjallajökull, Iceland eruption in 2010 to suggest the setting of safe levels is designed to enable continuance of the risk-generating activities, rather than constrain them.

Chapter 3 leads on from the previous one to provide the theoretical grounding for the following analysis. Discourses on safe climate change are contextualized within a framework of critical discourse analysis. This approach argues that the setting of a dangerous limit, and the subsequent communication of this claim, is an act of power designed to protect vested interests and legitimate the continuance of the industrial activities generating the problem. This discussion of the role of language in policy, ideology and social control sets the background for the subsequent sections of the book.

Different climate science perspectives on why two degrees is or is not a dangerous limit are analysed in Chapter 4. Though there will inevitably be, in part at least, a chronological structure to this account, it is not intended to be purely an historical account of two degrees in climate policy, which I and others have already provided.

Chapter 5 compares the dangerous climate change narratives in the public sphere with the scientific perspectives detailed in Chapter 4. In Chapter 6 a normative perspective, rooted in the climate justice literature, is offered to summarize the preceding chapters into a broad critical account of the two degree concept. This chapter explores how the construction of climate change as a phenomenon with a single dangerous limit ignores the geography of vulnerability, and discusses the ethical implications of responsible nations defining a level of climate risk that puts those least responsible for emissions in harm's way.

Emerging questions about the viability of meeting the two degree limit are outlined in Chapter 7. This brings the analysis up to date with the discussions since 2009 of the utility of trying to reach an international agreement through the two degree framework. The analysis highlights the absence of any voice for the public in this debate. Whilst discussions are currently about what, if anything, should replace the two degree limit, I suggest the debate should move on from the 'what' to the 'who'. Who decides how much warming is too much, how safe is safe enough?

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Chapter 8, the final chapter, explores the strengths and weaknesses of claims for bringing global publics into the debate. Strengths and weaknesses of the respective approaches are assessed.

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1 The stories we tell about climate change

The ideology of labels

White (2013) argues that the only way to respond to climate change is from the Kantian position that things in themselves are unknowable, that all we have knowledge of is our mental processes and categories. This perspective is counter to the dominant institutional norms, which rely on symbols – primarily language – to divide indivisible reality to aid our management of the world (Tolle, 1997; Watts, 2011; Zerzan, 2002; Eagleton, 2007). Stories are an attempt to reconnect those divided elements into a partial, bounded reality.

I am going to be referring to the two degree dangerous limit as a symbol that makes possible the telling of an ideological story about climate change. Ideology is a form of language that forgets that there is little significant correlation between the words we use and physical world to which they refer (Eagleton, 2007: 200), and through this forgetting seeks to forge political unity (ibid.: 222). I am going to begin this chapter by exploring the value that the concept of ideology can bring to the ideas discussed in this book. In this section of the chapter I will draw largely on Eagleton's *Ideology. An Introduction* (2007) to highlight the opinions most relevant.

Ideology is the only means of navigating and orientating ourselves within a reality too complex to comprehend in its totality (Eagleton, 2007: 151). Hence ideology is an inevitable feature of modernity which becomes a problem only when put to the service of minority elite interests (ibid.: 152). The process of developing a narrative that can create political unity in a complex world demands the narrative is homogenous. This homogenization is only possible by expelling the other, that which is alien or a threat to that homogeneity (ibid.: 126). We will explore how the two degree limit symbol homogenizes the physical world, how people experience the world, their vulnerability to the impacts of climate change and the responses that constitute solving climate change.

This homogenization is ideological in the problematic sense because it serves the interests of elite actors. The two degree symbol, by assuming avoidance of dangerous climate change means the same thing for the whole of humanity, validates stories that are designed to mask the conflicts between the interests of

the ruling class and those of society as a whole (ibid.: 57), thrusting alternative ideas beyond the very bounds of thinkable (ibid.: 59).

Eagleton, writing from a Marxist perspective and hence focusing on relations of production, argues that there is little point changing the story if the social conditions generating the social contradictions that ideology seeks to mask remain in place. The social contradiction in question is the capitalist drive for ever increasing profits. However, the social contradictions creating conflict in the Marxist sense are the same social contradictions creating climate change. By this I mean that the quest for increasing profits and continuous increase in gross domestic product (GDP) remains the guiding paradigm of human activity and any attempt to address the problems it creates – whether inequality or climate change – are to be addressed within this paradigm. However, we will not be making reference to capitalism in this book but will instead use the term industrial modernity, which Giddens (1991: 22) has defined as ‘the sum of the meanings, values and structures necessary for the reproduction of industrial society, as expressed through both the physical and discursive’. This allows us to talk about climate change as the result of a particular way of being in the world without relying on a contested term such as capitalism (which has as much real-world relevance as the term ‘freedom’) and without assuming the proletariat will save humanity.

So, will widespread public awareness that the attempt to define a single dangerous limit for the world is an act of power designed to protect the interests of a small elite on its own resolve the climate crisis? No, but the argument of this book is that it will not be possible to address climate change without this awareness. It is a necessary element of the process but insufficient on its own. The understanding and transformation of reality are not two separate processes but one and the same phenomenon (Kolakowski, cited in Eagleton 2007: 99).

Two degrees as an ideological story – a brief summary

It will be shown that two degrees is described in the public sphere as a scientifically defined dangerous limit for climate change and that this description is an ideological act. Ideology cannot be a naked exercise of power if it is to find acceptance amongst those citizens who are subjugated by those ideologies: ‘The exercise of power must remain hidden; if it reveals its hand it can become an object of political contestation’ (Eagleton, 2007: 116). Instead, the ideologies must be internalized by the people so that individuals govern themselves in a way that is a natural continuation of elite interests. The ideological work performed by the two degree storyline is the delaying of the need for a cessation of industrial activity. The two degree storyline makes climate change a problem for the future, when we find ourselves committed to that amount of warming, if not more. By delaying the need for action, the two degree story, as well as giving the impression that policymakers are doing something (Viktor and Kennel, 2014), legitimizes the political and economic system that generated the crisis (Habermas, 1998).

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We are *Homo Narrans*, storytelling and story-attending beings that use narrative rationality and the evaluative criteria of good reasons to assess the persuasiveness of any story and its truth claims (Roberts, 2011). However, climate change itself is an abstraction resting on statistical inference and a global network of monitoring stations in orbit and on the Earth's surface (Hulme, 2009). Therefore, in order to build public awareness and, it is hoped, support for mitigation, those numbers, the scientific data, need to be made into a story, reformulated into symbols with appeal beyond the walls of the laboratory (Pearce, 2014). The conversion of the scientific data into a narrative is where the ideology gets to work. Who writes those stories, what those stories include and omit – these are all conditioned by the distribution of power. This lies at the core of the failure of policy elites to develop an effective response to climate change because if policy is defined and controlled solely by these elites and experts, then policy will naturally only reflect the concerns and values of a tiny fraction of the demos – that fraction which wishes to preserve its own privileges (Machin, 2013). Chapter 3 will explore in more detail how elites captured the climate risk storytelling process.

The ideological work of a symbol must be hidden in order for it to function ideologically, but in order for ideological narratives to have mass appeal they must also serve to cohere and promote those forms of consciousness that are in tune with the most significant tendencies of an era (Eagleton, 2007: 121). Ideologies will not work if they bear no relation to the lived experience of the time. The foundational myth of climate change – that it is a phenomenon with a single, knowable objectively true dangerous limit – is an abstraction, a story made possible by its reference to the existing discourses of environmental limits.

The ideological stories emerging out of elite organizations are intended to shape the beliefs, attitudes and ultimately the behaviours of the recipients; it is a performative language, designed to get things done (Eagleton, 2007: 19). In order for the story to shape the beliefs of the audience, it must be one that the recipients can understand because without pre-understanding of some kind we could not recognize or pass judgement on an issue (Eagleton, 2007: 5). Yet anthropogenic climate change is a novel and unfamiliar risk, which is likely to have profound but highly differentiated and poorly understood impacts on people's lives. In addition, given that ideologies are more or less systematic attempts to provide plausible explanations and justifications for social behaviour that might otherwise be the object of criticism (Eagleton, 2007: 52), it is important that the story position the two degree limit as something beyond criticism, not simply as the wish fulfilment of a small section of the population. Hence, one of the roles of ideology is to naturalize a political decision, and indeed it seems quite natural nowadays to think in terms of a maximum rise in the average global temperature (Cointe et al., 2011).

So, what sort of story are the data emerging out of climate modelling and observations shaped into? The two degree story follows the simple template many people would first have encountered in the fairy tales of their childhood.

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Once upon a time there was a happy land full of happy people who spent their days working, shopping and travelling. But their way of life angered an invisible monster who threatened to create great suffering if the people did not change their ways. Yet people did not change their ways and the more they carried on with their lives, the angrier the monster got. One day the king asked some of the cleverest people in the land to find out why the monster was getting angry and what could be done about it, besides stopping the work, shopping and travelling that made everyone so happy. These clever people told the king that unfortunately it was all the working, shopping and travelling that was warming the land, and making the monster angry. The king then asked his advisers what they should do about this. His advisers said, well, it's not a problem yet, certainly not for us here in the castle, and we think we can keep going for a little while yet, but if it gets more than two degrees warmer, the monster's anger will become uncontrollable and it might well march on the king's castle and destroy it. So the king called together the engineers, scientists and business people and told them to find a way for people to carry on working, shopping and travelling without warming the land by more than two degrees. And lo, these people told the king not only could they make it possible to carry on working, shopping and travelling without warming the land, but that their solutions would ensure an increase in the amount of work, shopping and travelling people could do. So it came to pass that the monster was appeased, and everyone lived happily ever after, working, shopping and travelling.

This simple grand narrative removes all paradox and offers a path through to a promised land where the benefits of neo-liberalism can be maintained, without the worry of climate change ruining the party. This is not just one story about climate change – it is the only story. We can go further than that, too: in fact, there are no stories to tell without the idea of a single global dangerous limit. Roberts (2011) has identified the importance of stories to building public engagement with climate change as part of a process of deliberative democracy that can act as a counterweight to the dominant expert and elitist climate change narrative. Groys (2009: xv) illustrates this point when he claims: 'the economy functions in the medium of numbers. Politics functions in the medium of language.' The goal then becomes the transcription of society from the medium of money to the medium of language (ibid.). Hence, developing a politics of climate change, to allow there to be decisions to be made, means working through the medium of language, but a democratic language of the people, not institutional language. In other words, it requires giving people the chance to tell their stories and have those stories heard. It is through this opening up of the policy landscape to the people's stories that we begin to see that climate change is not a single problem with a single number answer but, like myths, means something different to everyone who encounters it.

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Symbols and narrative rationality

People tell and listen to stories, not discourses (Roberts, 2011: 10). That is, we employ the evaluative criteria of good reasons and narrative rationality to make sense of our world (ibid.: 12). Narrative rationality refers to the way we interpret and evaluate new stories against older stories acquired through our experience. As Roberts (2011) explains:

We search new accounts for their faithfulness to what we know, or think we know, and for their internal and external coherence. As we grow older, we learn more sophisticated criteria and standards for assessing a story's 'fidelity' or coherence, but constructing, interpreting and evaluating discourse as 'story' remains our primary, innate, species-specific 'logic'.

(Fisher, 1987: 5, cited in Roberts, 2011: 34)

Narrative rationality hence refers to how well a story holds together for its audience as a credible sequence of events, and makes sense in real-world terms – how well the story marries with the values, beliefs and experiences common to its listeners. Symbolism thus comes to play a central role in the perceived rationality of a narrative. Do the symbols used in the narrative reflect, employ or in other ways match the symbols we as individuals use to assess the trustworthiness of a narrative? Symbols offer guidance about how to respond to specific situations, and mobilize pre-existing cognitive patterns and trigger ritualized forms of behaviour (Blünderhorn, 2007: 255). So it is that the two degrees target has functioned successfully as a 'boundary object' (Star, 2010) for campaigners, artists and scientists, as a threshold around which narratives of urgency, concern or collapse are constructed. That is, it has become a socially constructed entity which is powerful and has endurance both because it has credibility in many different worlds and because it works to stabilize discourse across the boundaries of these worlds. The credibility arises more from the values of the actors involved in the construction of this social entity than any objective measure of when climate change might become dangerous. However, it would not do to promote two degrees of warming as a dangerous limit because a handful of First World technocrats find it a convenient measure. It must instead be presented as a scientific fact.

Science's status atop the knowledge hierarchy is clearly illustrated in both global and national environmental politics, where ecological science shares the stage (sometimes comfortably, sometimes uneasily) with economics as the authorized foundation for understanding and addressing environmental issues (Burke and Heynen, 2014: 12). Hence science serves a symbolic function when used in expressions such as 'scientists have identified two degrees as a dangerous limit'. We know this to be true, that the use is a symbolic one as part of a broader ideological discourse, because who, after all, are these scientists? Are they biologists, chemists, physicists, geologists or meteorologists? Of course it cannot be any one discipline, so which disciplines are they, how do you weight their respective

input, how does one mediate across the different disciplines to produce a single result? No, what we are dealing with here is science as a symbol: white coats, white men, laboratories and an objective truth free from the world of politics. However, the last time a multi-disciplinary team came together with the goal of identifying a dangerous limit (Blair et al., 2005), they came away empty handed. Setting a single limit for the world then enacts the economics discourse of cost-benefit analysis which makes the problem one solvable by neo-liberal economics rather than a problem of neo-liberal economics. Shaw and Nerlich (2015) have shown how reports from global institutions such as the International Energy Agency, various United Nations (UN) bodies and many NGOs employ the language of budgets, offsets, sinks and sources – in short, the language of double-entry bookkeeping. It is no coincidence that over 200 years ago Goethe understood just how important the concept of double-entry bookkeeping is to the interests of the businessman (Goethe, 1995 [1796]: 18). Nor is it just happenstance that the denialist organization the Global Climate Coalition were early champions of technological fixes to climate change (Vanderheiden, 2008: 34).

If language is the instrument by which the world and society are adjusted (Benveniste, 1971, cited in Moretti, 2014: 18–19), then these sorts of symbols are shoring up a mobilizing narrative that naturalizes the problem of climate change to one of an insufficiently green form of industrial modernity, ensuring the stories we tell about climate change do not pose any threat to the current order (Jerneck, 2014: 29). So it is that no raised eyebrows met the previous Secretary of State for Energy and Climate Change's claim that 'we must get off the oil hook – and onto clean, green growth. The science demands it. Our survival requires it. And our living standards will benefit from it' (Huhne, 2011).

Solving climate change through ecological modernization

The statement from Chris Huhne offers a succinct definition of ecological modernization; it is the fairy tale put into policy-speak. From this vantage point, the primary motivation for acting against climate change is economic (Machin, 2013: 20). The attempt to transform institutions within the bounds of modernity in order to meet ecological challenges are often conceptualized under the rubric of ecological modernization (Dryzek, 1997; Schlosberg and Rinfret, 2008; Hajer, 1995). Ecological modernization, in providing 'the dominant discursive space in which climate change is interpreted and conceptualized' (Dryzek, 1997: 131), requires the world to be constructed as 'planetary machinery in need of scientific management and monitoring' (Steffen et al., 2004: 9). Consequently, under ecological modernization all the roads that take us out of the environmental crisis are roads that lead us further into modern society (Spaargaren and Mol, 1992: 432). Ecological modernization might thus justifiably be described as 'yet another (and perhaps final) example of late modernity's ability to appropriate and incorporate resistance to itself' (Chouliaraki and Fairclough, 1999: 12). The rehabilitation of technology under ecological modernization and the rubric of 'high-tech' (Ezrahi et al., 1994: 4) has been described as nothing more than a

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final and universal victory for the technical code, a complete colonization of the lifeworld (Feenberg, 2002: 140). The two degree symbol serves a particularly important function in the ecological modernization ideology – in imagining a single limit for the whole world, it sustains and extends the globalization agenda.

Olausson describes globalization as a leitmotif of modernity that is being reinforced by the transnational nature of environmental issues such as climate change, which are forcing us to think globally (Olausson, 2009: 421). If the problem is global, one privileges global solutions that embody a particular social order (Smith, 2007: 200). The global discourse assumes a shared future, shared perspectives – shared in this case meaning Western. Roszak (1978) identifies such global constructions of humanity as an oppressive denial of personhood which has come to define the meta-narrative of modernity. Smith understands the dominant climate change discourses as a global ‘gaze’, a masculine construction that ‘speaks of detachment and power, with nature as an externalized other’ (Smith, 2007: 201). The idea of the climate change discourse as a discourse of power is echoed by Backstrand and Lövbrand, who see dominant constructions of climate change as increasing the reach of the state by legitimating a ‘green governmentality’ that seeks to extend control through technologies of power to the domain of the environment (Backstrand and Lövbrand, 2007: 127). This is a theme picked up by Wynne and Jasanoff, who suggest that climate change computer models such as global circulation models act as ‘one of the markers of modernity’ in that they create a centralized, all-comprehending knowledge (Wynne and Jasanoff, 1998: 59–60), which forces those outside the modelling community to put their trust in computations they do not really understand (see also Moss, 1995: 34; Nowotny et al., 2001: 183).

The basic ontological assumptions that frame my examination of this subject are broadly aligned with critical realism. I recognize that there are (at least as regards the physical world) underlying structures and mechanisms which generate phenomena, versions of which we construct through language (Somekh and Lewin, 2005: 123). The description of two degrees of warming as a dangerous limit cannot influence whether people are harmed by changes in the climate or not, but can define how that harm is understood and what relationship it has to constructions of a dangerous limit. These approaches theorize risk as both factual and constructed, and maintain that the inclusion of scientific and calculable elements to the process of building risk policy should not be at the expense of recognizing the social elements of understanding and responding to risk (Ravetz, 2006; Hulme, 2009; Martell, 1994; Eden, 2004). It is this attempt to understand climate change as a physical reality constructed in many different ways that leads Bray and Shackley (2004: 2) to describe climate change as a ‘quasi-reality’, and claim a social-constructivist methodology as the best approach to understanding such a problem.

The reasons for using a two degree dangerous limit

In the Introduction we saw how the narratives of dangerous climate change in the public sphere seek to exorcize the ghost of uncertainty (Van der Sluijs, 2005)

by defining a single limit which anchors (Moscovici, 1963) this novel threat in familiar storylines. Anchoring describes the means by which people come to understand an unfamiliar event. People can only make sense of the world by finding ways to reconcile their beliefs with some set of facts about how reality must operate (e.g. Schon and Rein, 1994). To anchor an object is to fit it into an existing system of classifications – to name it and relate it to other objects in the system (Wells, 1987: 443). Moscovici (1963) seems to be the first thinker to explain the role of anchoring in knowledge production, and uses the term ‘social representations’ to describe the way new ideas are taken up by, or communicated to, the public. The process of social representation involves anchoring, comparing a foreign object to already known systems or categories. Anchors allow groups to make sense of novel risks by classifying and naming the threat, thus making the unfamiliar familiar (Washer and Joffe, 2006: 2143). Another process in the evolution of social representations of a novel phenomenon is objectification, which saturates an unfamiliar entity with more familiar images, objects, symbols. Anchoring in this way overlaps with symbolization, providing people with a means to experience abstract content. A gradual process of familiarization, discussion and use simplifies the idea into a single image. Eventually, the image is entirely assimilated into a framework of representations, and becomes an element of reality rather than of thought – an unmediated fact (Wells, 1987: 444).

This familiarization is achieved by creating a story of the past, present and future of climate change which employs the same narrative arc that defines storytelling in Western cultures (Roberts, 2011), uses the symbol of science to give credibility to the storyline for diverse groups (Shaw, 2013), creates a quantitative framework which enacts a cost-benefit analysis of the policy options (Shaw and Nerlich, 2015), and relies on the voices of authoritative individuals to give the claim credibility. It is the central thesis of this book that it has only been possible to generate this narrative by ignoring the contradictions inherent in the idea that sustains this narrative, namely the claim of a single knowable dangerous limit. In order for there to be any hope of limiting the harm arising from climate change, it will be necessary for a discourse to emerge that can accommodate this paradox, a public narrative which no longer, when forced to confront this fallacy, simply shrugs its shoulders and says, ‘But there it is’ (Black, 2012).

Bronstein identifies a symbolic element to the social construction of risk. The manipulation of symbols can be a key technique of social control; if the public accepts a particular definition of a problem then they will generally consent to the actions the powerful wish to take (Bronstein, 1984: 219). The social construction of risk involves competing efforts between different organizations to ensure their symbolic representation of the danger becomes the dominant one (ibid.). This struggle to maintain a particular symbolic definition of a problem pulls on the esteem of science to give a value position the appearance of fact, because an ideological position ‘can never be really successful until it is naturalized, and it cannot be naturalized while it is still thought of as a value rather than a fact’ (Fisher, 2009: 16).

Climate change, as a complex, global phenomenon characterized by a range of uncertainties, is very difficult to communicate to the public through the

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broadcast media (Pidgeon and Fischhoff, 2011). Other commentators have described the value of the two degree symbol not in ideological terms, but as a simplification of a complex matter which aids communication of climate risk (Jaeger and Jaeger, 2010), and thus acts as the rope that policymakers can climb to reach the lofty ambition of limiting warming to two degrees (Cointe et al., 2011).

The results of a survey of 2,002 UK adults conducted by Carbon Brief in 2012 indicate that the two degree symbol has failed as a communicative device (Figure 1.1). The respondents were asked: ‘At what level of temperature rise do you think climate change will become dangerous?’ The average mean temperature suggested was 8 degrees centigrade, and, ignoring the ‘don’t knows’ the three most popular choices were 5 degrees centigrade, followed by 2 degrees and then 10 degrees centigrade (Carbon Brief, 2013). We can therefore see that there is almost total ignorance within the UK population of the end goal of climate policy. This suggests that there must be near-total ignorance of how well the UK is doing in respect of the targets, what those targets mean, what it is people are being asked to engage with, and what is likely to happen if those targets are (and are not) met.

Of course, if the two degree concept is not resonating with the public, how can it be said to be ideological? Upon whom is the ideological work being done? I want to suggest that the two degree idea functions like a gateway. For the disinterested citizen, the two degree dangerous limit is an irrelevance. However, for anyone seeking to engage with the debate, whether campaigner, curious member of the public, journalist or policymaker, the two degree marker soon heaves into view and tracks their every step from there on in, framing all subsequent climate change narratives.

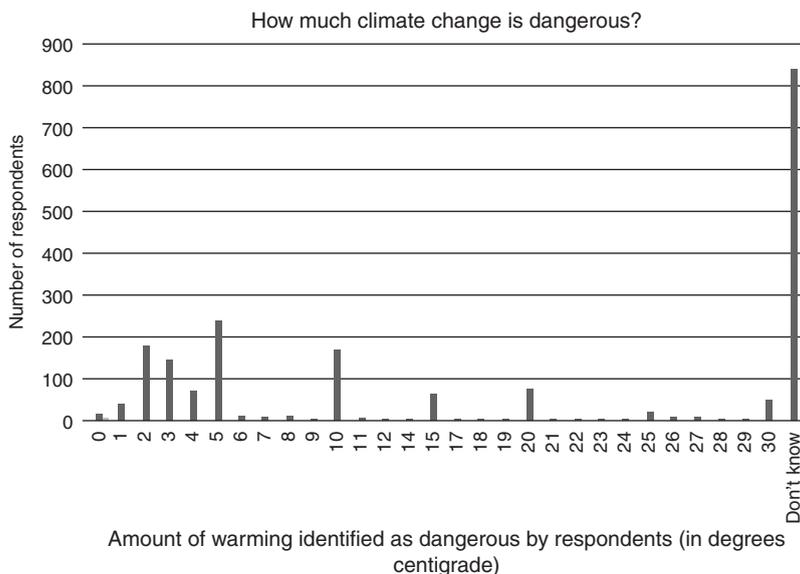


Figure 1.1 Survey of 2,002 UK adults about when climate change will become dangerous

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2 Two degrees and environmental limits discourses

The rest of it is crap but without targets you are nowhere. That's a fundamental principle you have to establish.

(Campaigner 6)

When limits become inconvenient

The two degree limit, like other safe limits, reflects the dualism of a simplified dose-response relationship. The institutional determinants of risk definition and scientific risk modelling have been traced back to the development of the civil nuclear industry, and the US Atomic Energy Commission's use of probabilistic risk analysis in the 1950s to assess the maximum credible chance of a nuclear reactor accident (Ravetz, 2006a: 72). Ravetz describes the uncertainties in civil nuclear power as 'overwhelming', but that it was necessary to deny the impossibility of defining the nature of the risk in order to legitimate the development of a nuclear power industry (ibid.). These risk assessments included the first attempt to define a dose-response dynamic, in this case for exposure to radiation.

Commoner (2003) argues that such efforts required the official denial of the fact that there is no safe limit for exposure to radiation and other carcinogens. In the 1960s the Occupational Health and Safety Administration in the USA was engaged in a dispute with an industry body (the American Industrial Health Council) over acceptable levels of exposure to the carcinogenic substance benzene. The Occupational Health and Safety Administration sought to develop worker health and safety legislation on the basis that there is no reliable way of determining a safe threshold for substances such as benzene, whereas the American Industrial Health Council argued for the establishment of such a level (Commoner, 2003: 35). Commoner's work indicates that attempts to identify safe limits are orientated towards the legitimisation and maintenance of potentially harmful industrial practices which, absent the 'safe limit' would be stopped or drastically curtailed. The belief in safe limits requires a dichotomous world view, where systems and individuals are defined as impacted/not impacted (Tickner, 2003: 9). Commoner (2003: 33) claims that where that assumption is successfully challenged the idea of a safe limit has to be abandoned.

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Such challenges normally arise where the limits concerned are deemed to have unacceptable impacts on the maintenance of the practices that define industrial modernity. For example, following the Fukushima nuclear accident, the safety limit for child exposure radiation was increased by a factor of 20 so that children from the Fukushima prefecture could return to school (Watts, 2011). Another example of using limits to enable rather than constrain industrial practices was shown when flights across Europe were grounded following the eruption of the Eyjafjallajökull volcano in Iceland. At that time there was no safe limit for atmospheric concentrations of ash; the presence of any ash, no matter how minor, was deemed dangerous. Between 14–20 April 2010 many flights across Europe remained grounded, causing massive disruption. Eventually, following immense pressure from airlines such as British Airways, the Civil Aviation Authority set a safe limit for volcanic ash at a level high enough to allow flights to recommence. This same resetting of safe limits is now under way in the climate debate (Viktor and Kennel, 2014; Jordan et al. 2013; Krieglner et al., 2014). Two degrees was an unexamined limit all the time it allowed for business as usual and did not require immediate emission cuts. Now that those cuts have to be made, and hence are a threat to business as usual, people are calling for it to be reset or abandoned. As John Ashton, special envoy on climate change for three successive UK foreign secretaries, remarked in an open letter to the chief executive of Shell, '[g]overnments have obligated themselves to do whatever it takes to keep climate change within 2C. I once heard an industry peer of yours dismiss this. Politicians, he said, had promised it cynically to keep NGOs off their backs. But there was no will to act on it. At the table was one of your own predecessors, who did not demur' (RTCC, 2015).

The analysis in this chapter will therefore assume that articulating a world view that divides safe from dangerous, impacted from not impacted, can be an act of power (Leiserowitz, 2005: 1441) which is in fact integral to modern-day politics and science (Ravetz, 2006a: 74; Ross, 1991: 6).

The political economy of limit setting

Hulme claims that the desire to conceive of the world in simple dichotomous terms of dangerous/not dangerous tipping points is the product of a culturally grounded way of believing (Hulme, 2009: 60). Rather than reflecting objective properties of the physical world, the 'meaningless precision' of clearly defined safety limits (Funtowicz and Ravetz, 1994: 93) serves an important ideological function, it being 'continuous with the scientific perspective of quantitatively dominating the physical world' (Ross, 1991: 208). Machin sees the safe/dangerous dichotomy reflecting a Western culture dominated by dualisms – public/private, culture/nature, mind/body (Machin, 2013: 111–112). The claim that science can identify dangerous limits is, for Ross, essentially normative and fulfils a political function: 'Calculations surrounding our ability to survive in a dramatically altered natural world are presented rationally so as to deny the irrationality of the actions generating the crisis' (Ross, 1991: 136). In addition, the discipline of

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risk assessment is inherently conservative and designed to preserve the industrial status quo (Winner, 1986: 139). That the risk-generating activities are socially beneficial is taken for granted: that is why they are amenable to risk assessment, a balancing of these benefits against harm. Alarms about particular hazards will engage the public's imagination where more ambitious general criticisms do not. Risk analysis is thus a 'strategic complement for, or even an alternative to, the politics of social justice' (ibid.: 141). Risk analysis, in the end, is about finding a place for that risk in society, making it acceptable (ibid.: 150).

Blünderhorn (2007: 260–261) identifies a post-ecologist turn from the early 1990s, since when risks have been reconceptualized as opportunities. Hope for democratic citizenship was replaced with a politics of delegation where people were happy to offload complex decision making to experts, regulatory bodies and charismatic leaders (see Roberts, 2011, for a discussion of how various areas of policy, for example the setting of bank interest rates in the UK, were removed from the hands of particular governments and into the hands of the civil service). This post-ecological turn sees dangers treated as risks and transformed into legally and scientifically normalized improbable accidents (ibid.: 190). When scientific challenges to corporate practices have come to the forefront, environmental scientists have had to meet with demands for more scientific, technological and economic studies in support of their stances before protective measures are pursued (ibid.: 194).

The setting of environmental limits allows the state to give the appearance of taking action in the face of environmental crisis, and hence maintain its legitimacy (Habermas, 1998). Doing something means controlling events in order to get a predictable outcome (Bronstein, 1984). Defining and agreeing limits, and building a network of institutions and events to implement those targets, provides the appearance of action and progress towards a solution, rather than helplessness. In addition, the quantitative ontology of environmental limits acts as 'first order questions which divert attention away from questions about the political and social order' (Smith, 2007: 202).

The ability to weigh outputs such as emissions against climate change targets is essentially a technological exercise, requiring global networks of surface and atmospheric monitoring devices. This further erodes any sense of climate change as a political issue for, as Dickens (1992: 157) observes, defining technological solutions as the correct solutions to environmental problems in effect makes political and ideological choices appear as merely technical matters. Therefore the quantification of the climate change problem not only serves a vital anchoring function, tying the climate change problem into common experiences such as speed limits (Jaeger and Jaeger, 2010), but it also frames climate change as a technical issue that can be managed through the framework of modernity (Weingart et al., 2000: 263; Haila and Dyke, 2006: 187).

Defining two degrees as an acceptable risk

Article 2 of the United Nations Framework Convention on Climate Change (UNFCCC) from 1992 represents the first official acceptance of the idea of a

knowable dangerous limit to climate change, though the convention does not quantify that limit (UNFCCC, 1992). Though efforts had been made by this stage to identify a limit for warming (e.g. Rijsberman and Swart, 1990), around the same time as the German Advisory Council on Global Change (WBGU) was making the claim to have calculated a dangerous limit, the Organisation for Economic Co-operation and Development (OECD) was writing, apropos of the UNFCCC, that '[g]iven that many uncertainties remain about the prediction of climate change, rigid targets are deliberately avoided' (OECD, 1995: 11). Oppenheimer and Petsonk (2005) have provided a scientific, legal and political history of Article 2 of the UNFCCC. Their history examines the debate leading up to the formulation of Article 2 and subsequent discussions of its interpretation and implementation. They trace a growing interest in the prospect of a dangerous threshold to climate change to the mid-1970s (*ibid.*: 196, and references therein). Though elements of Oppenheimer and Petsonk's account are challenged by other authors (for example Tol, 2007; Flannery, 2006), there seems to be broad agreement that the limits idea first made it into print in the mid-to-late 1970s. Research by the economist W.D. Nordhaus published in 1979 is cited by Oppenheimer and Petsonk as the first systematic treatment of the questions being raised in the mid-1970s, wherein two degrees of warming is described as a 'reasonable' limit as it reflects the maximum warming experienced within the range of long-term natural variations over the last 10,000 years (Oppenheimer and Petsonk, 2005: 197).

The WBGU reports of 1995, 1997 and 2003 are seen as important markers in the dangerous limit debate during this period. Jaeger and Jaeger, alongside Tol (2007) and Oppenheimer and Petsonk (2005), agree about the importance of the WBGU reports. Jaeger and Jaeger argue that it was these reports, and the efforts of the WBGU's chairman, John Schellnhuber, which convinced Angela Merkel to push for the two degree target at international conferences. For these authors the WBGU reports 'did indeed trigger the political process that fifteen years later led to the global visibility conferred to the 2° target by the G8, the Major Economies Forum, and the Conference of the Parties held in 2010 in Copenhagen' (Jaeger and Jaeger, 2010: 7). The WBGU papers were commissioned by the German government and fed directly into the UNFCCC process and the first Conference of the Parties (WBGU, 1995), the creation of the Kyoto Protocol (WBGU, 1997) and current European Union (EU) policy (WBGU, 2003). Tol (2007: 425) argues that the 1995 WBGU paper marks the first appearance of the two degree target.

The unanswerable question

The WBGU reports exhibit a tendency to substitute unreflectively the term 'dangerous' climate change for 'acceptable' climate change. This thesis claims that the distinction is a critical one in the climate change debate. Dangerous limits are grounded in external definitions of risk which seek to identify the limit of warming in purely physical terms, and arrive at one single understanding of

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dangerous for all life. However, the IPCC recognizes that any definition of dangerous rests on the level of risk deemed acceptable (IPCC, 2007: 97). It is clear, therefore, that risk assessments cannot determine what is 'dangerous' purely on scientific bases without some judgement about what is acceptable (Pidgeon, 1997). Lorenzoni, Pidgeon and O'Connor argue that it is important to understand what values society will bring to bear to determine what society or individuals will ultimately come to regard as dangerous (Lorenzoni et al., 2005: 1388). The ideal scenario is a body of rational actors using the scientific evidence in conjunction with individual value systems to build an aggregate picture of acceptable risk which would then legitimate the policies implemented to meet this acceptable risk level (Schneider, 2007; IPCC 2007; Sabatier and Jenkins-Smith, 1993; Lorenzoni et al., 2005; Lowe and Lorenzoni, 2007). Elsewhere in the literature, rather than define limits as dangerous, the idea of tolerable change is conflated with acceptable change. It is not always clear whether tolerable means physically tolerable, or whether it refers to an ethical or moral limit. From an ethical perspective Lowe and Lorenzoni (2007: 1390) ask 'how much change are individuals/societies prepared to tolerate?' Lorenzoni et al. (2005: 10) adopt an explicitly ethical definition of tolerability when they claim that tolerability and acceptability are socially constructed and highly subjective. The WBGU reports instead rely on a purely physical definition of tolerability to argue for a two degree limit, arguing such a rise would 'constitute climate changes that are absolutely intolerable' (WBGU, 1997: 18).

Weinberg's (1972) idea of 'transcience' maintains that currently scientific questions are being asked of non-scientific problems. In terms of climate change, I understand this to mean that science is providing quantitative answers to essentially qualitative questions (Rayner, 1987: 19; Baer, 2005: 4; Shrader-Frechette, 1991: 57). Therefore the answer to the question, 'How safe is safe enough?' must be totally systemic, possessing no definitive answer (Ravetz, 2003: 14).

Arguing that many environmental issues resist simplification through the reductive frames of normal science, Ravetz (2006a: 78) urges his readers to view the idea of certainty in science as an impossible goal. Instead, it is necessary to recognize that scientific activity is creating fresh uncertainty and instability, and should no longer be considered a terminus (Nowotny et al., 2001). Rather than being the singular means of responding to environmental problems, science should instead become one of several inputs into the decision-making process, a process wherein the ideal of rigorous scientific demonstration is replaced by that of open public dialogue which seeks to accommodate the plurality of legitimate perspectives (Ravetz, 2006b). Scholz et al. call for trans-disciplinary processes as a key element in developing socially inclusive, representational knowledge. This requires the inclusion of knowledge and values from agents from the scientific and the non-scientific worlds (Scholz et al., 2000: 477). So, whilst science has a role in describing the landscape of uncertainties and facts, the discussion about how to respond to these situations should be a societal one, not the preserve of scientific experts (Evans and Plows, 2007: 828). These perspectives are a reflection of the unique status of environmental science as the

most socialized, and thus most complex, of all scientific activity (Nowotny et al., 2001; Ravetz, 2003).

Finding the answer anyway

WBGU reports sought to quantify the dangerous limit, and outline how such a limit could be avoided through the adoption of a ‘tolerable windows approach’ (TWA). There are two key principles used to calculate the TWA: ‘preservation of Creation in its current form’, and ‘the prevention of excessive costs’ (WBGU, 1995: 13). The TWA:

is derived from the range of fluctuation for the Earth’s mean temperature in the late Quarternary [sic] period. This geological epoch has shaped our present-day environment, with the lowest temperatures occurring in the last ice age (mean minimum around 10.4 °C) and the highest temperatures during the last interglacial period (mean maximum around 16.1 °C). If this temperature range is exceeded in either direction, dramatic changes in the composition and function of today’s ecosystems can be expected. *If we extend the tolerance range by a further 0.5 °C at either end, then the tolerable temperature window extends from 9.9 °C to 16.6 °C.* Today’s global mean temperature is around 15.3 °C, which means that the temperature span to the tolerable maximum is currently only 1.3 °C.

(WBGU, 1995: 13, emphasis added)

This addition of 0.5 degrees centigrade is an important step in defining dangerous climate change as two degrees of warming. Rather than defining the limit on the basis of projected impacts derived from computer models, the WBGU casts back to previous climate regimes, and then adds another 0.5 degrees to reach the two degree target. The additional 0.5 degrees is based on the assumption that humanity is better able to adapt to climate change than our hunter-gatherer forebears (WBGU, 2003: 9). This is a problematic assumption, not least because it is unclear how one can quantify this difference in adaptive capacity. It seems equally arguable that hunter-gatherer societies, in being less reliant on complex interdependent technologies and extended production chains for the provision of essentials such as food and power, would better be able to adapt to the impacts of climatic changes. There are many other distinctly political and subjective elements.

The 2° Death Dance, the 1° Cover-up is the title of an investigative story written by Cory Morningstar in 2010. This story provides information on how an early report in 1990 identified one degree as a dangerous limit, and how that definition subsequently disappeared from official narratives. This report was written by an environmental campaigner, and so has not gone through a peer-review process. Nonetheless, the report provides a perspective relevant to discussions of the black boxing of the two degree limit. The report in question focuses on the Villach conference of 1985 and the Stockholm Environment Institute (SEI) report of 1990. The SEI report used research from the Advisory

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Group on Greenhouse Gases (AGGG) to make recommendations on warming limits, proposing a low-risk scenario of one degree of warming and a high-risk scenario of two degrees. Morningstar's commentary on the SEI report interprets the decision to go for the two degree scenario as a cover-up. This cover-up is traced to the involvement of various industry think tanks and global warming sceptics in the funding of the Villach and Bellagio conferences which led to the publication of the SEI report. The funding issue is a matter of record, as is the dropping of the one degree target from the policy framework. In addition, Boehmer-Christiansen (1994) has argued that the AGGG was disbanded because it was criticized for being too partisan and policy prescriptive.

Weart (2003) notes that the decision of the IPCC in the 2nd Assessment Report of 1995 to stick to the same climate sensitivity range as appeared in the first IPCC report was a political decision, as the authors did not want to give critics an opening to cry inconsistency. This incorporation of political concerns into the climate science is, for Weart, 'a striking demonstration of how the IPCC process deliberately mingled science and politics until they could be scarcely disentangled' (ibid.: 173).

Overcoming the uncertainty

Uncertainty pervades any attempt to model climate impacts at a global scale 20, 30 or 50 years into the future. The uncertainty surrounding climate science is so profound as to make it difficult even to know the extent of the uncertainty (Arnell et al., 2005: 1421). Several other observers conclude that the domain of ignorance is potentially so great and irreducible as to render climate projections virtually worthless (Weart, 2003; Allen et al., 2009; Wohlforth, 2004; Oppenheimer, 2005; Pearce, 2007). Smith and Elliot argue that the reliance on science to provide answers under conditions of uncertainty can actually increase the level of conflict rather than reduce it, as each party uses the uncertainty highlighted by the science to support their own views (Smith and Elliot, 2007: 2) – a point echoed by Kahan (2010: 296).

It is this exploitation of uncertainty by interests trying to forestall effective mitigation policy which has led some researchers to favour a discussion of limits to be reframed in the language of risk (Painter, 2013). Rather than say we know nothing at all (Hulme, 2009: 73), through the academic discipline of risk, uncertainties can be reduced down to a single, quantifiable metric, normally in the form of a cost-benefit analysis. Risk assessment seeks to accommodate uncertainty through statistical modelling (Tickner, 2003: 6). The desired outcome of such modelling is a credible, probabilistic assessment of the likelihood of a particular event or events arising. From this perspective, danger is understood as a combination of high stakes and unfavourable odds (Malnes, 2008: 661). However, the process relies on the use of probabilistic assessments, which relies on subjective interpretation of the data.

With subjective probabilities, 'uncertainty can always be turned into risk' (Gigerenzer, 1992: 27). All that is required is for all possible outcomes to be

attributed a value that totals one. Probabilities modelled solely on empirical observation comprise two separate approaches – propensities and frequencies. Propensities describe outcomes constrained by physical properties: when rolling a dice the chance of getting a three is defined by the properties of the dice, i.e. there is a one-in-six chance of throwing a three. Frequency probabilities (or frequency distributions) are based on a large number of observations, i.e. the uncertainty about the outcome of rolling the dice would be determined empirically through rolling the dice many times (Gigerenzer, 1992: 28). Projections of climate change impacts are not bounded by physical properties of the system in the same way as illustrated by the dice example. The physical aspects of climate change are of course bounded by the physical properties of the system, but those properties are, at a global scale, too complex to be fully addressed in models. In addition, various subjective assumptions have to be made about how social systems will change and influence or respond to the climate system.

Hulme and New report that a variety of emissions scenarios are used in IPCC reports to reflect a range of possible future emission scenarios. Developing these emission scenarios requires the modellers to make subjective judgements in defining the storylines, about the structure of their models, and about what the parameter values of these models should be. The resultant emissions scenarios therefore contain an in-built subjectivity that precludes low-probability (in the opinion of the modellers) emissions futures (Hulme and New, 2000: 203). Therefore it is necessary for climate projections to employ probabilistic assessments and frequency distributions – techniques that use data alongside subjective judgements.

Another subjective element in probabilistic modelling is expressed in decisions on the degree of probability selected as appropriate to the modelling process. Dessai, Hulme, Lempert and Pielke (2010) identify a distinction between precision and accuracy in probabilistic assessments. A precise assessment provides a narrow distribution curve of possible outcomes, but could be wrong, in failing to capture low-probability events. An accurate probabilistic assessment will be less precise, but is more likely to capture the ‘true value’ (albeit alongside a range of incorrect values). The role of rationality in Bayesian analysis has been questioned by Baer, who, in discussing the study of climate sensitivity, argues that faced with huge uncertainties, ‘what you choose to act as if you believe is fundamentally an ethical choice’ (Baer, 2005: 14). In modern societies political institutions generally make decisions about risk within the framework of cost-benefit analysis (CBA), which seeks to weigh the financial costs of avoiding the modelled risk scenario against the benefits (either economic and/or social) of avoiding the anticipated harm(s). As regards climate change mitigation policies, this means if it is cheaper to prevent the emission of a tonne of CO₂ than it is to repair the damage caused by the release of the CO₂, then prevention is the appropriate course of action (Hulme, 2009: 120; Schneider and Kuntz-Duriseti, 2002: 55). However, this simple metric ignores the fact that not every tonne of CO₂ has the same climate impacts. A tonne of CO₂ released into an atmosphere that already has an excess of CO₂ is likely more damaging than a tonne of CO₂ released into a

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pristine atmosphere. For this reason, some have argued that policy should take into account the cumulative effect of emissions (for example Allen et al., 2009). If one thus imagines the budget in terms of a total weight of CO₂ in the atmosphere, the nearer to that total budget one gets, the more value one may attribute to each individual tonne of CO₂ released.

Using cost-benefit analysis to define risk

Kimble and Tawney argue that the application of CBAs to climate change policy is born of the recognition that there is no line separating safe from dangerous climate change. Instead, the CBA seeks to define what is an acceptable level of warming – acceptable in this sense having a purely economic meaning (Kimble and Tawney, 2009: 25). CBAs therefore derive their legitimacy from the assumption that some amount of damage is reasonable, affordable, even efficient compared with the cost of entirely stopping the pollution (ibid.). The CBA approach derives its validity from the principle that there is an optimal balance between warming and economic growth. Such an optimum is intended to provide the maximum economic growth with the minimum of climate change impact. The Stern Review of 2006, the most well-publicized attempt to define climate risk through economics, argued that this optimum equates to an atmospheric concentration of CO₂ of between 538–750ppm (parts per million), or a warming range of 2.33°C–3.90°C (Stern, 2006: 298). CBAs of climate risk have been criticized for over-simplifying complex processes, and doing so within an ostensibly scientific and economic framework that masks a range of normative assumptions (Schneider and Kuntz-Duriseti, 2002; Baer, 2005; Barker, 2008; Funtowicz and Ravetz, 1993; Nelson, 2007; Hawkins et al., 2008). According to these critiques, deciding what is a cost and what a benefit is not reducible to the scientific balancing of neutral numerical values, but is instead a distinctly social and cultural process (Johnson and Covello, 1987: viii; Barker, 2008: 13). Therefore CBA can only be used to inform climate change policy by over-simplifying the social and physical dimensions of the problem.

For example, CBA of climate change tends to assume climate change will be linear, all impacts can be monetized, prices can be agreed and that the winners will compensate the losers (Dowladabati, 1999: 297–298). Kimble and Tawney provide an example of this over-simplification by examining the way CBA treats high-impact, low-probability climate events. CBA of climate risks only works by trimming off the 5% at the end of the probability distribution tail for climate sensitivity models. The IPCC Working Group 1 assessment of 2007, on the basis of a comparison of different probability distribution functions, shows a 5% chance of six degrees centigrade or more of warming at 550ppm. Kimble and Tawney argue a CBA could only have come up with a recommendation of 550ppm by ignoring this fat tail, as much existing environmental law would not deem such a risk acceptable (Kimble and Tawney, 2009: 28). Whilst CBA and the above derivatives have as their goal an optimal response, which does just enough and no more, others have argued for a more robust response – robust in

this sense meaning a willingness to risk doing more/spending more than may be necessary, in order to guarantee the avoidance of danger. An important difference between a robust and an optimal response, at least as regards the issues around uncertainty described above, is that an optimal response requires more accurate projections than those needed for a robust response (Dessai et al., 2010), because a robust response prioritizes safety over cost saving.

The role of institutions in defining acceptable risk

So how does one idea of acceptable climate risk become the one measure for 7 billion people? Adopting a critical perspective, we see that particular ways of valuing the environment become ascendant in part because their proponents have political and economic influence, but also because they resonate with systems for (de)valuing other people, other knowledges, and other forms of valuation (Burke and Heynen, 2014: 10). Defining the nature of the problem is a crucial step in elite capture of risk-response strategies.

Bronstein, writing about government and industry responses to lung disease in the Appalachian coal-mining communities, identifies three stages to the social construction of danger (Bronstein, 1984: 223). Stage one addresses the definition of danger, which in Bronstein's account is a process initiated by the workers and local communities themselves, in the face of official opposition. Stage two involves the authorities legitimating those claims of danger, and stage three sees these same authorities co-opting the issue in order to gain control over discussions about what responses are appropriate. This is essentially an institutional process, especially under conditions of profound uncertainty and high stakes – stable definitions need to be codified and removed from contestation.

Bronstein's analysis provides some interesting perspectives for understanding the process by which climate change became constructed as a phenomenon with a single dangerous limit. The time leading up to the formation of the IPCC in 1990 and the UNFCCC in 1992 equates to the problem definition stage. However, in the case of climate change, the claims of danger were not coming from a range of socially atomized subaltern voices and campaigning organizations, but from the scientific community. This process could therefore be described as something of a lateral and top-down communication process (lateral in the sense of trying to convince other elite actors, i.e. policymakers, of the need to take action; top-down because of the need for a communication strategy to make the public aware that human activity was changing the climate, and that such changes would in all likelihood be negative). Stage two describes the period from 1993 to 2004, when the ideas of climate danger became increasingly enshrined in the thinking, communications policies and research agendas of various states, most notably those of Western Europe. Climate change also became increasingly important to the work of environmental campaigners during this period, though my research indicates that it was still not a mainstream topic during this period. From 2007, with the EU Energy and Climate Strategy, the G8 commitment to the two degree target, and the Copenhagen Accord, we

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have entered stage three of Bronstein's model of the social construction of risk, wherein elite actors use the symbolism of the two degree target to take ownership of the debate. It is this construction of climate change as a phenomenon with a single dangerous limit which has entered the mainstream of the political process and public discourse. However, there is an element to this process that is absent from Bronstein's analysis: what happens when the stage three responses are themselves disputed? That is a question explored in Chapter 8 of this book.

Under conditions of empirical uncertainty, institutional setting, alongside social and political values, comes to play a determining role in defining what is true (Johnson and Covello, 1987: 357). Wynne and Jasanoff argue this is especially so in the case of complex problems requiring global co-ordination of responses, because knowledge production can be universalized only through a complex and fragile social production infrastructure. Therefore the 'global reproduction of knowledge is more dependent on the institutions involved than the facts themselves' (Wynne and Jasanoff, 1998: 20). Eden (2004: 59) draws on ideas from organization theory to show how institutions absorb uncertainty and turn it into fact – a point repeated by Cooke (1991) and Hind (2007). Cooke argues that decision makers place great weight on the uncertain opinion of experts and do so in a rather non-methodological manner, but that this informal and subjective process is black boxed through the formal communications of institutions and think tanks (Cooke, 1991: 5). Turner looks back to Festinger's work from the 1950s on social reality to explain how consensus is achieved in situations where data are sparse. Social reality functions to provide validity for a person's subjective beliefs in the absence of the ability to test the belief. In the absence of any proof or ability to test a proposition, subjective validation becomes dependent on consensual validation. A belief is correct/proper to the extent that it is anchored in a group of people with similar beliefs, opinions and attitudes (Turner, 1991: 454). Group uniformity becomes an increasingly important determinant of decision-making, the greater the level of uncertainty. Consensual validation takes place within the boundaries defined by the institutional norms. Cass argues that it is important not to overlook the important role played by material incentives in ensuring actors accept the norms operating in the process of reaching consensus; these norms do not necessarily reflect the beliefs of most actors, but are just a calculated norm compliance designed to secure benefits and avoid costs (Cass, 2007: 25).

The ultimate goal of constructing problems so that they are aligned to the organizational frames of dominant institutions is to make them amenable to 'political regulation' (Weingart et al., 2000: 263). Moss contends that this demand for institutions to frame problems in such a way as to ensure policy relevance has influenced the practice of climate science, shaping the formulation of research questions, choice of methods, standards of proof (Moss, 1995b: 172). The demand for policy relevance means climate change institutions have turned climate change into an instrumental technocratic project embedded in expert-oriented and publicly inaccessible storylines that favour policy and research elites (Boehmer-Christiansen, 1994: 128). This, it is claimed, suits

science for policy which seeks clear and simple answers, but does grievous violence to our ability to find real solutions (Moss, 1995a: 6).

The framing of climate change as a phenomenon manageable through existing political structures prevents institutional responses from raising any fundamental challenges to neo-liberal structures and practices. The demand for problems to be aligned with the organizational frames of policymaking means that the development and application of knowledge follows not from nature itself but from these organizational frames (Eden, 2004: 37). Crenson (1971: 23) has described organizations as ‘the mobilization of bias’, by which he means that organizational frames do not develop out of a socially inclusive democratic debate, but reflect the agenda of the most powerful interests in society – a point echoed by Bronstein (1984: 200). The unreflective use of these frames sets up a positive feedback loop of self-reinforcing path-dependent processes. Eden describes how the self-reinforcing relative benefits of current actions compared with other choices increases over time. These processes become increasingly efficient as infrastructure and experience of them increase. Consequently, past organizational choices become reified, and organizational ontologies, discourses and categories become, for the organizations’ members, attributes of the world rather than mere conventions (Eden, 2004: 52).

In his study of political responses to air pollution, Crenson explains how power relations act to exclude certain options and responses from the organizational frames employed by city authorities. This power is used to create or enforce social, political and institutional practices and values which limit political processes to those issues comparatively innocuous to the holder of power (Crenson, 1971: 21). Lukes (1974) talks of a second dimension of power to explain the way certain issues are kept off the political and institutional agenda. Newell, in his analysis of the influence of NGOs on international climate change policy, cites Kripps’s identification of ‘non active forms of power’ (Newell, 2000: 176). Thus, rather than look for evidence of conflict to see whether or not power is being exercised, instead one needs to illuminate the ways in which, and reasons why, actors adjust behaviour to actual or anticipated preferences of others (*ibid.*). Consequently, institutional discussions of risk are in fact discussions about power: ‘the power to impose risks on the many for the benefit of the few’ (Perrow, 1984: 306). Tickner believes issues of risk and environmental policy ‘cannot be separated from questions of economics, political power and institutional capacity and will’ (Tickner, 2003: xvi–xvii). Adopting a Marxist perspective, Castree (2000: 13) argues that definitions of environmental risk are entirely conditioned by the limits imposed by the historically and socially situated conditions of its production under the aegis of capitalist institutions.

So far we have looked at how storytelling, relying on familiar narrative structures and objects, has an essential role in helping us make sense of the world in general, and novel risks in particular. In order for those storylines to align themselves with the cultural norms of our times, assume an identifiable enemy that can be defeated and not challenge the dominant paradigms of

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industrial modernity, the stories must simplify the complexity of the issue, largely through moving from the discursive to the quantitative. These storylines take institutional form and become reproduced across the public and policy spheres. The next chapter examines in more depth the forms of language required for this and how those norms get circulated through our culture.

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3 Critical discourse analysis of climate change narratives

We must aim high: for the adoption of an ambitious and universal agreement in Paris in December to keep the rise in global temperatures below the dangerous threshold of 2C.

(Ban Ki-moon, 2015)

The discourse of two degrees

In this chapter we examine how language is used to define the type of problem climate change is, and look at how those definitions are sustained. This sustaining is of particular importance; even though there have been significant advances in our understanding of climate change since 1977 (Nordhaus, 1979) when two degrees was first identified as a dangerous limit, the two degree limit has remained unchanged as the goal of successful climate policy. This demonstrates how important it is to be at the table during the problem-definition stage (Dery, 2000).

The terms according to which particular issues are discussed define the way in which the topic is experienced and thereby also the perceived possibilities to act (Dryzek, 1997: 179–180). The techniques of discourse analysis offer an effective means of understanding how language is used to construct the idea of a single dangerous limit. The word ‘discourse’ denotes the ‘ensemble of ideas, concepts and categories through which meaning is given to social and physical phenomena’ (Hajer and Versteeg, 2005: 175). Discourses are purposeful and directed ‘linguistic actions’ (Wodak, 2008: 5) which aim to act upon the social world. The invisibility of the interests and power relationships inherent in linguistic performances (Roberts, 2004) makes discourse a powerful ‘hegemonic device’ (Newell, 2000: 77). A systematic approach to examining the relationships between discourses is needed in order to reveal the power relations embedded within them – a methodology known as critical discourse analysis (hereafter CDA). CDA is applied in many different contexts, and uses a broad range of techniques, though normally includes an element of genealogical analysis (Fowler, 1991: 37).

Discourses represent what it is possible to say at a given moment (Ramanzanglo, 1993: 19). We have been looking at how the dominance of industrial modernity shapes what it is possible to imagine and say when the processes that define

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industrial modernity generate risks beyond the control of the institutions designed to manage those risks (Beck, 1986). Given the assumption underpinning the ideas in this book, that the dominant discourses on climate change are primarily designed to reproduce existing social relations, I turn to the techniques of CDA.

CDA has been described as a contested research instrument with no blueprints for how to proceed (Chouliaraki and Fairclough, 1999: 23). However, there are some common assumptions underlying the decision to examine the social world through the lens of CDA. The aim of using CDA is to uncover the ‘implicit or taken-for-granted values, assumptions, and origins of a seemingly neutral, self-evident, and objective ... text, and relate it to structures of dominance and power’ (Olausson, 2009: 424). From this perspective texts are not passive but instead are seen as ‘work’ – part of productive activity and the process of producing social life. CDA is particularly relevant to my area of study, given its value in helping to reveal how language figures in responding to the ‘detrimental environmental impacts of the neo-liberal global order’ (Fairclough, 2001: 230). Importantly, given the connection I make between the quantification of climate change and the legitimation of modernity, CDA recognizes that discourses are systems of knowledge which inform the technologies that consolidate power in modern society (Fairclough, 2001: 232). Olausson justifies using CDA to analyse media treatment of climate change because its constructionist, socio-cognitive and critical epistemological pillars harmonize well with the theoretical frameworks on which his research was based (Olausson, 2009: 424). In common with my thesis, Olausson identifies CDA as the appropriate analytical tool for examining how, in late modernity, discourse naturalizes and maintains relations of power and dominance, makes them part of the natural order of things (Fairclough, 2001). Hegemonic institutions elicit consent by the production and dissemination of ideology that appears to be merely common sense. Science is a key symbol in this process; in bourgeois society the dissembling of power takes a specific form – the concealment of political interests behind the mask of science. (Eagleton, 2007: 154).

Different groups of actors compete, through discourse, to construct more or less differing accounts of the gravity of climate change. Carvalho and Burgess (2005: 1458) argue that ‘different social actors (scientists, politicians, policy-makers, businesses, pressure groups, and media professionals) are locked in discursive competition around how climate change risk is to be framed in the media’. The media often privilege what they deem the most credible and authoritative voices on a particular topic. Credibility and authority, from the perspective of the media, normally reside with the most powerful actors (Allan et al., 2000: 13).

Levy and Spicer (2013) describe these different discourses as ‘climate imaginaries’ – shared socio-semiotic systems that articulate and structure a field around a set of shared understandings that provide a sense of coherence and link actors into a network around the issue. A variety of actors, including firms, NGOs, governmental agencies and multilateral organizations, advocate different

climate imaginaries that reflect their ideologies, normative commitments, scientific understandings and material interests. This contestation among ‘interpretive communities’ (Leiserowitz, 2005) is not just to instil a particular imaginary in the public mind. Rather, the aim is to forge a hegemonic alliance in order to shape broader economic responses and mobilize supportive policies at multiple scales – regional, national and supranational. As with other popular concepts such as ‘sustainable development’ and ‘corporate citizenship’, ‘the very fuzziness’ of the two degree imaginary ‘has helped to build alliances and compromises’ (Cointe et al., 2011). The imaginaries that are resonating most strongly are those successfully connected with popular interests and identities, thereby having a broader resonance with people’s everyday lives. They are also closely linked with material structures to constitute value regimes that enjoy hegemonic stability through the alignment of economic, discursive and political elements (Levy and Spicer, 2013: 675). This alignment is vitally important because political systems are most secure when all educated, artistic and ambitious people can find interesting, well-rewarded work.

Institutional discourses

Institutions, as authoritative sets of rules and norms, are central to the sustaining of particular problem definitions. Decision-making power under modernity has taken institutional form. This is especially true of the transnational environmental problems that have emerged since the latter part of the twentieth century. Rayner and Thompson explain how the increasingly important role played by international institutions in human affairs has given rise to a revived interest in institutional explanations, supplanting rational actor theories, wherein the social was explained by aggregating individual utility maximization strategies (Rayner and Thompson, 1998: 322–323). Institutionalism in sociology refutes this notion of agency, arguing instead that it is institutionally embedded rules, not individual actors, that guide political action (ibid.). O’Riordan and Jordan (1999) have examined at length how these institutionally embedded rules influence political action. The concept of institutions is very broad, ranging from formal deliberating bodies engaged in treaty making to the informal liaisons among a range of different decision-making and non-decision-making communities and actors. However, despite this variety, what defines all these interactions as institutional is the ‘presence of some sort of order and guiding principles of social solidarity’ focused around a ‘locus of regularized or crystallized principle of conduct that governs a crucial area of social life and that endures over time’ as a key characteristic of institutional behaviour (ibid.: 346).

Whilst institutional interactions happen at a wide range of scales, Kasperson et al. note that it is the larger, more powerful institutions that are the primary players in setting the terms of society’s discussion of risks (Kasperson et al., 1988: 18), and that it is only these large transnational institutions, such as the IPCC, that are capable of managing and understanding climate change (O’Riordan and Jordan, 1999: 347).

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Underlying the writing of the UNFCCC and the formation of the IPCC is the idea that the causes and impacts of climate change can be controlled through the use of science-based international agreements. International regimes predicated on these assumptions are operating within what Sunderlin (1995: 212) has described as a 'managerialist paradigm'. The managerialist paradigm assumes that the origin of environmental problems lies in inadequate policies of international and national governing institutions, and that the solution therefore lies in improving those policies, by creating a new regime. An international regime is defined as a system of norms and rules specified by a multilateral legal instrument, normally a convention (Porter and Brown, 1991: 20). Broadhead has expanded this definition of a regime, which she characterizes as a set of implicit or explicit principles, norms, rules and decision-making procedures around which actors' expectations converge (Broadhead, 2002: 106). International regimes to date have been dominated by economic norms (Cass, 2007). The increased dominance of international finance means states are more cautious in adopting policies that will reduce the likelihood of internal investment (Paterson, 1996: 194). It is because green diplomats have to negotiate against a backdrop of the established economic order that the resulting environmental regimes are so flawed as to be virtually worthless (Broadhead, 2002: 103). Sunderlin (1995: 216) has highlighted the opinion of several writers that 'global governance, generally speaking, is probably impossible'.

Some writers have sought to portray the institutions of the EU as an exception to these norms, and instead argue that the EU is seeking to implement a set of regimes that constitute an ecological norm for the community leader (Jordan, 2008; Schlosberg and Rinfret, 2008; Gerhards and Lengfeld, 2008). Jordan cites a 2006 statement from a UK environment minister as evidence of this claim, in which the minister remarks that the EU's 'raison d'être in the 21st century must be to prevent the exploitation of the planet. The European Union must become the Environmental Union' (Jordan, 2008: 486).

For idealists, institutions seeking to cope with environmental problems are 'boosting concern, building capacity, and facilitating agreement' among participants. Idealists often point to the success of the Montreal Protocol in regulating CFC emissions as an example of building successful international environmental regimes (Sunderlin, 1995: 215). Substituting liberal for idealist, Roberts identifies the liberal institutionalist's optimism about the building of environmental regimes as being grounded in a belief that regimes can be developed along rational co-operative lines that are somehow divorced from the power-maximization strategies of individual states (Roberts, 2004: 148). Realist approaches to regime building are more critical, and are closely aligned to elite theory. The realism paradigm sees international relations as a power struggle in an anarchical world, whereas neo-realists adopt the position that co-operation is only achievable under the hegemonic power of one state (Porter and Brown, 1991: 28). Roberts identifies an elite theory approach to the study of international regime building which, in opposition to pluralist accounts, assumes the government is the agent of the capitalist class, and most decisions serve the interests of this class (Roberts, 2004: 148). From these critical perspectives

international conventions are seen as little more than window dressing, which give the impression of participation whilst business continues as usual (Porter and Brown, 1991: 372). Absent any facility for imposing agreements on powerful states, international policy tends to be diluted to the level acceptable to the least enthusiastic state (Roberts, 2004: 177).

Media and policy discourses

There are two forms of discourse at work in sustaining the two degree symbol of most interest to the arguments made in this book: the political and the media. The mass media have been identified as the most important institutional setting for shaping public attitudes to climate change (Doulton and Brown, 2009; Carvalho and Burgess, 2005; Koopmans, 2004; Martell, 1994; Risbey, 2006; Olausson, 2009; Painter, 2013). However, the media do not operate in a social, cultural and political vacuum and media reporting often reflects institutional and political norms (Stocking and Holstein, 2008). Consequently, credibility and authority, from the perspective of the media, normally reside with the most powerful actors (Allan et al., 2000: 13). As a result of these cultural preferences, media reporting tilts towards powerful elite sources which provide a predominantly establishment view of the world (Mautner, 2008: 33). This results in a marginalization of more unconventional and challenging accounts, thereby establishing the boundaries within which public understanding of climate change takes place (Newell, 2000: 88).

Policy discourses

Elite policy cues are a key determinant of public concern about climate change (Brulle et al., 2012), with political actors playing by far the most powerful and effective role in shaping perceptions of climate change (Carvalho and Burgess, 2005: 1478). This influence stems from the ability to articulate and set the terms of a discourse (Roberts, 2004: 125) which, as regards discussion of acceptable levels of climate risk, receives little challenge from the media, for the reasons outlined above. Others argue the power of a particular political party to be influenced by the need to garner sufficient public support in elections, and the role environmental campaign groups and the media play in generating or undermining public support for environmental policy. Discussions of climate change communication that are grounded in pluralist theories argue that environmentalist discourses have an influential role in setting the terms of the media debate and the policy agenda (Smith, 2005; Doulton and Brown, 2009). Policy is shown to influence climate science through the provision of funding for particular areas of research (Hansen, 2005).

These clearly delineated limits symbolize climate change as solvable through normal science, rather than an issue best responded to through a post-normal science. Post-normal science demands that science should be only one of several inputs into the decision-making process – a process wherein the ideal of

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rigorous scientific demonstration is replaced by that of open public dialogue which seeks to accommodate the plurality of legitimate perspectives (Ravetz, 2006). If those agents presented by the media as credible voices on climate change invoke the symbolism of normal science to justify the two degree limit, it will be difficult to make progress towards an inclusive dialogue. Instead, using quantitative targets will continue to act as ‘first order questions used to divert attention away from questions about the political and social order’ (Smith, 2005: 202), preventing the emergence of any widespread understanding of climate change as a political issue.

Media use of authoritative voices

We have already seen that the work of creating meaning occurs not in a social vacuum, but in a social context already populated with symbols and images which people employ in negotiating social relations. Where the shared meaning is fragile or under-determined by empirical evidence then reaffirmation is sought through the use of fixed and stable symbols (Holloway, 1997). One of those symbols, which can shore up belief in the absence of firm empirical evidence, is authority figures.

World leaders last night pledged to stop the planet’s temperature rising by more than two degrees. Gordon Brown and US President Barack Obama led the G8 in the historic vow.

(The Sun, 9 July 2009)

The experts tell us that the only way to stay below that 2C limit is for global emissions to peak in 2015 – and then start falling. In other words, we have set ourselves up at a nice corner table in the last chance saloon. Copenhagen is that last chance.

(The Guardian, 16 September 2009)

You have become President at a crucial moment in the planet’s history. We are close to the climatic Point of No Return: a two-degree rise in temperatures, which will trigger an unravelling of all natural processes.

(The Independent, 20 October 2008)

Is Gordon Brown setting out to save the world – again? It seems so.

(The Daily Telegraph, 20 October 2009)

Edelman (1985) maintains that if there is no conflict over meaning, the issue is not political, by definition. The above quotes, taken from headlines around the time of the Copenhagen conference, highlight the absence of any challenge from the media regarding the two degree limit. Political language has little to

do with how well people live, but is more concerned with legitimating regimes and the acquiescence of publics in actions they had no part in initiating (ibid.). The two degree symbol has been the foundation of the politics of ensuring the climate change generating activities are not a negotiable element of discussions about how to respond.

The important issue is to ensure that a polished façade is presented to the public through the media (Blündhorn, 2007: 257). Part of building that polish comes not only from a consistent message but having that message relayed by experts. The above newspaper quotes show the discourse on climate change so far is an expert and elitist discourse in which only world leaders have the power to save us. This encourages members of the public to take a passive role, to sit back and wait to be told what to do. Democratic involvement must be limited to demands that do not impact on the core imperatives of the state. These imperatives are domestic order, survival, revenue, economic growth and legitimation, which together comprise the ‘zone of necessity which features only limited democratic control’ (Dryzek et al., 2002: 663). The dominance of these core imperatives in policymaking, and the fact that these imperatives conflict, at least in part, with the green agenda, leads Dryzek (1997: 2) to conclude that whilst some states are greener than others, there are no green states.

The symbolism of science

Scientism is the handmaiden of industrial modernity (White, 2013: 11). It shares with the language of economics a shutting down of debate, a depoliticizing of the issue through number. Reliance on these symbols leads to restricted policy responses reflecting particular interests and socio-political imaginaries (Aitken, 2012: 211). In this world view the dominant assumption guiding interactions between humans and the non-human world is that all disorders can be made ordered through the expert application of industrial technologies (Hewitt, 1983: 202). Though this idea has come under increasing attack since the 1960s, to the extent that it has become commonplace in sociology to claim science is now just one story among many (Bauman, 2000: 243–4), Durant has cautioned against the assumption that such perspectives have impacted on the wider political and social influence of science, citing Wynne’s assertion that science remains ‘the default agent of public meanings’ (Durant, 2008: 211).

Of course, this culture of predictability, a knowable future, the delivery of universal benefits through efficient planning, do not sit easily with the acceptance of irreducible uncertainties. This is not the fault of scientists. Painter makes the point that the public and scientists are working to very different definitions of uncertainty (Painter, 2013). Most people do not encounter science after school or college, where science is equated with finding definitive answers, solving problems. However, for most practising scientists uncertainty is integral to science, is a positive (Painter, 2013: 7). Yet industrial modernity is diagnosed as a territory ruled by the reason of clear, calculating and contradiction-free

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argument (Eagleton, 2007: 21). From both a Zen and a dialectical materialist viewpoint, it is only paradoxical statements that can grasp reality.

Those familiar with climate science are perfectly comfortable with the fact that one can be certain about the anthropogenic nature of changes in the climate and uncertain about what the implications of that science are, how those changes will play out. However, within the media and political spheres, uncertainties around our knowledge about the speed, distribution and magnitude of climate change impacts have been conflated with (non-existent) uncertainties about the anthropogenic nature of the observed warming trends, resulting in the ‘condensation’ of uncertainty’s many meanings and complexities into ‘one undifferentiated category’ (Shackley and Wynne, 1996: 285).

Lowe et al. (2006), and Rachlinski (2000) claim that robust policy cannot be formulated without productive public engagement, and that such engagement is impossible without first resolving the uncertainties and confusion surrounding climate science. Whilst policymakers are waiting for science to reduce uncertainty to such a level as to allow robust policymaking (Dessai et al., 2007: 2; Parry et al., 2001: 81), the empirically under-determined modelling results are being over-interpreted both by scientists (Pearce, 2007) and the downstream users of the findings, who may not fully understand all the uncertainties that exist (Demeritt, 2001: 322).

Other commentators claim that the extent and significance of the uncertainties are exaggerated by decision makers so as to postpone taking action that may be unpopular with the public, powerful interest groups, or both (Boykoff and Boykoff, 2004; Weingart et al., 2000). Stocking and Holstein discuss how corporate and special interests have developed a wide repertoire of methods to manufacture doubt about science that threatens their interests, most recently focusing the skills learnt from tobacco lobbying to climate change (Stocking and Holstein, 2008: 23). The fear that politicians will exaggerate uncertainty to appease powerful interest groups causes scientists to downplay the uncertainties, according to Lövbrand (2004: 453). As one prominent climate scientist noted, ‘because climate change is not just a scientific topic but also a matter of high policy, good data and thoughtful analysis may be insufficient to overcome confusion that masquerades as uncertainty caused by the clash of different interests, standards of evidence, or degrees of risk aversion/acceptance’ (Moss, 2007: 5). Bazerman (2006) asserts that there is no significant uncertainty in the climate change debate as regards the primary issue: our political elites know climate disasters are inevitable but are refusing to act – a point echoed by Dessai et al. (2010), who maintain that the uncertainties are not of sufficient magnitude to prevent policymakers planning effective adaptation strategies. Environmental campaigners are reliant on the discourses of science in order to argue their case (Darier, 1999; Beck, 1995). These groups sometimes work with the climate science community to produce new research (for example Carter and Ockwell, 2007), though it is more common for campaigners to synthesize existing climate science alongside policy analysis in support of particular campaign objectives.

The symbolism of money

The economy, as with science, functions in the medium of number, whereas politics functions in the medium of language (Groys, 2009: xv). So creating a definitive quantitative value for dangerous climate change is essential to removing discussions of acceptable levels of climate risk from the political sphere and ensuring power elites retain control of defining possible responses. It is a framing that also leads to the creation of knowledge products that can be patented, privatized and commoditized (Burke and Heynen, 2014: 18). It is a form of symbolism that lends itself well to cries of ‘more markets – green markets, carbon markets! Anything, as long as it confirms the fictions of the dominant political order’ (White, 2013: 91). For Kunkel, humans are characterized by our capacity for speech and corresponding political nature. To subordinate politics to economics is therefore an abdication of humanity (Kunkel, 2014: 162). This inevitably leads to performances from the likes of Richard Branson positioning himself, and the capitalist entrepreneurial practices he embodies, to ‘act to augment the economic foundations of bourgeois power by making the entrepreneur a central figure in climate policy, and, by extension, environmentalism’ (Prudham, 2009: 1596).

This subjection of social life to determination not by democratic debate but by economic planning is a process that began in the 1930s, whereby the world was reshaped to fit the ideas of economists (Mitchell, 2013: 124). One cannot enter into discussion with economic processes, negotiate; all one can do is adjust one’s actions in line with the economic circumstances (Groys, 2009: xvi). Communist society is simply one in which power and the critique of power operate in the same medium; a language that affirms paradox, as opposed to ideology which cannot countenance paradox.

Wynne and Jasanoff (ibid.) identify media, the law, regulatory agencies, advisory bodies and advocacy groups as key institutional and political factors in the removal of paradox from the climate debate, in favour of a quantitative discourse that depoliticizes discussion of acceptable climate risk. These institutions tend to assume (or require) that all uncertainty be quantifiable, leaving qualitative questions such as ‘What counts as uncertainty?’ unasked (Tickner, 2003: 6; Schneider and Kuntz-Duriseti, 2002: 55). The quantification of uncertainty is seen in some quarters as an ideological act – providing the impression of objectivity while denying the culturally determined components of the knowledge production process (Mulkay, 1991: 8; Wynne and Jasanoff, 1998: 26; Kline, 2010: 9). The desire to turn unknowns into knowledge, and the assumption that to count as knowledge the answer must be quantitative, can be understood, at least in part, as an act of power (Backstrand and Lövbrand, 2007; Patton, 2002). In this scenario problems become defined as technical, solvable only by highly educated experts.

Constructing a world safe for two degrees

Whilst a large body of the social sciences literature argues for a constructivist and symbolic interpretation of risk, environmental policy remains grounded in a

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realist assumption about the nature of risk (Harrison and Davies, 1998: 3). Constructivism has been described as an investigation into the causes of belief, a querying of the social reasons why people do or do not believe a particular truth claim (Schneider, 2001: 339; Eden, 2004: 51). Constructivism is often associated with critical sociology. This is because the dominant construction of reality will normally be that of the dominant social actors (Patton, 2002: 100), and it is the exposure of how power operates that interests critical sociologists. In the face of a global phenomenon like climate change, where most people are not involved in doing climate science but all are implicated in the findings of that science, the media play a key role in this process of construction.

It is not a case of either/or with political and media discourses. The media, in not only shaping public risk perception but also articulating public opinion, are assumed to play an important role in policymaking (Carvalho and Burgess, 2005: 1457). The media's gate-keeping role not only works to exclude certain perspectives, but also ensures actors wishing to have their stories covered by the media present the narrative in line with journalistic norms (Smith, 2005). Koopmans's studies on the impact of the media on environmental movements saw the media not only as influencing the opinions of lay audiences, but also as a crucial source of information for engaged communities on each other's views and behaviour, and that these communities 'evaluated and adapted their own strategies' in light of this knowledge (Koopmans, 2004: 370). Whilst the above accounts identify a central role for the media in the construction of climate change, Boykoff and Mansfield question the focus on broadsheet news sources in media analysis of environmental reporting. They note that the reason for this focus is the presumption that broadsheets are the primary influence on international and national policy discourse and decision making (Boykoff and Mansfield, 2008: 17). Most research in mass communication has found journalism to be profoundly conservative in support of existing power structures and the status quo (Mautner, 2008: 33). This extends to a widespread respect amongst journalists for expert and scientific knowledge (Weigold, 2001). Pollack attributes this respect to the fact that journalists and scientists share the same intellectual foundations (Pollack, 2003: 23), which may explain the laudatory comments on science and scientists that Durant (2008: 111) has identified as being prominent in the media. Yet the media reporting of science is widely held to be far less nuanced than the science itself (Kline, 2010; Doulton and Brown, 2009; Stocking and Holstein, 2008), and as unable to accommodate the possibility of irreducible uncertainties in climate science (Smith, 2005: 1475).

The purported balancing norms present in media reporting identified by Boykoff and Boykoff (2004) drive the media to report challenges from groups and individuals who feel their interests are being threatened by particular scientific findings, which can further distort the reporting of science, for example by giving space to accounts that underplay the likely impacts. On the other hand, Smith, discussing his research into the reporting of science in the media conducted at a series of seminars hosted by the BBC, notes that NGO actors, policymakers and scientists present at these seminars accused the media of failing in their

duty to report the science accurately by often exaggerating the dangers or attributing particular events to climate change without any scientific justification (Smith, 2005: 1473). Newell claims the media have turned the climate change issue from one that is a challenge to industrial processes into an environmental problem pretty much like every other, its resolution easily accommodated within existing political and economic practices (Newell, 2000: 68). This is largely achieved by ignoring more unconventional and challenging accounts, thereby establishing the boundaries within which public understanding of climate change takes place (ibid.: 88). Carvalho and Burgess (2005: 1467) cite research that relies on the values of ‘progress’ to promote technological fixes to climate change over ethical and political choices. Allan et al. (2000: 14) argue that the media do not simply reflect the reality of environmental risk, but provide ‘contingently codified (rule-bound) definitions of what should count as the reality of environmental risks’.

Repetition of core tropes

Carvalho and Burgess (2005) employ a cultural circuits model to illustrate that the relationship between the media and the public is not a simple one of direct linear transmission of scientific knowledge. Instead, climate science becomes circulated through various institutions and interests groups, meaning that what is required is an ‘ecology of knowledge’ (Aker, 2007: 413). An example of this circulation of knowledge can be found upstream from the media report, with research showing that the balance of sources cited in climate change stories has shifted from scientists to politicians, interest groups, NGO reports and outputs from policy-science boundary organizations (Doulton and Brown, 2009). Downstream from media activity, information interacts dynamically with psychological, social, cultural and institutional factors, resulting in amplification or attenuation of individual and social perceptions of risks (Kasperson et al., 1988).

These dynamic interactions do not negate a political economy explanation of media activity, but instead show how important it is that the media stick to repeating simple tropes voiced by authoritative actors and institutions to overcome these distortions, thereby ensuring the core messages are received as intended. Therefore if, for example, the communication source is described as an independent scientist, or a group of Nobel laureates, the content of the message may well command public attention and increase the receiver’s tolerance for weak evidence (Kasperson et al., 1988: 22). Repetition is also a key element of ensuring a message is perceived as valid: ‘A factual statement repeated several times, especially if by different sources, tends to elicit greater belief in the accuracy of the information’ (ibid.: 180).

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4 The science of the two degree limit

In common with other members of the Committee, I am getting a little nervous about this balance between 2° and 4° in your assumptions. Surely the whole nature of feedback mechanisms and the irreversibility of some of the things like the collapse of the rainforest or the ice sheets over 2° is that the thing that will increase the risk of going to 4° is actually going to 2°? Therefore, you cannot actually separate the two in the way that you seem to be doing. It is almost like saying that you are going to aim to get off the toboggan halfway down the hill.

(Environmental Audit Committee, Martin Horwood, MP,
questioning Lord Turner, then Chair of the Committee on Climate Change,
February 2009)

What is a normal climate?

The idea that climate change will become dangerous at some point requires a definition of ‘normal’ climate from which this new state of affairs is a deviation (Hulme and Dessai, 2008: 5). This is predominantly the ‘pre-industrial average’, identified by the WBGU as equating to the Holocene, a period of benign climatic stability stretching back to approximately 12,000 BCE and which enabled the development of human civilization (WBGU, 1997: 13). The pre-industrial average of the past 10,000 years is simplified in EU communiqués to a pre-industrial baseline of 1750 (Bierbaum et al., 2007: ix). However, the choice of baseline period has varied markedly, including the ranges 1931 to 1960, 1951 to 1980, and 1961 to 1990 (Hulme and Dessai, 2008).

In the 2007 Fourth Assessment Report of the IPCC, projections of future warming are based on a baseline of 1990 temperatures (the mid-point of 1980–1999), to align with the baseline for emission cuts in the Kyoto Protocol. The 1990 baseline is 0.5 degrees warmer than the pre-industrial, whilst the global average surface temperature is now about 0.8 degrees above its level in 1750 (Bierbaum et al., 2007: v). So the IPCC’s projected increase for the twenty-first century of 1.1–6.4 degrees Celsius above 1980–99 levels would be about 1.6–6.9 degrees Celsius above pre-industrial level (Hare, 2009: 1). Thus there is no fixed idea of what counts as a ‘normal’ climate against which to assess the likely severity of changes. This disputation applies also to the definition of

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climate, which was ‘arbitrarily and rather weakly agreed as a 30 year weather pattern in 1935 following more than fifty years of negotiation and dispute’ (Hulme and Dessai, 2008: 6). The belief in the idea of a normal climate finds expression in the desire to stabilize the climate. This idea of stability is of particular appeal to policy actors, who find their ability to plan and control undermined by the impacts of climate change, and thus understand a stable climate as a ‘public good’ (Hulme and Dessai, 2008: 22).

Sometimes ‘stabilization’ of atmospheric concentrations of greenhouse gases is offered as a proxy for a stable climate (for example UNFCCC Article 2, 1992) but, as Moss has shown, exactly what is meant by stabilization of greenhouse gases is unclear, and in any case stabilizing the level of greenhouse gases will not stabilize the climate as increased levels of CO₂ will continue to change the climate for years to come (Moss, 1995: 60). In one instance, the stability provided by effective mitigation is deemed political and economic, rather than predominantly climatic; ‘only by mitigating the effects of climate change and finding new, achievable ways to adapt to them can the world find stability and prosperity’ (Bierbaum et al., 2007: v).

A climate that moves away from a normal state is feared to be more or less dangerous, depending on a range of statistical, cultural and physical factors. The academic and scientific literature offers three approaches to the definition of dangerous climate change. The realist approach defines dangerous in terms of physical impacts – for example, on ecosystems, glaciers or precipitation patterns. A second approach highlights the role of values and culture in defining dangerous change. Third, some authors seek a synthesis between cultural and physical definitions of danger. I examine this literature to illustrate what approach has had most influence on defining a dangerous limit. My theory assumes that the two degree limit is a concept that is an expression of elite values which has been placed on top of the physical science without having any substantive relationship to that science. The idea of the two degree limit as an economically acceptable target has been present in the literature for 30 years. The science has proceeded over that 30-year period alongside the economically derived two degree target, but without actually impacting on, or providing evidence for, the legitimacy of the two degree limit.

What criteria have been used to define a dangerous limit to climate change?

The norms of environmental limits detailed in the previous chapter have sublimated the uncertainties of climate projections into the two degree symbolism. This sublimation is achieved by focusing on large-scale global discontinuities such as the melting of the West Antarctic ice sheet (Oppenheimer and Petsonk, 2005). Although the IPCC has recently confirmed that ‘[i]t is not possible to make deterministic, definitive predictions of how climate will evolve over the next century’ (IPCC, 2013a: 1034), much of the international climate policy

debate in recent years can be interpreted as an effort to specify exactly what the UNFCCC statement means (Knopf et al., 2012: 121). The scientists themselves recognize that the question of what may be dangerous levels of climate change is a critical issue, but not one that can be addressed without an in-depth debate and dialogue between scientists, policymakers and society (Knopf and Geden, 2014). Yet to date, the vast majority of work on defining dangerous climate change has been geared towards science, without any attempt to build a public dialogue about acceptable climate risk based on that science.

The complexity of the interactions between a global atmospheric/oceanic circulation system and global social systems are difficult to model (Moss et al., 2001; Dessai et al., 2010). Meaningful projections of when climate change will become dangerous require a level of granularity that is beyond the scope of current modelling capability (Dessai et al., 2010). Knowing that climate change will increase the intensity of rainfall in the UK does not make it possible to know when, where and to what extent extreme flooding will occur. In order to overcome this, many projections look to larger-scale impacts.

The two degree dangerous limit has emerged against a backdrop of research highlighting the possibility of profound impacts at temperatures at or below two degrees, as in the latest IPCC report which shows that '[i]ncreasing magnitudes of warming increase the likelihood of severe, pervasive, and irreversible impacts. Some risks of climate change are considerable at 1 or 2°C above pre-industrial levels' (IPCC, 2013b: 14). Another report suggested significant risks to food production across regions of South Asia, southern Africa and parts of Russia by the time global mean warming reaches the range 2–2.5°C above pre-industrial and, therefore, to meet the definition laid out by the UNFCCC, global average temperatures must be kept below this level (Global Climate Forum, 2004: 3).

A lead IPCC author has noted that 'even an increase of just 1.5°C to 2°C of warming has been projected to lead to the extinction of 10–15% of all plant and animal species, to the risk of highly adverse and severe impacts on food production in some African countries, increasing burden from malnutrition, increased mortality from heat waves, floods, and droughts and many hundreds of millions at risk of increased water stress in Africa, Asia, and Latin America' (Hare, 2009: 20). The Stern Review (2006) showed that with 1°C warming we will see flora and fauna range shifts, increasing malaria, glacier melts and severe food disruptions in the Sahel region of Africa. With 1–2°C we can expect decreases in crop productivity in the tropics and low latitudes with up to 50% yield declines, 15–40% of species facing extinction and severe water shortages affecting up to 1 billion people.

These regional projections show that different forms of dangerous change occur at different times in different places. The dominant approach to defining dangerous climate change is primarily concerned with very large-scale impacts (WBGU, 1995, 1997, 2003; Jaeger and Jaeger, 2010; Tol, 2007; Oppenheimer

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and Petsonk, 2005). This fixation on large-scale impacts gives researchers and policymakers the chance to avoid the complications of a more qualitative account of what dangerous climate change might be (Oppenheimer, 2005). These impacts are commonly defined in terms of ‘thresholds’, a critical level of change beyond which one can expect significant and unmanageable changes (Parry et al., 1996: 2; Schneider, 2001: 18). Defining a dangerous threshold in terms of impacts has been challenged by authors arguing that the real tipping point is the crossing of a threshold in atmospheric concentrations of CO₂ sufficient to cause these changes sometime in the future. These tipping points have already been reached (Harvey 2007a, 2007b; Pearce, 2007), or soon will be (Hansen et al., 2013).

Using the idea of tipping points to define dangerous climate change

Researchers focusing on thresholds in terms of physical impacts identify several types of threshold, though these can be condensed into two categories. The first category describes the crossing of thresholds that results from smooth change. Where on this path the decision is made to stop is a value-based choice. Other researchers fear a rapid, sometimes imminent, crossing of profound thresholds that threaten such large-scale impacts as to be universally considered dangerous (Lowe and Lorenzoni, 2007: 8; Patwardhan et al., 2003: 4). The distinction between smooth and rapid crossing of thresholds reflects the widespread assumption that the speed of change is another important determinant of danger (Lowe and Lorenzoni, 2007; Leiserowitz, 2005; WBGU, 1995, 1997, 2003; Oppenheimer, 2005). The large-scale physical discontinuities identified as defining dangerous climate change are generally in the form of ice sheet disintegration and attendant sea-level rise (Oppenheimer, 2005; Risbey, 2006; Hare, 2009), Amazon rainforest dieback (Rockström et al., 2008: 21), coral reef bleaching (Blair et al., 2005), and agricultural stress (Richardson et al., 2009; Stern, 2006). It is argued that the consequences of such changes are so widespread and so negative as to be undeniably dangerous.

Many of the analyses of dangerous physical climate change impacts, both in the academic literature but also in other public texts, take their lead from the various IPCC Assessment reports. Governments have asked the IPCC to offer expert judgement on what might happen (Working Group I), what if it happened (Working Group II) and, therefore, what might be done to deal with the situation (Working Group III). The IPCC uses a range of key vulnerabilities in its assessments, including magnitude, timing, persistence, potential for adaptation and importance of the system (Schneider, 2007: 60). In order to account for these disparate measures, and provide a warming range that covers them all, the IPCC calculates that the preponderance of these vulnerabilities is estimated to intensify somewhere between 0.8°C and 3.3°C above current temperatures (or 1.5–4.6°C above pre-industrial).

Chapter 19 of the Working Group II report (2001) identified five ‘reasons for concern’ that could be used to ‘aid readers in making their own determination

about what is “dangerous” climate change’ (Smith et al., 2001: 915). This ‘burning embers’ diagram did not appear in the 2007 IPCC report. Smith et al. (2009) updated the diagram to show that the climate science now showed that dangerous impacts were likely to occur much sooner than the projections shown in the original diagram. In addition, Smith et al. (2009) critiqued the failure of the burning embers diagram to differentiate between the significance of the different systems being impacted.

Article 2 also uses another definition of dangerous climate change – namely, a rate of change to which ecosystems would be unable to adapt. On that measure it would seem that dangerous climate change has already begun. In 2009 the Royal Society Technical Working Group claimed that coral reefs were already undergoing ‘catastrophic’ decline because of rising temperatures (Royal Society Technical Working Group, 2009: 3), a point reinforced by Smith et al. (2009) in their review of the IPCC’s ‘burning embers’ diagram.

The idea that dangerous climate change is that which causes thresholds to be exceeded has been questioned on the basis that not all ecosystems will be prone to the same threshold, making identification of dangerous change very much case dependent (Parry et al., 1996: 3). If not all ecosystems have the same threshold, how many or which ecosystems must be pushed beyond their thresholds of adaptability before climate change is considered dangerous (Leiserowitz, 2005)? Even just looking at one system, ice sheets, poses problems, as different ice sheets (for example the Greenland and the West Antarctic ice sheets) have different sensitivities to warming. This makes their usefulness as indicators of dangerous climate change questionable (Oppenheimer and Alley, 2004: 263).

Turning beyond a purely ecosystem focus requires comparison of vulnerability across a range of widely divergent situations. Is water deficit as strong an indicator of danger as disease vulnerability or food shortages? Are several relatively minor impacts occurring together to be weighted equally to one large impact (Oppenheimer, 2005: 1400)? Questions have been raised about the extent to which focusing on large-scale events sufficiently overcomes the issues of subjectivity. Even in respect of such large-scale changes there is little agreement because the causes, outcomes and likelihood are largely uncertain and rely heavily on subjective judgements (Lowe et al., 2006: 438). Ramanathan and Feng (2008) argue for a differentiated picture which recognizes a range of threshold values of global and regional surface temperature change depending on the elements of the climate system that are being impacted by the warming. Whilst the only way to accommodate the different vulnerabilities of different physical systems is to adopt the 1–3 degree range of dangerous impacts used by the IPCC in its 2007 Assessment report, such a wide range does not meet the demands of policy, which seeks a single, globally agreed target.

As the late Stephen Schneider said when I interviewed him in 2009, regarding the well-known burning embers diagram:

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Scientifically, when you look at the literature on damages in my chapter 19 of IPCC we have a table on there, Table 19.1, where we list the damages horizontally in rows and across the top it goes one, two, three, four, five degrees of warming. A lot of people including Martin Parry did not like that. He wanted us to be very specific on the thresholds at which these things are triggered and I said ‘we can’t do that’. The reason we have words stretching out over a fair amount of space is because some literature [is] suggesting the thresholds are irreversible or unfixable damage are very low, other literature in the middle and some literature at the high end, so all that we can say is that the more you increase the pressure on the systems, the more the number of the systems which will be at risk and the more intense those risks will be, and that is exactly absolutely scientifically defensible based upon the literature. And I’ve always been a believer in policy and measures over targets and timetables. This is because when you actually look at the climate system in detail and impacts, there’s a lot of scary things out there. The IPCC did not lie to you but the honest chapters spell out that very rarely do we know the actual thresholds.

This point was echoed by one of the board members of the Committee on Climate Change, Sir Brian Hoskins, in a presentation given at an Exeter University conference on identifying dangerous rates of change, held in September 2008:

We, many of us, think there are likely to be thresholds in the climate system and wouldn’t it have been convenient if we knew there was a certain threshold where, if [we] were at 499ppm CO₂, everything would be fantastic and at 501 disaster comes in. And I don’t think any of us think it’s quite like that. In fact, I am pretty sure it’s not like that, but there may be some thresholds in the climate system. Whether you think it’s the melting of the Greenland ice sheet becoming irreversible or whatever, so there may be some thresholds. They may be local thresholds or they might be more global ones, but we certainly don’t know when they are going to occur, so how do we build that in to our thinking?

Despite these uncertainties, the norm amongst many thought leaders is to claim that the risk of crossing critical thresholds increases sufficiently beyond two degrees above pre-industrial for such a level of warming to be considered dangerous (Bierbaum et al., 2007). This seems, at least in part, to have been decided in discussions within the EU and Germany at the policy science interface. ‘First, we can acknowledge that the limit was – sometimes inadvertently, sometimes consciously – introduced into the policy debate not by policy makers but by some of us’, write Jaeger and Jaeger (2010: 25). Jaeger and Jaeger have worked for a philanthropic organization called the European Climate Foundation, which finances ‘thought leaders’ to fund strategies for transition to a low-carbon economy (www.europeanclimate.org). The point to note is that this is not a

debate happening in a democratic and accessible forum, and in positing the desirable future of a ‘transition’ to a ‘low-carbon economy’ it is an advocacy group that is moving well beyond the bounds of science into the realms of politics and ideology. As Chapter 8 will show, this is far short of the democratic processes deemed necessary for the development of just and inclusive climate policies.

Under questioning by the UK Environmental Audit Committee, the then chair of the Committee on Climate Change sought to justify imposing a dangerous limit defined by thresholds in the face of the challenges raised above. Answering the question posed in the quote that began this chapter, he answered:

No, I do not think that is right. You are absolutely right to identify that one of the things you have to be very aware of – that the process of going to 2° or 3° in itself produces feedback loops which increase the chance of going to a higher level – is that those feedback loops should be in the scientific models to start with. What gets very complicated is whether there is anywhere what people call tipping points or thresholds. Does it become totally irreversible or do we simply have feedback loops without absolute irreversibility? I think that the scientists vary on that. However, we did highlight that it was possible that some of the feedback loops became very strongly reinforcing above a certain temperature and that there were some physical things which might be irreversible – melting the Greenland ice sheets, et cetera. I therefore think that we have fairly rigorously taken those into account in the way that we did it; and it was a sense of those feedback loops and irreversibility that made us believe that the crucial thing is to limit the increase to about 2 or slightly above 2; and to make very likely that we do not go above 3, and almost certain that we do not go above 4.

(Environmental Audit Committee, 2009)

The political pressure to reduce this complexity down to a single measure was clear from the early stages of climate negotiations within the UK:

I’m trying to remember the dates, probably about ’96, ’97. In the UK at least there were attempts at least to actually define a safe limit and, you know, use that as a kind of policy threshold of some sort. Originally they saw it as a range, but to get more towards practice and commitment in policy terms you can see how it makes sense to say this is more like the kind of target we have got to avoid and treat as a threshold. So let’s fix a figure and then, like you say, it becomes a kind of, it’s a focal point around which everyone can concentrate. Originally back in about ’97, when I actually went to one of these NERC [Natural Environment Research Council] meetings the scientists were all there deliberating about the policymakers, saying ‘the policymakers have asked us to give them, you know, some definition of what would count as safe or unsafe climate

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change, where is the limit?’ And I asked, ‘are you sure that you can actually pretend to answer that question? Why don’t you say to the policymakers we can’t answer that question? Wouldn’t that be a scientifically sound and reasonable thing to say on the basis of existing science’ (and probably based on future science as well, but leave that one out for now). And they didn’t want to do that at all because they were scared it would undermine their funding and influence. So they are already operating with assumptions about what policymakers would take on board.

(Science/policy actor 2)

These insights support the claim that the scenarios emerging from the science were considered ‘too extreme for the public policy world to absorb’ (Wynne, 2010: 293). In their striving for credibility, climate scientists therefore ‘have constructed a representation of future climate change and its human causes which presents it as reassuringly gradual’ (ibid.: 295). So even though a two degree increase in the global average surface temperature is likely, for example, to result in up to four degree warming in the middle of large continents and even larger increases in the polar regions (Bierbaum et al., 2007: 2), a two degree rise in temperature above pre-industrial remains the most commonly quoted idea of how to avoid dangerous climate change, despite the significant risks of deleterious impacts for society and the environment (Richardson et al., 2009: 16).

Making sense of the science

Campaigners

This section uses interview data to explore how climate change communicators have responded to this complexity and uncertainty. The results reveal little faith in the idea of two degrees as a dangerous limit.

I don’t think we’ve necessarily been successful in explaining to people that ahead of two degrees there are also going to be significant issues world-wide and I think that’s a failure of the NGOs to talk about actually we are already seeing and will see some significant impacts on the poorest parts of the world. I don’t think we in reality we really talk about two degrees, we don’t really talk about two degrees as a threshold, well, two degrees particularly two degrees. We’ve never really run a campaign saying keep below two degrees.

(Campaigner 1)

Just because you’ve limited warming to two degrees if you can get to the point where we can actually achieve [it] doesn’t mean you [are] not still going to have really devastating impacts of climate change.

(Campaigner 10)

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My understanding is that the kind of changes that would happen that under two degrees or under and up to two degrees don't sound like they there are things I want to happen. I don't want the world to go to two degrees.

(Campaigner 5)

It's the first, and possibly most important step, but we're aiming for it because it's the tipping point – the line between a solvable crisis and an unsolvable crisis.

(Campaigner 6)

Two degrees seems to be beyond which tipping points occur, which is why two degrees has been chosen, if I am right.

(Campaigner 4)

I think to a certain degree it is tied up with, I mean, I wouldn't want to blame scientists, but some climate scientists, especially those who felt the pressure of policymakers and business interests, have been complicit in formulating the two degree idea, the idea that there is some safe limit, or probabilities can be calculated or so forth. A lot of scientists have been complicit in that and part of that is due, I would think, due to pressure from policymakers, or felt that the idea that there will be pressure from policymakers and business. But part of it may be due to ingrained linear thinking among a lot of scientists who frankly should know better.

(Campaigner 12)

Scientists

The scientists I interviewed were not willing to take responsibility for promoting the two degree idea, despite the accusation put forward by Campaigner 12, above.

Undoubtedly the two degrees C and it being a threshold between acceptable and dangerous is very much a 'social construct' of a handful of wealthy nations or the relevant people or the people who've made themselves relevant in those wealthy nations. I don't think it's got any scientific legitimacy.

(Climate scientist 1)

Originally the IPCC came up with a range 1.5 to 4, but basically the idea that that can be seen as a range, originally they saw it as a range. But to get more towards practice and commitment in policy terms, you can see how it makes sense to say this is more like the kind of target we have got to avoid, and treat as a threshold. So let's fix a figure and then like you say it becomes a kind of, it's, it's a focal point around which everyone can concentrate.

(Science/policy academic 2)

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There was a pervading sense of two degrees as a bit of a hot potato that no one was keen to take ownership of. Nor was there any great appetite for unpacking the concept, at least not in public and not in their role as a scientist.

This two degrees figure is so much edged into sort of discussion on mitigation if you're starting to sort of undermine that when there's such crucial negotiations coming up then you basically make that figure look weaker or in the worst case you know give politicians reason to disregard it without anything to replace it.

(Climate scientist 3)

So there is this problem of translation so it is very difficult to represent the thinking that underlies setting targets limits or whatever, and that's a really tricky problem to overcome.

(Science/policy academic 3)

We are telling people what might happen at different levels but we can't say more than that, so the identification of a particular target has to come when scientists step outside of their role as providers of information.

(Climate scientist)

It's not a science issue, it's a science and policy issue, a culture issue and a society issue all rolled up into one big mess.

(Climate scientist 1)

I think there are still uncertainties in the climate system and our understandings of it that might potentially indicate that reaching the two degree target might be quite late in effect because there might be unforeseen consequences which might take place even below that target.

(Science/policy academic 3)

At the 'Four Degrees and Beyond' conference held in Oxford in 2009, in his keynote presentation, John Schellnhuber said sardonically:

You see the two degree target looks pretty okay, yeah, it's a compromise so of course we will lose all the coral reefs if we go up to two degrees, or most of them, but who needs coral reefs anyway?

(Schellnhuber, keynote conference speech, September 2009)

Shortly afterwards I interviewed one of Schellnhuber's colleagues, who had authored a report advocating a two degree limit, to ask how that claim could be married with the loss of the coral reefs.

Well, with the coral reefs we know a lot about coral reefs but not enough to say when it, exactly what is going to go when. Coral reefs are very

complex and very different in different regions so they are under a lot of pressures, that is the basic problem here. It is not only the temperature. This is the one thing that puts pressure on them because they are already close to the limit but they can cope, but there is the problem of ocean acidification coming up. Then there's the problem of massive over use, massive over consumption of species and the physical destruction of reefs, and then there's the issue of sedimentation resulting from the wrong land-use decisions, deforestation and soil erosion, for example. They are at under at least quadruple impact and to say we are to continue like this and only look at the two degrees then it is very likely we will not see the type of reefs we see today in a world of two degrees.

(Science/policy actor 1)

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5 Do public narratives reflect the science?

And of course because we've got this incoherence in the scientific community and the lack of a focused message who is it that colonizes the space then between the policymakers and the general public and the scientists? Well it's people like me, hacks, NGOs who of course their job is to be professional communicators. And the NGOs whenever they put out their latest campaigns on climate change they say 'the science says that' or the 'scientists say that' and ultimately the scientists don't say that or don't think they say that but because there is no coherent message from the science community anyone can say anything they like about what the scientists say.

(Mark Lynas, 'Four Degrees and Beyond' conference panel discussion, 15 September 2009)

A noted BBC news presenter wrote an article bemoaning what he saw as the BBC's uncritical acceptance of alarmist climate change narratives, saying 'Environmental pressure groups could be guaranteed that their press releases, usually beginning with the words "scientists say" would get on air unchallenged.'

(*The Daily Mail*, 25 January 2011)

Selecting texts for analysis

In the last chapter we looked for the scientific papers and research programmes that had identified two degrees as a dangerous limit and found no evidence of science having discovered a two degree dangerous limit. We now look to see whether this absence of a scientific basis for the two degree limit is reflected in public discourses on two degrees.

In this chapter I will employ news stories and other less visible public narratives to support the points being made. I will also use some excerpts from interviews to illustrate a key point of this book: that what people say about dangerous climate change off the record is not the same as what they express in print. Hence we can understand the discourse around dangerous climate change as being informed by a 'not in front of the children' principle.

In the Introduction I provided a rationale for the selection of texts that provide the data for this analysis. I now turn to explaining the data selection made on the basis of the relationship between the different discourses. The process of

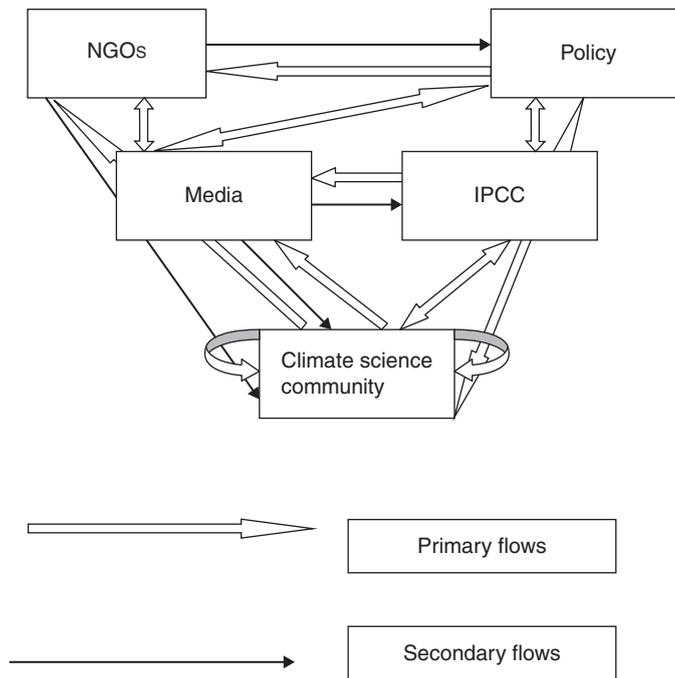


Figure 5.1 Flow of discourse between different climate change communicators

identifying significant commentaries is aided by an explanation of the relationships between the various discourses, to help explain how, directly or indirectly, these might influence each other.

Figure 5.1 lays out, in a simple form, the movement of information and ideas between the different communities in the dangerous limit debate. I have differentiated between primary and secondary flows of information, with the larger arrows representing the primary flows.

Primary flows

Climate science provides the majority of the data and knowledge informing climate change discourse. Hence climate science is identified as providing a primary flow of information to all other parties. This is not to argue that all climate science papers and research will have a significant impact, only that climate science is a source of significant discourses. There is also a belief that climate science, through the auspices of the IPCC, shapes government policy. The extent to which governments do actually respond to climate science is disputed. Nonetheless, the IPCC is intended to mediate between climate science and policy-makers. However, the IPCC has only issued five assessments since 1990 (1990, 1995, 2001, 2007 and 2014). Therefore the state requires other channels for the ongoing transfer of climate science.

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An example of just such a channel is the conference called in 2005 by the then UK Prime Minister Tony Blair, and hosted by the Meteorological Office, which was intended to define dangerous climate change (Blair et al., 2005). Additionally, several studies indicate that an audience of immediate concern to many climate scientists is other scientists working in their area of expertise (Boehmer-Christiansen, 1994; Van der Sluijs et al., 1998). I argue in this thesis that the environmental campaigning community is an important agent for the construction of the dangerous limit, and is a community that relies heavily on scientific evidence to promote its cause. This relationship is illustrated by the prominence of 350.org, the genesis of which lies in a series of papers and pronouncements by the climate scientist James Hansen, which argued that the dangerous limit should be defined in terms of atmospheric concentrations of CO₂ of 350ppm. The media are identified as being of primary importance to environmental campaigners because the political economy of the media defines what representations of the dangerous limit will be accepted and carried by the media, thus shaping how environmental campaigners construct their representations of the dangerous limit.

Figure 5.1 features a two-way primary flow between the media and policy. Policy changes are a prominent feature of news stories, and public perception of the state is heavily influenced by media coverage. Policy statements that aim to impose restrictions on people's activities in order to achieve reductions in emissions of CO₂ are given prominent coverage, and the way such potentially unpopular policies are presented will likely be of key concern to the incumbent political party. The remaining primary flow is from policy to environmental campaigners. Their campaigns will often be a reaction to government policy. The climate camp protest at Heathrow Airport in the summer of 2007 was ostensibly a reaction to government plans to build a third runway at Heathrow, and the protest at Kingsnorth power station in 2008 was in response to government plans to build more coal-fired power stations. The IPCC assessments include summaries for journalists, and therefore are identified here as providing a primary source of information to the media on the dangerous limit.

Secondary flows

The climate science community is identified in Figure 5.1 as subject to two secondary flows: from the media and campaigners. The extent to which discussions of dangerous limits within the climate science community have been constrained or defined by external social norms is difficult to assess. However, any such influence, if it exists at all, may partly be mediated through external discourses coming from environmental campaigners and the media.

The IPCC collates, interprets and disseminates peer-reviewed climate science, and its own peer-review panel comprises, in part at least, climate scientists. As with the climate science community, the IPCC is deemed to comprise socially situated actors. For example, Agrawala (1999) argues that the findings of the IPCC reflect an internalization of the requirements of the policymaking

community. The IPCC finds it necessary to reflect these requirements in its quest for international legitimacy. A secondary flow is shown between the media and the IPCC on the assumption that the media will have a role to play in the maintenance of the IPCC's legitimacy, and thus the findings of the IPCC will be sensitive to the way the assessments are reported by the media.

The extent to which climate change policy is influenced by the demands of environmental campaigners is unclear. However, when in power the then UK Climate Change Secretary Ed Miliband called for a climate change social movement in order to give government the support it seeks for its climate change policies (Hinsliff and Vidal, 2009). For this reason I have identified the state to be subject to some degree to influence from campaigners. Absent from this schema is the impact of business and special interest lobbying intended to limit the extent or impact of climate change policies on the economic status quo. This is because whilst such groups are very active, and are deemed highly influential (Boykoff and Boykoff, 2004), they do not generally critique the two degree limit, and instead focus on more general debates about the existence of anthropogenic forcing of the climate, the severity of the impacts, and what amount of economic growth should be sacrificed in the name of climate change.

The communicative value of the two degree symbol

As we saw in Chapter 1, the use of the two degree symbol is sometimes justified on the basis that it aids communication and understanding of an otherwise complex and abstract phenomenon – a goal that it has failed to achieve. This explanation of two degrees as an aid to communication did not make it into the media reports analysed for this research. This clearly demonstrates the reality of the 'not in front of the children' principle as an explanation for the discrepancy in representations of the two degree limit between broadcast documents such as news reports and NGO commentaries, as opposed to interviews, presentations and other accounts of the concept given to knowledgeable audiences.

Another reason for doubting the communicative value of the two degree symbol is simply that, in the UK press at least, it simply is not used very much at all. Figure 5.2 employs a logarithmic scale to show the huge gulf between mentions of 'global warming' and both '2 degrees' and 'two degrees'. The foundational narrative of what is commonly described as humanity's greatest challenge and the end point of the policy intended to address that challenge – the two degree dangerous limit – barely warrants a mention in the UK press. To reiterate the point made in the Introduction, if it were not for Copenhagen there would not be enough data to fill a journal paper, let alone a book.

Although claims for a two degree dangerous limit were being made from the early 1990s, it would seem from Figure 5.2 that such debates were of little interest prior to 2005. For news reports this can in part be explained by the absence of any event- or personality-driven storylines around which such a discussion could be held. Another explanation may be that for both academic journals and news channels the debate was as much about establishing the empirical truth of

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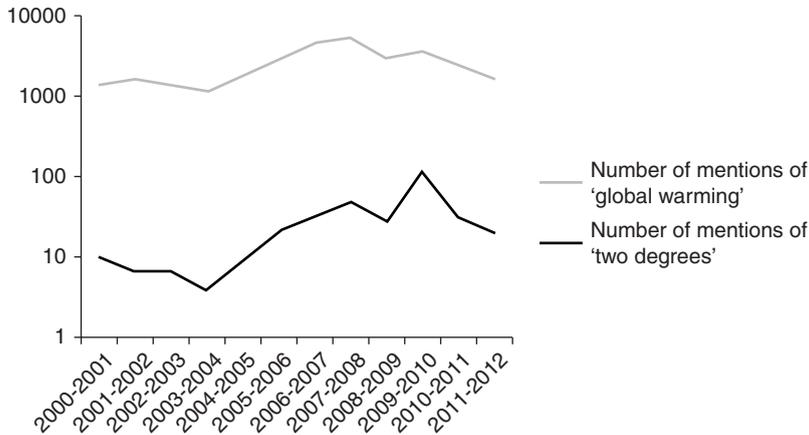


Figure 5.2 Number of newspaper stories featuring mention of 'two degrees' and 'global warming' in UK newspapers, 2000–12

anthropogenic climate change. Achieving consensus on this must necessarily be a precursor to consideration of how much human interference with the climate is too much. An additional barrier to academic examination of the dangerous limits issue might be structural, i.e. due to an absence of funding streams. Yet, the UNFCCC had in 1992 established the idea of dangerous climate change, whilst leaving 'dangerous' undefined. Identifying dangerous limits to climate change, given the gravity of the projected consequences, would seem an issue worthy of immediate and urgent attention. Evidence of such attention is absent from the pattern in Figure 5.2.

From Figure 5.2 it appears that media coverage of the two degree idea did not start until 2005. Why was 2005 such a watershed year in coverage of the two degree limit? First, and most importantly (at least on a global scale), 2005 was the year in which the Kyoto Protocol was ratified. Though the emission cuts mandated were not explicitly derived from the need to avoid a definitive dangerous limit, it appears that in reporting and analysing the implantation of the protocol, mention of the two degree limit would have been swept up along with other discussion of other elements of the climate change debate in this coverage. A second, more UK-specific event was the conference called by Tony Blair in 2005 with the intention of defining a dangerous limit to climate change. Though there was no statement from the conference defining two degrees as a dangerous limit, there is frequent mention of impacts at two degrees in the conference output documents. This was followed by the release of the Fourth IPCC Assessment report in 2007, the adoption of the two degree limit by the G8 in 2009, and the Copenhagen Accord of 2009.

I argue that Latour and Woolgar's (1979) idea of black boxing can help explain the near media silence on the two degree limit up to 2005. Black boxing describes how the ideas, debates and controversies that attend to the development of facts

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are hidden away. If the ‘fact’ works, then it is used without examination of, or concern for, the ideas on which the ‘fact’ rests. Such occlusion of the back story is also an important part of defining the idea as fact, because removing the idea from its social context reinforces the sense of objectivity.

The majority of broadcast commentaries treat the idea of a dangerous limit in simplistic terms, avoid examination of the normative elements of the two degree limit, and turn to elite voices to reinforce the concept of a two degree dangerous limit to climate change. The only public – by which I mean accessible and high-profile – reference to the communicative function came from the Stern Report:

The EU has defined a temperature threshold – limiting the global average temperature change to less than 2°C above pre-industrial. This goal allows policy-makers and the public to debate the level of tolerable impacts in relation to one simple index.

(Stern, 2006: 28)

We can only hope that debate about tolerable impacts gets underway soon. In the meantime, if it is not a scientific fact, does not define the line between safe and dangerous climate change, and has not led to a public debate about acceptable levels of climate risk, we are surely justified in asking: What exactly is the two degree limit for?

One UK member of Parliament I interviewed described those who use the two degree idea to circumscribe the limit of acceptable policy as engaged in an act of deceit:

I think there are real difficulties in the sense that the science is moving so fast and the politics is struggling to keep up and we’ve now kind of fossilized this two degrees as some kind of totemic value. I think there’s almost a culture of deliberate deception. That sounds very strong, but I think that’s what it is. It is deliberate deception and I think it’s very easy to fall into that trap of just accepting that two degree figure, recognizing that anything else is too complicated, too difficult to communicate or at least get acceptance for. So there’s a kind of shared complicity in this adoption of the target which as the most recent science shows is absolutely not going to be safe at all.

The possibility that the claim of a two degree limit is little more than a lie did not seem to trouble other people I interviewed.

We are asking people to do big things to change their lifestyles, to change the way they use energy and we need to make a cogent argument to people why we’re trying to do it and the reason were trying to do it is much clearer now than there was before we got agreement on two degrees.

(Campaigner 2)

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It's similar to a speed limit on the road. Of course in the end the public has to decide; do we put it at 50 or at 60 because a limit at 52.6 wouldn't be communicable. But with the two degree limit the communication is more important than others because it's not something that gets measured by specialists and communicated to other specialists and the consumer doesn't know, but this is something that has to be communicated to the public.

(Science/policy academic 6)

Uncertainty is really not a big help in the political domain and public communication. If there is some kind of certainty that going past two degrees would be dangerous, catastrophic, then the politicians who are resistant to change and the public in general who are resistant to change in general I think will hang on to that.

(Campaigner 1)

Dangerous at, above or around two degrees

So how do the media use the two degree limit in their reporting? To provide an account of public representations, I will approach media representations of the 'two degree is a dangerous limit' concept from five different perspectives:

- 1 Climate change will become dangerous at two degrees exactly, so the goal is to keep warming at some unspecified level below two degrees.
- 2 Climate change will become dangerous at any point over two degrees, so warming to two degrees is still safe.
- 3 Climate change will become dangerous around two degrees.
- 4 Two degrees is 'dangerous'.
- 5 Climate change is already dangerous, or dangerous below two degrees.

The differences may seem minor – trivial even – but they show that the exactitude of 'two degrees' breaks down when trying to map the symbol onto reality. After all, if runaway climate change kicks in at two degrees then there seems little point advocating a policy framework that commits humanity to two degrees of warming. If different reports argue for different limits, who are the public to believe?

Climate change will become dangerous at two degrees exactly, so the goal is to keep warming at some unspecified level below two degrees

A report by the UN says global attempts to curb emissions of CO₂ are falling well short of what is needed to stem dangerous climate change. The UN's Environment Programme says greenhouse gases are 14% above where they need to be in 2020 for temperature rises this century to remain below 2C.

(BBC, 21 November 2012)

Two degrees is where we trigger runaway climate change: two leads to three, three to four, four to five, five to six ... by which time it's about over

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for life on Earth. In other words, our elected leaders are giving us – at best – a coin-flip chance of avoiding catastrophe.

(The Guardian, 2 September 2009)

The government is committed to avoiding what has become known as ‘dangerous climate change’; in other words, keeping the average global temperature increase to below two degrees centigrade on pre-industrial levels.

(World Development Movement, 2007: 1)

Scientists warn that action must be taken, before the year 2050, to prevent climate change reaching dangerous levels, by limiting global temperature increase to well below 2° Celsius.

(2°C – Too High!, WWF 2006)

Two degrees is dangerous.

(The Independent, 28 November 2005)

The victims, who make up the majority of the countries present in Copenhagen, are convinced that only a 1.5 degree increase could save them.

(The Daily Telegraph, 12 December 2009)

Climate change will become dangerous at any point over two degrees, so warming to two degrees is still safe

He led the ‘1.5 group’ – a collection of island nations that will drown if the temperature rises by more than two degrees.

(The Sunday Times, 28 February 2010)

Will world leaders reach an agreement that will stop the atmosphere warming more than two degrees above pre-industrial levels – the level scientists say will avoid the most disastrous consequences of climate change?

(The Observer, 20 September 2009)

There is overwhelming agreement – from governments, corporations, NGOs, banks, scientists, you name it – that a rise in temperatures of more than 2C by the end of the century would lead to disastrous consequences for any kind of recognised global order.

(The Guardian, 6 March 2015)

2°C is a clear limit that cannot be exceeded – the world must act with urgency.

(Tearfund, 2007: 1)

All agree that we have to stabilize global temperatures to within two degrees of pre-industrial levels and the reason for that is because if you

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cross that threshold then there are tipping points in the Earth's system which could drive the warming process essentially out of control.

(*Age of Stupid*, 2009)

The Prime Minister Gordon Brown said: 'I think that the academic evidence as a whole leads to one conclusion – that we've got to take action against climate change. And, I don't think there was any disagreement amongst the major countries at Copenhagen that (if we) allowed temperature rise above two degrees centigrade by 2050 – it would be very serious indeed.'

(BBC News online, 25 January 2010)

The maximum figure of two degrees of warming on the global thermostat was not plucked randomly by Angela Merkel, the German Chancellor who tried to drag the other leaders towards it. No – it is calculated by virtually all the world's scientists to be the threshold beyond which our planet's fragile natural systems will begin to unravel rapidly.

(*The Independent*, 11 June 2007)

Many scientists say we need to limit temperature increases to a maximum of 2 degrees C to avoid 'dangerous interference with the climate system'.

(*Only Planet*, 2007: 32)

The scientific consensus says we need to stop the world getting more than 2 degrees warmer than pre-industrial times if we want to avoid dangerous climate change.

(Department for Energy and Climate Change, 2010)

Climate change will become dangerous around two degrees

Though it's now almost impossible for us to stay below 2c, it's not a dramatic threshold above which something bad would suddenly happen. Rather it's like a speed limit in that the higher you go above 2°C the greater the risk of a serious disaster.

(King and Walker, 2008: 99)

At roughly 2–3°C above pre-industrial, a significant fraction of species would exceed their adaptive capacity and, therefore, rates of extinction would rise.

(Stern, 2006: 293)

(Lord Turner's) climate change report, published yesterday, is long, detailed and impressive. It has the admirable objective of trying to cap global warming at two degrees or a little more.

(*The Guardian*, 2 December 2008)

Two degrees is ‘dangerous’

Occasionally the doubts over the dangers of two degrees of warming are communicated through the use of quote marks. Why use quote marks? It is not as if newspapers would report ‘the apple fell according to what scientists describe as “gravity”’.

A major new report commissioned by the UK government suggests it is unlikely that ‘dangerous’ climate change can be avoided.

(BBC news online, 30 January 2006)

The government is committed to avoiding what has become known as ‘dangerous climate change’; in other words, keeping the average global temperature increase to below two degrees centigrade on pre-industrial levels.

(World Development Movement, 2007: 1)

Two degrees, because it has been widely recognised by climate scientists as the critical threshold, has sometimes been characterized as a ‘safe’ level of warming.

(Monbiot, 2007: 17)

Until now, the most widespread interpretation of ‘dangerous climate change’ has been the definition of the ‘2°C threshold’.

(Baer and Mastrandrea, 2006: 6)

Two degrees constitutes a level of warming referred to as ‘dangerous’ by scientists.

(*The Guardian*, 10 April 2013)

Information is Beautiful is a project by graphic designer David McCandless which explores engaging ways of presenting data about the issues affecting people’s lives. In turning his skills to representing the climate change numbers he refers to two degrees as a ‘safe’ limit, in quote marks: www.informationisbeautiful.net/visualizations/how-many-gigatons-of-co2/

Climate change is already dangerous, or dangerous below two degrees

My searches revealed few mentions in the news media that dangerous climate change might already have begun. Books and interviewees, however, seemed willing to articulate fears that it might already be too late to stop dangerous climate change. Environmental campaign materials and website statements relied heavily on ideas of distinct thresholds between a stable and a dangerous climate, whether at 1, 1.5 or 2 degrees. However, in interviews environmental

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campaigners were less forthright about the existence of a distinct point at which the climate becomes dangerous, with a tendency to talk in terms of a continuum of danger.

We're already in the 'dangerous impacts' zone of global warming with drought, glacial water loss, heat waves, etc., but the dangers we're trying to avoid with 350 are the ones we can't normalize further down the line. There's no bringing back the Greenland ice sheet once it goes.

(Campaigner 6)

I think if there were discussion about it there would be [a] sense of that and certainly there would be in the Arctic communities who are already being affected by massive climate change. And I can imagine them saying 'what are you talking about safe, it is already past the point of no return for us. You guys may be talking about what is safe for you, but it happened quite a few years ago for us'.

(Campaigner 3)

I don't think WWF would take the position that it's safe below two degrees and dangerous above two degrees.

(Campaigner 11)

Substituting 'dangerous' with 'acceptable'

It is a core argument of this book that the appropriate framing of climate risk is not between the false dichotomy of 'safe' and 'dangerous', but instead in terms of acceptability between the risks we face and the policies needed to reduce those risks, and what level of risk we want to live with. This distinction was recognized in interviews and dialogues with expert audiences but was almost entirely absent from the public sphere, bar one newspaper item.

Another interesting indicator is the rate at which the scientists themselves are getting bleaker: 90 per cent of them, according to two recent polls, don't believe the world can attain the emissions targets that will keep warming to an 'acceptable' two degrees this century.

(*The Independent on Sunday*, 30 August 2009)

We can tell you what the risks are, but we cannot tell you what's acceptable. Therefore it's a value judgement.

(Bob Watson, Darwin lecture, 14 March 2010)

This report was in a sense supporting the view of the scientific community that two degrees is in a sense the maximum that we should accept.

(Schellnhuber, 'Four Degrees and Beyond' conference, 14 September 2009)

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I think NGOs have crowded round the two degrees because at least after that there's dangerous climate change, there's unacceptable climate change ahead of that.

(Campaigner 1)

Well, in the first report we did it roughly, we had the two different dimensions. As I said, the two degrees and the point two and we asked for a long-term acceptable limit and this long-term acceptable limit for absolute temperature was derived from, well, keeping the natural surrounding roughly intact.

(Science/policy actor 6)

Coping with the uncertainties of the science

Roger Harrabin, the BBC's environment analyst, in an email exchange, identified an aversion to uncertainty both within political circles and the media. This he identified as a vicious cycle: reporters will attack any sign of uncertainty in policymakers, whilst the media have little time for nuance. In defence of this position, Harrabin wrote: 'You try writing an uncertainty headline' (personal communication, 9 March 2010).

Further insights into the policy-media dynamic on uncertainty can be gained from the transcript of a BBC Radio 4 documentary examining how uncertainty is avoided in public discourse. A former education minister for a Labour government described on the programme how politicians would change their language when speaking on and off the record:

Put the media in between us, a journalist say[s] to me, 'Could you speak to the public through me, the journalist?' and you change completely. You adopt the language of certainty. And that's partly because of a very simple thing: you're on the record, it can be thrown back at you.

The presenter of the programme then had the following exchange with a journalist member of the panel.

PRESENTER: Would we really rip into any minister who confessed to uncertainty?

JOURNALIST: In the first instance, we certainly would, we certainly would.

PRESENTER: Why would we, because it's not an unreasonable position, is it?

JOURNALIST: We regard it as an unreasonable position. We feel as journalists we want to achieve one of two things: a very clear answer which breaks new ground; or we want to look as if we're the one with big testicles, right?

(BBC Radio 4, 2008)

Smith, in his observations of meetings where the BBC discusses its reporting of risk issues, noted: 'Journalists have demanded to know what facts there are – or to demand "when are we going to get to the truth on climate change" and do

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not carry with them a sense that science is primarily a process of contestation' (Smith, 2005: 1474).

My interviews with climate scientists indicated that the uncertainties in projecting dangerous impacts were profound.

There are real damages associated with 2 degrees and it's a legitimate thing to say that you don't want to experience the damages above 2 degrees. And so at 1.8 degrees of warming the world is not well off at all. It is twice as bad as it is now and at 2.2 degrees the world does not become a climatic pumpkin. It's too late to prevent dangerous change but not to prevent very dangerous change.

(Climate scientist 2)

It is worth quoting at some length from the late Stephen Schneider, whom I had the privilege of interviewing for this research. His longstanding experience at the heart of the climate policy-science interface meant he was able to provide some telling insights:

I've been dealing with the issue of meaningless numbers for so long. The environmental community, and I will count myself part of them, though from the scientific side, have long realized that in the political world that statements like 'we have to do as much as we can as quickly as we can as fairly as we can and as cost-effectively as we can' is not so cloutful, if I can coin a word, inside of Parliaments, White Houses, 10 Downing and Congress as 'we cannot exceed two degrees above pre-industrial otherwise the world turns into a climatic pumpkin'. And back in 1988 environmental groups were arguing we must have a 20% reduction in our emissions. Now I was at a meeting where that was first proposed and I said 'wait a minute guys, we haven't looked at what the costs and the benefits of this are'. I'm not talking about narrow economic views, but you can't just pluck a number out of your head, and they said, 'no, we have to have a number because without a number we can't get their attention'. So I understand there is a political strategy in approaching this in terms of number.

(Stephen Schneider)

In terms of you look at tables that certain people come up with about what sort of impacts we will have at that two degrees, that the sea rise, ice sheets melting, desertification, drought, flood that kind of thing, I don't think necessarily two degrees is necessarily the point when that suddenly starts to happen.

(Policy/science academic 1)

The Independent newspaper, reporting on a conference convened by the UK government in 2005 in an attempt to define a dangerous limit, wrote:

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The Government's conference on Avoiding Dangerous Climate Change, held at the UK Met Office in Exeter a year ago, highlighted a clear threshold in the accumulation of greenhouse gases such as carbon dioxide (CO₂) in the atmosphere, which should not be surpassed if the 2 degree point was to be avoided with 'relatively high certainty'.

(*The Independent*, 11 February 2006)

Compare this with what one respondent who attended the conference recalled when I asked if the Exeter conference was where the two degree limit originated:

That was not my understanding. I think this whole conference was set up and Tony Blair wanted this conference to come up, the language was I think ... Tony Blair wanted to figure out a level that was self-evidently safe, or maybe he used the danger metaphor, I can't remember. But that was the whole purpose of having the whole conference. But from what I recollect, in response to Blair's statement, 'what level of greenhouse gases in the atmosphere is self-evidently too much', I don't think the conference endorsed any specific level.

(Science/policy academic 4)

Few news reports I analysed went into any great depth about dangerous limits to climate change, but those that did, rather like *The Independent* report above, would invoke expert opinion to shore up the uncertainty:

The Tyndall Centre says that to prevent the earth from warming by more than two degrees above preindustrial levels, carbon dioxide concentrations in the atmosphere must be stabilised at 450 parts per million or less (they currently stand at 380). But this, as its sources show, is plainly insufficient.

(*The Guardian*, 21 September 2006)

The report, written by eight leading German professors, says that 'dangerous climatic changes' will become 'highly probable' if the world's average temperature is allowed to increase to more than 2 degrees centigrade above what it was before the start of the Industrial Revolution.

(*The Independent on Sunday*, 7 December 2003)

A 'Scientific Expert Group Report on Climate Change and Sustainable Development', which was not covered in the UK media, provided a rare example of climate scientists using their scientific expertise to support a two degree target:

No one can yet say for certain what increase in global-average surface temperature above the 1750 value is 'too much', in the sense that the

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consequences become truly unmanageable. In our judgment and that of a growing number of other analysts and groups, however, increases beyond 2°C to 2.5°C above the 1750 level will entail sharply rising risks of crossing a climate ‘tipping point’ that could lead to intolerable impacts on human wellbeing, in spite of all feasible attempts at adaptation. Given what is currently known and suspected about how the impacts of climate change are likely to grow as the global-average surface temperature increases, we conclude that the goal of society’s mitigation efforts should be to hold the increase to 2°C if possible and in no event more than 2.5°.

(Bierbaum et al., 2007: xi–xii)

I interviewed another of the report’s authors, and asked him directly, as a follow-on from his previous answers which identified the two degree statement as a value choice, how he reconciled this belief with his involvement in a notionally scientific document that argued for the two degree limit. He replied (by email, as a follow-up to our earlier telephone interview):

This report is of a different character. As described in the Foreword to the report, when establishing the Scientific Experts Group, the UN Division of Economic and Social Affairs requested the panel to make recommendations for action. This charge differs from that given to the IPCC, which is to provide policy relevant information but to be policy neutral (i.e., not advocate particular decisions or policies). In the report itself we attempted to make clear that our role here was different, and that we were reaching a judgment that incorporated our values and made recommendations of what should be done. But I will also point out that we remained true to how we interpreted the available scientific evidence. The sentence you quote above reflects uncertainty, both in its formulation ‘No one can yet say for certain’ and in its use of a range (2–2.5°C) rather than a single number.

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6 Who loses in a two degree world?

I do often point out I use two degrees and I haven't come up with the definition. It is one certain people in the UK and EU have come up with and broadly we acknowledge it, and most of us are aware that this is going to kill people elsewhere in the world but they are a long way away, they're poor and they're generally black and we don't care.

(UK climate scientist)

Already dangerous for some

Variations in the level of human vulnerability to climate change, and the form that vulnerability takes, are of increasing interest to researchers (Adger et al., 2009). This attention to the relationship between culture and vulnerability has been linked to a 'second wave of adaptation studies, as opposed to the focus on purely physical impacts which defined the "first wave"' (Petheram et al., 2010: 2). Vulnerability to climate change is defined as the degree to which geophysical, biological and socioeconomic systems are susceptible to, and unable to cope with, adverse impacts of climate change (Schneider, 2007: 57). The focus on human vulnerability is aligned with the discussion of climate as a cultural category (Hulme, 2009, 2008; Lähde, 2006). Of particular interest is the vulnerability of the cultures of marginal and indigenous groups to climate change (Leduc, 2007; Petheram et al., 2010; Salick and Ross, 2009; Martello, 2008), wherein vulnerability is seen as a function of poverty, with poorer nations and communities being more vulnerable to climate change impacts than their wealthier counterparts (Eriksen and O'Brien, 2007).

The reason for including indigenous voices in building climate change adaptation practices is either based on concerns about equity and justice (Baer and Mastrandrea, 2006; Eriksen and O'Brien, 2007; Sokona and Denton, 2001), or to ensure effective adaptation by using information possessed by the communities but lacking in the West (Patt and Schröter, 2008; Petheram et al., 2010). Subjective experiences of danger are not limited to variations in the ability to cope with the physical impacts. Often the danger has psychological dimensions, as expressed in terms of insecurity or lack of safety (Dessai et al., 2010). These perceptions of danger are determined by personal experience, values, information and trust

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(ibid.). Malnes has argued that a more qualitative understanding of danger might force us to consider the extent to which ‘social well-being’ might be undermined by changes in the climate. This metric is much more subtle and sensitive to change than that offered by ice-sheet disintegration. Questions of concern to this approach include what motives and values might be met, in what ways, so that society as a whole may further develop without undermining its long-term existential conditions. What do various groups of people perceive and believe about these questions, what worries them most, and which solution strategies would they favour (Malnes, 2008: 663)?

It is not only people from the global South who will suffer disproportionately from the impacts arising from two degrees of warming. The two degree limit is a global average which accounts for the differential warming of land and oceans, tropics and poles. As predicted in the models, warming at the poles is happening much faster than elsewhere, with the Arctic having warmed by some 4 degrees Celsius as opposed to the global average of around 0.8 degrees Celsius (www.nisdc.org), with severe impacts on the people who live in these regions.

Walker makes reference to the case of a north Alaskan Eskimo village that is already planning to move its 400-year-old settlement 18 miles further inland because of melting permafrost and eroding cliffs (Ageyman et al. 2009, cited in Walker, 2012: 209). Ehrlich has recently written of what this rapid warming means for the people of Greenland, and in particular the subsistence hunters (Ehrlich, 2015). Recounting the changes to the extent and stability of the ice sheet over the period of her visits beginning in 1993 up to the present day, she tells a story of rapid physical and social changes brought about by the accelerating melting of the ice in Greenland. She provides devastating accounts of people in despair at seeing their way of life and culture disappear before their very eyes, without any idea of how they might possibly live or know what to do in a world where the ice is going and will soon, to all intents and purposes, be gone in so much as it will no longer be safe enough or present enough to support the lifestyles of what Ehrlich calls ‘ice adapted people’.

The uneven distribution of risk is also evident within nations. For example, in the UK the most deprived households are 122% more likely than others to be living within the sea flood zone than the rest of the population (Walker and Burningham, 2011).

It is therefore clear that climate change impacts will not be distributed according to human ideas of fairness, equity or justice. Paradoxically, this disconnect means the issues of climate change and justice are inextricably linked (Harris, 2013; Walker, 2012). This is because climate change is, at root, an issue of fairness in a finite world (Athanasίου and Baer, 2002: 64). Therefore, it has been argued, the issue cannot be meaningfully addressed without taking the promotion of justice as a central aim of global climate policy efforts (Vanderheiden, 2008; Harris, 2013).

There are two dimensions of the climate justice debate of particular relevance to the arguments made in this book. The first is procedural justice, which refers to the ways in which decisions are made, who is involved and who has influence.

Procedural justice speaks to the central argument of this book, and is an issue addressed in more depth in Chapter 8. This chapter is largely focused on the second dimension, distributive justice: ‘the distribution or sharing out of goods and harms (risks)’ (Walker, 2012: 10).

The unequal distribution of risk

As the most recent IPCC report makes clear, the shifting mosaic of impacts and vulnerabilities underlying the claim of a single dangerous limit is not secret. Nor does the IPCC report hide the fact that climate change is simply a multiplier of the vulnerabilities generated by current forms of economic practice, noting that amongst the contributors there is broad agreement that:

People who are socially, economically, culturally, politically, institutionally, or otherwise marginalized are especially vulnerable to climate change and also to some adaptation and mitigation response. This heightened vulnerability is rarely due to a single cause. Rather, it is the product of intersecting social processes that result in inequalities in socioeconomic status and income, as well as in exposure.

(IPCC, 2014: 6)

There is a deep and bitter irony in recognizing that climate change will itself make it difficult for the most vulnerable nations and people to build the resilience that may allow for a meaningful existence under these new climatic conditions. Yet this very realization could be a trigger for allowing new ways of thinking about development to emerge:

Climate change will make poverty reduction increasingly difficult to achieve. The state of the world’s ecosystems and the rising population means that pursuing a path of conventional growth is no longer an option. We have a collective responsibility to reverse this damaging trend by introducing economic policies and new technologies that allow us to develop a human community within the planetary boundaries and in harmony with nature.

(Ekman et al., 2008: 11–12)

The latest IPCC report goes on to give examples of the various changes already occurring in different parts of the world. This includes changing hydrological systems resulting from changes in patterns of precipitation, glacier melt and permafrost thawing (IPCC, 2014: 4). In addition, reflecting Ehrlich’s report from Greenland, ‘many terrestrial, freshwater, and marine species have shifted their geographic ranges, seasonal activities, migration patterns, abundances, and species interactions in response to ongoing climate change’ (IPCC, 2014: 4). Written like that, the impacts seem manageable and not terribly concerning. Indeed, these sorts of changes are not as likely to make the headlines in the way that a powerful single event such as a hurricane, which arrives and passes in a

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day, might. Yet, as Ehrlich's testimony shows, the impacts can be just as profound. Reporting from a once bustling hunting outpost, Ehrlich quotes two locals:

Seven years ago we could travel on safe ice all winter and hunt animals. We didn't worry about food then. Now it's different. There has been no ice for seven months.

We are not so good in our outlook now. The ice is dangerous ... Around here it is depression and changing moods. We are becoming like the ice.

(Ehrlich, 2015: 46)

The IPCC goes on to record that climate change is already negatively impacting crop yields whilst climate-related extremes such as heatwaves, droughts, floods, cyclones and wildfires are already exacerbating existing inequalities and vulnerabilities, with significant impacts on current levels of human well-being (IPCC, 2014: 4). These problems are almost certainly going to increase in intensity and distribution because the manner in which societies have responded to existing climate events demonstrates a significant lack of preparedness for climate variability (*ibid.*).

Looking to the future, the IPCC projects that some ecosystems and cultures are at risk of 'severe consequences', with additional warming of around 1°C and 'many species and systems with limited adaptive capacity are subject to very high risks with additional warming of 2°C' (IPCC, 2014: 12). These risks are 'unevenly distributed and are generally greater for disadvantaged people and communities in countries at all levels of development' (*ibid.*). The conflict and suffering that will arise as a consequence is already beginning to find expression across the poorest regions of the world (Parenti, 2011) – places that Klein (2014) calls the 'the sacrifice zones'. In these places adaptation is already taking place, employing the politics of the armed lifeboat by arming, excluding, forgetting, repressing, policing and killing (Parenti, 2011: 11). It is because the global average of two degrees warming generates so much risk for the most vulnerable that a lead IPCC author has described the two degree target as 'totally inadequate' (Tschakert, 2015).

Climate justice and two degrees

As the latest IPCC report makes clear, in aiming for a minimum of two degrees warming, policymakers are knowingly putting the weakest and most vulnerable people of the world in harm's way (IPCC, 2014). It is therefore difficult to speak of two degrees as a progressive, just or desirable end point for climate policy. Indeed, with two degrees of warming seemingly the best deal on the table, any talk of climate justice within a two degree framework would seem questionable, as the setting of an emissions limit that reflects the vulnerability of the poorest and least able to adapt should be a cornerstone of climate justice (Paavola et al., 2006). This appears to be a difficult truth for some to accept. Athanasiou and Baer recognize that '[t]wo degrees centigrade of warming

would be a death sentence for tens of thousands, perhaps millions of people, a commitment to catastrophic losses of species and ecosystems, and attendant intensification of geopolitical instability' (Athanasίου and Baer, 2002: 44), but then go on to lay out a just and fair way of achieving two degrees.

Of course, it is easy to sit in my office with a secure roof over my head, a full stomach, a reliable power supply, and free from illness and threats to my life, and suggest all the people of the global South are desperate to have a debate about dangerous limits to climate change. As George Marshall highlighted when questioning why it took the NGOs so long to wake up to climate change, 'it is hard to make the case for dedicating resources to a long-term threat when one is working with people who are struggling on a daily basis for survival in a context of severe poverty or violence' (Marshall, 2007: 211).

A campaigner I interviewed, who works on climate change issues mainly in the global South, and who generally rejected discussion of a quantified dangerous limit as an essentially neo-liberal discourse, had met representatives of the campaign group 350.org at a conference. He revealed that his conversation with the 350.org representatives revealed a wide divide on the issue of dangerous limits. The respondent working in the South told me:

They sort of were friendly and laid out their thing and said 'you know, we have had all these nationwide demonstrations and our starting point was two degrees, our starting point is we have to cut emissions, we have to have targets. Emissions have to be stopped at this level, this is our first step. Once we can get a movement aligned around' (two degrees, or a movement aligned behind whatever target it was they were talking about their idea was), 'this is the major thing we need to do, the first step we need to take and after that we can work out how we are going to do it'. And I said, 'frankly in all of these discussions over many years (with indigenous people from the South) the issue of emissions targets and the issue of two degrees and the issue of 350 parts per million has never once come up. In reality, when you are talking climate politics with people in the South, this is not where the core of the issue is, I mean, it is really not the core of the issue and it has never come up in our real practical work with our groups in the South'. And the two students, they sort of at first they thought we were either kidding or we weren't really feeling the climate problem or we weren't of use to them and their movement. Their communication, in a way their sympathy for us, just melted away and they didn't understand what we were trying to waste our time about if we weren't trying to organize the world around two degrees or 350 parts per million or whatever it was.

Can the rich be asked to care about the poor?

If we accept that the wealth of the rich has come from exploitation of the poor (Vanderheiden, 2008: 46), what hope is there that these same nations are going

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to do whatever it takes to redress the current imbalance in responsibility, wealth and risk highlighted by the climate science? Addressing climate change requires a commitment to fairness. The current weighting of risk to those nations and people who have least responsibility would suggest that a fair response would be for rich nations to pool risk with those that are more vulnerable (Vanderheiden, 2008: xv). Because climate change is a problem of global injustice it cannot be tackled without addressing that injustice (ibid.). Ekman et al. (2008), recognizing that compensating developing countries for the costs of adapting to climate change is a stated obligation under the UNFCCC, argue that developed countries should be required to adopt legally binding annual funding commitments for both mitigation and adaptation measures in developing countries. This agreement should move beyond just nation-states to include the affluent and consuming classes in all nations as those who must assume the bulk of the effort of climate transition.

However, public acceptance of such policies would require, as a minimum, a sensibility of shared responsibility, or what is referred to in climate justice debates as cosmopolitanism. Cosmopolitanism stresses that we all have responsibilities to each other, no matter how distant. However, an approach to climate policy based around cosmopolitanism, argues Harris, is at loggerheads with policies that historically have been designed around the needs of the nation-state (Harris, 2013: 129). Cosmopolitanism requires that the individual is at the centre of policymaking and that policy recognizes the universality of the rights and needs of each individual, wherever they are living. This creed must have universal force if cosmopolitanism is to have any meaningful effect on people's lives. In this sense cosmopolitanism is the same as any other vision that requires all people, transcending class interests, to believe the same thing(s) and consent to be governed according to those principles. Whatever virtues this approach may have, it does not seem likely to move from a theory outlined in academic journals to a global policy framework in time to save the world's poorest from runaway climate change.

Public representations of the distribution of risk under the two degree framework

While Harris has identified nation-states as a unit of policymaking ill suited to building effective mechanisms for mitigating greenhouse gas emissions, Walker believes that more relevant in international negotiations are blocs of countries such as the G8 and G77 (Walker, 2012: 184). These blocs certainly feature large in media reports of climate negotiations. Who gets what and who gets a say in policy is divided up into nations and, perhaps more relevant in international negotiations, groups of countries. Such divisions can reveal stark differences in terms of vulnerability to risk (ibid.: 184). Media reports showed the powerful blocs to be strong advocates for the two degree target.

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The Group of Eight industrialised economies, including America, yesterday agreed for the first time that they must limit worldwide temperature rises to no more than 2C.

(The Guardian, 9 July 2009)

The wealthy countries have come together to recognise the desirability of holding global warming to two degrees Celsius above the pre-industrial level.

(The Daily Telegraph, 10 July 2009)

The less well off nations are less convinced about the desirability of 2 degrees. For China, it was reported as being too strict a target. 'You should not target China to fulfil the two degree target. That is just a vision. Reality has deviated from that vision,' said Dai. 'We do not think that target provides room for developing countries.'

(The Guardian, 17 September 2009)

This point was echoed by one interviewee:

Look at the position of many developing countries. They are concerned to not take on burdens that would slow their economic growth.

(Climate scientist 4)

African representatives at Copenhagen saw no salvation for the world's poor in a two degree target:

Lumumba Stanislaus Di-Aping, chief negotiator for the Group of 77, which represents developing countries, announced that the two degree target 'exposes over 100 countries to suffering and devastation', leading to the disappearance of low-lying island nations and 'certain death' for Africa. And he added that the \$10 billion a year fund would not be enough 'to buy the poor nations the coffins'.

(The Daily Telegraph, 12 December 2009)

Such hyperbole was given short shrift in the West:

Energy and Climate Change Secretary Ed Miliband hit out at Mr Di-aping, accusing him of trying to wreck the talks and offering 'disgusting comparisons to the Holocaust which should offend people from across this conference from whatever background they come'. Sweden's chief negotiator Anders Turesson said: 'The reference to the Holocaust is, in this context, absolutely despicable'.

(Mail on Sunday, 20 December 2009)

One campaigner saw arguments for limits, such as the one degree limit called for by the government of Bolivia, as a veiled attack on capitalism:

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And I assume you've been following the debate around 1 degree and 1.5 degrees and sort of what's been going on recently. It's actually in the Copenhagen accord there's a reference to 1.5 degrees and more recently in the Bolivian meetings that they're having Evo Morales has said the goal should be 1 degree. I think you'll find not all countries are taking these positions in good faith. The countries that are taking really, really ambitious positions are doing so because they know them to be impossible and they know they will completely stall and break down negotiations altogether. So there are countries, for example, within the climate negotiations that will say, 'you know, we want 10% in GDP to go to climate science and we need an 80% in emissions from all developed countries within the decade'. Now some people might characterize that as very, very ambitious, and other people might characterize that as an attempt to torpedo the process because it's such an ambitious aim that it's impossible, probably both politically and physically. And so you have that dynamic within the temperature debate in the negotiations as well. To what extent does Bolivia really care about limiting warming to 1 degree and to what extent are they fed-up with a global economy focused on capitalism which is most of what you hear Morales talking about?

(Campaigner 11)

A senior member of the WWF climate programme argued that there was not, unlike the G8, any consensus within the G77 on a dangerous limit:

We don't agree with this global goal of limiting warming. You had the very vulnerable countries in AOSIS [Alliance of Small Island States], with their slogan 1.5 to stay alive, who are within the G77 so it became very hard politically within the G77 to not at least want 2 degrees and then again within the G77 the argument then became between those who wanted 2 degrees, those who wanted 1.5 degrees and those who wanted 1 degree, you know as a threshold to limit warming to.

(Campaigner 5)

I think if there were discussion about it there would be sense of that and certainly there would be in the Arctic communities who are already being affected by massive climate change. And I can imagine them saying, 'what are you talking about safe, it is already past the point of no return for us. You guys may be talking about what is safe for you, but it happened quite a few years ago for us'.

(Campaigner 3)

Somebody whose existence depends much more on subsistence use of climate-sensitive resources would see themselves in that way and are already experiencing climate change at today's levels some way below two degrees C and see their livelihoods being threatened.

(Climate scientist 4)

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7 What next for two degrees?

The best available way forward for the planet at the moment is an 80% chance of avoiding a rise in temperatures above 3.5 degrees centigrade.

(Sir David King, 2011)

We concur with the view in the recent IPCC report that there is a high degree of confidence that global warming will exceed 2°C by the end of the 21st Century.

(Royal Dutch Shell, 2014)

Copenhagen: was it already too late?

In September 2009, just prior to the Copenhagen summit designed to deliver a global agreement that would see warming limited to two degrees, a three-day conference was held in Oxford. The conference was titled ‘Four Degrees and Beyond: Implications of a global climate change of 4+ degrees for people, ecosystems and the earth system’ (www.eci.ox.ac.uk/4degrees/). In bringing together academics, politicians and NGOs, this conference was an attempt to begin the planning for a world where climate policy had failed to mitigate emissions of greenhouse gases.

However, doubts over the possibility of limiting warming to no more than two degrees of warming had been voiced before that date. Scenarios emerging from the Fourth IPCC report in 2007 indicated that a low-emissions scenario would still result in a mid-range estimate of 1.8 degrees of warming, but possibly up to 2.9 degrees by 2100 (IPCC, 2007a: 14). The same Fourth IPCC report claimed that to stabilize atmospheric concentrations of CO₂ at between 445 and 490ppm (resulting in an estimated global temperature 2.0 to 2.4°C above the pre-industrial average), emissions would need to peak before 2015 (IPCC, 2007b).¹

So the Copenhagen conference took place in the context of grave doubts about the feasibility of limiting warming to two degrees. These doubts did not on the whole extend to questioning whether two degrees of warming would prevent dangerous climate change, at least not in the global North. One speaker at an anarchist protest camp, which had been illegally set up in a field next to Heathrow Airport to protest plans for expansion, was willing to voice these doubts to a packed tent:

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I'm going to start with some bad news and the bad news is this: two degrees is no longer the target and the news is contained in a recent paper written by James Hansen of NASA. What Hansen shows is that the profoundly pessimistic assumptions in the latest IPCC report working group 3 are insufficiently pessimistic and the reason for this is as follows. The IPCC assumes that the melting of the ice sheets at the poles will take place in a gradual and linear fashion and Hansen's own work with the palaeontological record shows that it is an entirely implausible scenario.

(George Monbiot, Climate Camp presentation, June 2007)

Hansen's position was unusual compared with that of other climate scientists, in so much as the majority of climate scientists rejected the idea of a single knowable dangerous limit to climate change, whereas Hansen believed in the existence of a dangerous limit, but at a level that it is now, bar a means of rapidly removing CO₂ from the atmosphere, impossible to reach – namely, one degree centigrade. This is a position he has maintained in his most recent paper on this subject, and he provides the following indicators as proof for his claim of a one degree dangerous limit:

Arctic sea ice end-of-summer minimum area, although variable from year to year, has plummeted by more than a third in the past few decades, at a faster rate than in most models with the sea ice thickness declining a factor of four faster than simulated in IPCC climate models. The Greenland and Antarctic ice sheets began to shed ice at a rate, now several hundred cubic kilometres per year, which is continuing to accelerate. Mountain glaciers are receding rapidly all around the world with effects on seasonal freshwater availability of major rivers. The hot dry subtropical climate belts have expanded as the troposphere has warmed and the stratosphere cooled, contributing to increases in the area and intensity of drought and wildfires. The abundance of reef-building corals is decreasing at a rate of 0.5–2%/year, at least in part due to ocean warming and possibly ocean acidification caused by rising dissolved CO₂. More than half of all wild species have shown significant changes in where they live and in the timing of major life events. Mega-heat waves, such as those in Europe in 2003, the Moscow area in 2010, Texas and Oklahoma in 2011, Greenland in 2012, and Australia in 2013 have become more widespread with the increase demonstrably linked to global warming. These growing climate impacts, many more rapid than anticipated and occurring while global warming is less than 1°C, imply that society should reassess what constitutes a 'dangerous level' of global warming.

(Hansen et al., 2013: 4)

Monbiot and Hansen aside, any concerns being voiced about the feasibility of the two degree target around the time of Copenhagen were focused on the target's achievability, not the dangers it commits us to.

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A rise of two degrees centigrade in global temperatures – the point considered to be the threshold for catastrophic climate change which will expose millions to drought, hunger and flooding – is now ‘very unlikely’ to be avoided, the world’s leading climate scientists said yesterday.

(The Independent, 19 September 2007)

‘The two-degree target is impossible, and a three-degree target is implausible’, said Paul Domjan, energy fellow at the London-based European think-tank and an author of the report.

(The Observer, 8 June 2008)

The difficulty of limiting warming to two degrees then becomes the catalyst for reconsidering nothing other than the limit itself, as articulated by the former UK Department for Environment, Food and Rural Affairs (DEFRA) chief scientist:

I would argue it’s an incredible stretched target, I would argue it’s very, very difficult to meet, although many politicians still believe it’s plausible. It’s plausible but not likely in my opinion. Therefore I would argue we need to get ready to adapt to four degrees Celsius.

(Bob Watson, Darwin lecture, 14 March 2010)

We had ten years to fix it when I and about ten colleagues told the US Senate over at the World Climate Conference in ’79. I mean, I remember having a knock-down scream-out with the head of the British Met Office who thought it was irresponsible for scientists to talk about policy till we knew everything.

(Climate scientist 2)

The idea that policymakers might have to raise the limit has been echoed in several recent academic papers (Guivarch and Hallegatte, 2013; Geden and Beck, 2014; Jordan et al., 2013). This is sometimes justified by allowing for an ‘overshoot’ of the target in the short term, whilst in the longer term looking to bring temperatures back to two degrees (Geden, 2013; Guivarch and Hallegatte, 2013). How this fits with the idea that two degrees is the upper limit after which climate change becomes catastrophic is not always made clear:

In the light of evolving scientific evidence, the Taskforce recommends that emissions reductions should aim to achieve greenhouse-gas concentration levels by the end of the century compatible with limiting global average temperature rise to 2°C, and to limit the period of time during which those concentrations are above levels compatible with that goal.

(International Climate Change Taskforce, 2005: 4)

These deliberations throw a clear light on the essentially symbolic nature of the two degree idea, which articulates climate change as a problem that poses no substantial threat to existing norms and values:

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There's a practical level, isn't there? If you say 'one degree', if you costed the repercussions of that globally you'll be laughed at. We are struggling to get the message heard at two degrees so I think there's a pragmatic element there, but I think it's important we remember all the time that this is a pragmatic thing.

(Climate scientist 1)

I think when you are trying to have some sort of policy impact you have to be fairly pragmatic about the targets you are using and to have some point at which you can begin to engage. I've never really looked into the debate leading into that adoption of two degrees as a target, so exactly how pragmatic that target is in terms of the debates that were being had I don't know. My instinct is that it's just a pragmatic point at which we can aim. DEFRA are deeply pragmatic people who work with politicians who are politically constrained in what they can do.

(Policy/science actor 1)

It is perhaps because the policies for two degrees are starting to bite that in 2013 in the UK the prime minister was quoted (though he denied the claim) as angrily expressing his desire to 'get rid of all this "green crap"' (*The Guardian*, 2013a), whilst at the same time the Australian prime minister's top business adviser launched a public tirade accusing the IPCC of 'dishonesty and deceit' as it focused on 'exploiting the masses and extracting more money' (*The Guardian*, 2013b).

If the two degree limit can be changed to three or four degrees when it becomes inconvenient, or overshoot, to be returned to at some more suitable time in the future, or is a means of getting feet under the policy table, one is left wondering what relationship it has to reality, or indeed any internal consistency:

In a sense, the 2° had entered the debate but it was always a slightly arbitrary figure that people had taken from the past, and we did not treat it as a completely binding one. As I say, you have to remember that you cannot say, 'The aim is not to go above 2°'. That is just not a doable aim. You have to define the aim as, 'I don't want a more than "x" per cent chance of going above 2°'. Once you have accepted that there is already a certain chance of going above 2°, you are trying to work out how big a chance you are willing to accept. We ended up believing that the most vital thing is to keep the chances very, very low that we go to really high levels like 4°.

(Lord Turner of Echinwell, chair of the Committee on Climate Change, Environmental Audit Committee, February 2009)

Copenhagen failures

Deliberations of what might become of the two degree target have arisen in the wake of what was generally perceived to be the failure of the Copenhagen talks, despite Western leaders being urged to rescue an impotent and incompetent

humanity from the perils of our own excesses, and even though questions about the validity and feasibility of the two degree limit had been raised in the years leading up to Copenhagen.

Start reading here, Barack: Only one person can now rescue these climate talks. This is the speech to turn shambles to triumph.

(The Guardian, 19 December 2009)

You have become President at a crucial moment in the planet's history. We are close to the climatic Point of No Return: a two-degree rise in temperatures, which will trigger an unravelling of all natural processes. The last two Presidents killed Kyoto. You can save its successor, which has to be negotiated before 2012.

(The Independent, 20 November 2008)

We'll never get a better chance to save the planet; Copenhagen ... climate battle is on plea as Obama acts.

(The Sun, 8 December 2009)

Can Obama save us from hell?

(The Daily Telegraph, 9 July 2009)

Alas, unlike in the films, our superheroes failed to deliver, and it is the 'mess' of Copenhagen that would inevitably lead to all our current climate agreement woes (*The Economist*, 2010).

However, in the lead-up to Copenhagen, well-placed observers were more circumspect about the prospects for agreeing a strong and binding international agreement, such as John Schellhuber, one of the key architects of the two degree limit.

In Copenhagen we actually may get a sort of under the UN Convention a full acknowledgement and maybe even an adoption of the two degree target. It's probably the best we can get in Copenhagen because no one should dream of the possibility that there will be numbers reduction measures for each country in the world which will be sealed in Copenhagen this year, but if we get first of all a long-term target then we get the right framework then we are in much better shape than we are now.

(Schellhuber, conference presentation, 15 September 2009)

Whilst there is a general sense that policy agendas were overwhelmed by financial crisis and other world problems (Kriegler et al., 2013), perhaps economic growth was what it was all about from the beginning, with Gordon Brown saying of Copenhagen: 'The UN talks are also about ... stimulating

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economic demand and investment’ (Machin, 2013: 17). Hence, when Dimitrov complained that it was impossible to agree a deal despite the conference ‘constituting the highest concentration of robust decision-making power the world had seen’ (Dimitrov, 2010: 18), he was missing the point. Are we to imagine that if the world had been riding high on record-breaking figures for economic growth, policymakers would have agreed a deal that would threaten that situation?

Two’s too much

Rather than call for abandoning the two degree target because it is no longer achievable, one negotiator has proposed revising the target down to 1.5 degrees. Petra Tschakert is involved in a process of reviewing the adequacy of the two degree goal overseen by the UN. In a recent paper Tschakert called for a new target of 1.5 degrees (Tschakert, 2015) – a goal the author admits would require, amongst other measures, the large-scale deployment of as yet non-existent carbon capture and storage facilities (ibid.). The review process was agreed in 2010 at the 16th Conference of the Parties in Cancun, when the two degree target was adopted as a long-term goal for climate policy. The results of the review are due to be published in the summer of 2015. The review, using a ‘structured expert dialogue’ methodology (UNFCCC, 2015), seems unlikely to offer any profound breakthrough in thinking, given that it will be grounded in the same ‘expert’ worldview that has conceived of climate change as a phenomenon best understood and responded to through the global gaze of Northern elites. This criticism holds true even if the result of the process is agreement on a 1.5 degree limit. Conceiving the story of climate change as one story, definable by one number, whatever that number may be, is a technocratic construction of the world – a world knowable and controllable only through those instrumental forms of knowing that are the preserve of the well educated and well heeled. Two degrees, one degree or four – they are all discourses of control, originating within the globe’s dominant institutions, visions of the world intelligible only to the few.

Controlling the world through ‘two degrees’

Imagining the world has a single dangerous limit for climate change is an act of power that is deeply rooted in the project of modernity; the construction of climate change as a phenomenon manageable through quantification in essence assumes climate change is a problem solvable by modernity, rather than a problem of modernity. Shepherd (1996: xiv) traces the origins of belief in the possibility of control to the advent of domestication and agriculture. The idea of uncertainty arose alongside these early attempts at mastery of the world: will the crop come up, will the rains come, will our enemies burn our fields (ibid.)? Others, writing in the green anarchist tradition, echo this connection between

agriculture and the desire for increased control, both of the natural world and the people in it (Zerzan, 1994, 2002; Diamond, 2005; Jensen, 2006; Brody, 2001).

However, within the social sciences it is more common to trace the idea of nature as an unruly force in need of control to the genesis of a capitalist class in Europe and the ensuing social, political, scientific and philosophical transformations of first the Renaissance, and then the Enlightenment (Merchant, 1980; Seymour, 1986; Cooke, 1991). From this latter standpoint the new capitalist class was the seedbed for a quantitative worldview that rapidly displaced medieval Church teachings (Ellul, 1965; Mumford, 1967; Nef, 1958). Yack claims that this quantification of the world is the framework within which what is most distinctive about the modern world unfolds (Yack, 1997: 121), is indeed a bedrock of modernity (Wallerstein, 1996: 8). Rather than unpredictable and revolutionary responses to endless religious wars, starvation and oppression, the new sciences that arose on the back of these quantitative epistemologies offered the promise of piecemeal social improvement through the careful collection and analysis of the appropriate data (Killingsworth and Palmer, 1996: 232). Since then, science has increasingly been offered up as a substitute for politics; scientific progress, in offering a speedier, trustier way to improve people's lives, offers the promise of escape from fragile and contestable human judgement (Stipple and Paterson, 2007; Ellul, 1965).

It is because our way of life has emerged from the scientific worldview of the Earth and its people as subject to the same universal laws, that it is impossible to imagine thinking of climate change as anything other than a phenomenon with the same dangerous limit for everyone and everything. So it is that, even as the fallacy of a two degree dangerous limit becomes ever more apparent, the media continue to cite the two degree limit uncritically. However, recent reports are more inclined to talk of two degrees as a policy goal, rather than scientific fact:

Activists claim that climate change poses the greatest threat to mankind and the world economy and want major industrialised nations to agree to binding targets that will limit global warming to no more than 2 degrees Celsius.

(The Daily Telegraph, 27 March 2015)

The goal of the UN conference is to get a binding agreement from all nations of the world to limit global temperature increase to 2 degrees Celsius (3.6 degrees Fahrenheit).

(The Independent, 1 April 2015)

Phase out fossil fuels as part of a worldwide drive to prevent global temperatures rising by more than two degrees.

(The Independent on Sunday, 5 April 2015)

Moving beyond the myth of controlling the climate

The target regimes of whatever number are all expressions of an idea of modernity that took root in the twentieth century. Modernity has historically operated on the assumption that advances in scientific knowledge inevitably reduce uncertainty (Wynne and Jasanoff, 1998; Lövbrand, 2004), and that eventually science will deliver humanity into a state of complete certainty (Haila and Dyke, 2006: 41). Hulme and Dessai place the desire for the imposition of order onto a seemingly chaotic pattern of weather events to a broader desire to control nature that emerged during the embryonic stages of modernity in the eighteenth and nineteenth centuries – an order imposed through quantification and statistical analysis of weather patterns (Hulme and Dessai, 2008: 3; but see also Sundberg, 2007). Nowotny et al. (2001: 10) cite this belief in the ability of planning and predictability to deliver benefits as reaching its apogee during the period of ‘high modernity’ circa 1945–60, when the dominant assumption guiding interactions between humans and the non-human world was that all disorders can be made ordered through the expert application of industrial technologies (Hewitt, 1983: 202).

Funtowicz and Ravetz (1993) argue for a post-normal science to rehabilitate a scientific response to the environmental problems of modernity. Ravetz (2006: 31) traces the need for a post-normal science to the awareness of environmental problems that first arose in the early 1960s with the publication of Rachel Carson’s *Silent Spring* (1962), and gathered pace in the early 1970s with the publication of *The Limits to Growth* (Meadows et al., 1972). A post-normal science is one that is able to recognize the possibility of irreducible uncertainties in our knowledge of the interactions between the open systems of society and global circulations of energy (Funtowicz and Ravetz, 1993; Ravetz, 2006). In terms of climate change, I understand this to mean that science is providing quantitative answers to essentially qualitative questions (Rayner, 1987: 19; Baer, 2005: 4). Therefore the answer to the question ‘How safe is safe enough?’ must be:

totally systemic, possessing no definitive answer. Also, defying any attempt at quantification, it belies the numerological reductionism that characterises our scientific world view. This conundrum is perhaps the characteristic internal contradiction of our modern intensive technology civilisation.

(Ravetz, 2006: 14)

In arguing that many environmental issues resist simplification through the reductive frames of normal science, Ravetz (2006: 78) urges his readers to view the idea of certainty in science as an impossible goal. Instead, it is necessary to recognize that scientific activity is creating fresh uncertainty and instability, and should no longer be considered a terminus (Nowotny et al., 2001: 38). Rather than being the singular means of responding to environmental problems, science should instead become one of several inputs into the decision-making process – a process wherein the ideal of rigorous scientific demonstration is replaced by

that of open public dialogue that seeks to accommodate the plurality of legitimate perspectives (Ravetz, 2006).

Scholz et al. call for trans-disciplinary processes as a key element in developing socially inclusive, representational knowledge. This requires the inclusion of knowledge and values from agents from the scientific and the non-scientific world (Scholz et al., 2000: 477). So, whilst science has a role in describing the landscape of uncertainties and facts, the discussion about how to respond to these situations should be a societal one, not the preserve of scientific experts (Evans and Plows, 2007: 828). These perspectives are a reflection of the unique status of environmental science as the most socialized, and thus most complex, of all scientific activity (Nowotny et al., 2001; Ravetz, 2006). The feasibility of achieving such a cosy partnership between these different cultures and forms of knowing is something addressed in more detail in the next chapter.

Note

- 1 When I initially wrote that sentence, the prospect of emissions levelling off in 2015 seemed remote; figures for 2013 had shown a record increase in global carbon emissions (UEA, 2013). However, 2015 saw much celebration of figures showing that industrial emissions in 2014 levelled off (IEA, 2015). The celebrations seemed as much about the fact that this stall occurred against a backdrop of economic growth than the emissions themselves, which still equalled the record-breaking emissions of 2013. Further, the IPCC figures will give just a 50% chance of staying under two degrees (IPCC, 2007b). Nonetheless, this could be a game changer and a sustained move to meeting the targets for giving us a 50/50 chance of limiting warming to two degrees.

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8 Climate change

The terminus of modernity?

The limits of democracy

One reason the two degree idea has not acted as a ‘mobilizing narrative’ (Jerneck, 2014) is because it is an attempt to impose a simple narrative onto a complex set of competing truth claims and values, which shift and change not only at a societal level, but also at an individual level, wherein desires, fears and beliefs can often be fluid and determined by a range of ever changing exogenous circumstances (Sagoff, 1988). As an abstract technocratic description of the world which at its core seeks nothing more than to reproduce and legitimate business as usual, the two degree narrative does not have the characteristics of a vision that can enthuse people. Indeed, as this book has sought to show, the goal of the two degree idea has been to marginalize discourses which offer the hope that a different future might be possible. One can also reasonably ask why it is imagined the whole of humanity will happily unite under a two degree banner, given the question posed by Andy Stirling: ‘When has humanity as a whole even undertaken – let alone controlled, still less achieved – any single explicitly and collectively deliberate end at all?’ (Stirling, 2014: 84).

That is why, in 2015, the news that emissions from energy sources had not increased in 2014 along with increasing economic growth of a 3% increase in GDP (IEA, 2015) was greeted with such jubilation. It offered the hope that the two degree target could be observed without the need to find an alternative meta-narrative to that offered by neo-liberalism.

Yet, despite the barriers that have successfully prevented the emergence of alternative narratives about humanity’s future, a conjunction of extraordinary pressures is forcing open a ‘rare window of opportunity through which the re-structuring of large-scale, long-lived “sociotechnical regimes” may be unusually sensitive equally to human agency and historical contingency’ (Stirling, 2014: 83). The debate about the future of the two degree target is central to the levering open of that window. Implicit in this opportunity, if it is to be any kind of break with current approaches to living in a carbon-constrained world, is the need for ‘alternative possible trajectories for knowledge, intervention and change which prioritize different goals, values and functions’ (Leach et al., 2010: 5). This approach denies the validity or usefulness of a global discourse, in favour

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of much more place- and context-specific ways of being in the world (ibid.). It is only at that kind of scale that the potential for a more democratic process of intervention and change can find expression. As we have seen, globalized discourses of climate change are immensely disempowering. For most people, a discourse around ‘parts per million’ or ‘2°C mean temperature rise’ is unintelligible, while the broad perception of climate change as a global problem is potentially unhelpful, as it makes it unclear what role the individual has to play in such a vast arena (Parag and Eyre, 2010).

Examining the two degree limit idea in light of these two categories of discourse shows that not only does the concept crowd out green radicalism discourses, but it acts as a bridge across a majority of the other discourses. In providing a unifying theme, the two degree limit accommodates a range of different perspectives, allowing a diversity of different approaches to be brought to bear on the climate change problem.

Lowe and Lorenzoni, in an examination of expert concepts of dangerous climate change, suggest that the ‘dangerous’ discourse is positive in its ability to draw attention from a wide spectrum of interests and motivations to managing climate change (Lowe and Lorenzoni, 2007: 143). I argue that the discourse, in constraining debate to those perspectives that are validated by the two degree limit, only serves the interests of the elites proposing the target, and consequently reject the claim that the two degree limit is positive or progressive. Rather than a positive approach, the concept fulfils an ideological function by not only blocking deep green values, but also by encouraging and validating those responses grounded within the paradigm of modernity. Nor has it been a successful strategy, as shown by recent discussions of preparing for four or more degrees of warming.

Democracy has increasingly become an engineering project, concerned with the manufacture of new political subjects and with subjecting people to new ways of being governed (Mitchell, 2013: 3). Hence a major theme of governmental reform over the past three decades was built on scepticism about democratic processes and the desire to transfer authority to new groups of technocratic guardians (Roberts, 2010: 6). This process has drawn on a deformed network of communication which has tended to conceal or eradicate the very norms by which it might be judged to be deformed, and so becomes particularly invulnerable to critique (Eagleton, 2007: 129). Replacing democratic deliberation on acceptable climate risk with a top-down discourse of ‘science says two degrees is a dangerous limit’ is a primary example of how climate change has been depoliticized and removed from the democratic sphere. The purpose of the European integration was from the start to create a protected sphere, protected from an excess of democracy (Mair, 2013), and so it is perhaps no surprise that the EU was the architect of defining a two degree dangerous limit as the end point of climate policy.

Addressing the taboos of Enlightenment ideology

Justice is inevitably political and politics involves disagreement, competing perspectives and active work to persuade others of your point of view (Walker,

2012: 12). The failure to provide a political space for debating acceptable climate risk is therefore an injustice. However, the question remains of how to give the individual a voice in discussion of acceptable climate risk and ensure the process is a just one. This book has suggested that we can only apprehend the reality of climate change indirectly, through symbols. The overarching symbol to date has been a number, two degrees. What is needed is a symbolism, a language that does not begin with this numerical symbol. This is not to suggest a change in language will be sufficient, but it is necessary. It is through language that we might articulate the possibility of ‘social conditions in which all men and women could genuinely participate in the formulation of meanings and values, without exclusion or domination’ (Eagleton, 1991: 175).

However, at the time of writing, it is not clear that climate change can be the object of that new discourse. Climate change, or more particularly the top-down technocratic discourse of preventing more than two degrees of warming, has not fulfilled its function of uniting humanity in a common cause. The findings emerging from a research project the author is currently engaged with show that whatever actions are being taken to reduce emissions are being undertaken in the name of concepts such as ‘energy security’, ‘green jobs’, ‘green growth’ and ‘fuel poverty’. These may or may not be relevant elements of the debate, and addressing these issues may help, as a side effect, reduce emissions. However, it is somewhat difficult to imagine these tropes building support for the huge cuts in emissions needed to limit humanity’s suffering to the impacts of two degrees warming. Adam Corner of the Climate Outreach and Information Network has written of a ‘climate silence’ that has descended over the UK since the failure of Copenhagen (Corner, 2013). Politicians are no longer talking about climate change, instead focusing on generating economic growth; scientists are cowed; and civil society organizations are adjusting their messages to this new reality, whilst trying to survive on diminishing contributions from an impoverished public. Nor, according to this report, will simply turning up the volume on the science break this impasse (Corner, 2013: 1).

This should not be treated as a defeat, but as an opportunity to be brave and honest. The evidence is clear: attempts to bound the problem of climate change within the straightjacket of a two degree policy objective have failed. Switching to a three degree or four degree limit does not constitute a solution to the failure to limit warming to two degrees. Climate change can no longer be seen as a technical problem to sit alongside other policy problems, to be managed with a specific set of techniques and innovations that tame the monster so that it can be kept within a cage and prevented from interfering with humanity’s manifest destiny of endless economic growth. It is a problem of how we want to live, and whilst no doubt there are commonalities about what every human wants for their future, it is difficult to imagine anything approaching a consensus being possible across the hopes, aspirations and desires of 7 billion plus people. So we begin to see that the real limit imposed by the reality of climate change is the limit to the globalization of trade and ideology. The other monster it is assumed can be tamed is science itself, which in calls for a participatory process, is seen to be an equal partner alongside other forms of

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knowledge, but is this nothing more than a platitude, which ignores the role science plays in the delivery of neo-liberal objectives? We will explore these questions in more depth, beginning with outlining what participation means in terms of building better climate policy.

Telling stories about climate change

Democracy comes from Greek, meaning the rule of the people (Lerner, 2014). Whilst participation can mean different things to different people, Lerner defines it as ‘democratic participation in ... decision-making about how a group of people is governed’ (ibid.: 6). This democratic participation has been identified as inseparable from the goals of sustainability (Bruntland, 1987; Middlemiss, 2014). Stirling (2014) sees democratic struggle as the principal means by which knowledges and practices of sustainability were shaped in the first place.

The uncertainties about future climate impacts and the essentially value-laden nature of defining acceptable climate risk under those conditions of uncertainty both allow and demand that citizens become both critics and creators in the knowledge-production process (Rayner, 1987: 8). The more individuals are involved in the decision-making process, the more likely it is that these individuals will adopt decisions as their own (Ockwell et al., 2009). It has also been suggested that opening up the debate may lead to better ideas, ideas that may have broader social resonance: ‘the creative work of social transformation is mainly the task of amateurs, not experts’ (Kunkel, 2014: 180). Conversely, failure to engage diverse voices in decision making can lead to the development of ineffective or harmful interventions (Ostrom, 1990). This latter point underscores the claim made in this book, that with the future of the two degree limit on the table, it is essential to bring diverse voices and perspectives into the deliberation. However, whatever the supposed benefits of a participatory dialogue about climate change, it is not clear that participants will be interested in participating, or that those who do will be bringing with them the hoped-for suite of suitably progressive politics (Machin, 2013: 59). The latter point is discussed below when assessing the possibility of reaching consensus.

The level of enthusiasm for participating in dialogues about climate change is likely to be limited, at least amongst some audiences, by declining levels of trust in politics (Lerner, 2014), declining levels of interest in climate change (Corner, 2013), disbelief that anything said will be listened to and acted upon by policy-makers (Burke and Heynen, 2014), and simply having other things they would rather do with their time (Young, 2002). It therefore seems necessary that in order to reduce the resistance generated by these barriers, it might at the very minimum require that the debate does not begin with a discussion of climate change, but instead allows participants to tell their own stories about how they would like the world to be in 50 years and compare this with what they think the world will be like. From this starting point one can begin to understand what role climate change plays in people’s beliefs about the future and the values at play in determining the acceptability of those scenarios.

This process can be inclusive by drawing on the storytelling capabilities that define human interactions (Roberts, 2011) and relating these to climate policy scenarios using the techniques of narrative policy analysis. Narrative seeks an alternative to consensus and instead aims for a form of workable compromise in the face of uncertain, complex and polarized issues (Hampton, 2009: 228). Narrative policy analysis recognizes that policy options are often presented in narrative form and so can be responded to, countered and refined through other narratives (Roe, 1994). As I have outlined elsewhere (Shaw, 2015), allowing people to tell their own stories about climate futures offers an accessible means to democratize the building of bottom-up climate policy scenarios to compete with those that are used to communicate elite constructions of acceptable climate risk. The emission scenarios that are most likely to work are those that ‘take people with them’ (Roberts, 2011: 145). It is therefore apparent that scenarios based on the stories people tell about the world they want and are unashamedly value based, are much more likely to engage publics than the constrained technical exercises that currently constitute the limit of participation. For these stories to emerge it is necessary to break with formal deliberation methodologies (Roberts, 2011: 151). To achieve this Roberts proposes running deliberative storytelling workshops, initially under the guidance of a storytelling professional, to explore the social and cultural aspects of life in 2050, and how these aspects of existence will be affected by changes in both practice and climate in that year. These forms of narrative can provide stories that will resonate more broadly and deeply than scenarios limited to choosing what degree of the energy we use in 2050 should be from nuclear energy, and how many shared car journeys a week we anticipate taking. It would not be possible to run global workshops in this way, but this approach, run as a series of pilot studies, could give useful insights into the issues likely to emerge from this process.

This process would by no means address all the challenges to building a carbon-conscious democratic citizenry, but in finding a way to talk about climate change that escapes the straitjacket of the two degree framework, it may at least highlight how to build alternative discourses rooted in a more humanistic worldview than that which currently defines discussion of climate policy.

The role of science in participatory dialogues about acceptable climate risk

Existing efforts to build a participatory dialogue, if they are to achieve their transformative potential, have to be about more than simply responding impotently to choices already determined upstream (Burke and Heynen, 2014). Instead, such dialogues must challenge the existing knowledge hierarchies, such as those embedded in the two degree symbol, which typically delegitimize non-scientists’ contributions to knowledge and practice and fail to address the broader social and economic questions constraining the opportunities for constructing alternative imaginaries (ibid.: 8).

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A frequent refrain within the social sciences is that societal value judgements must be given equal billing with climate science in the decision-making process (IPCC, 2014; Lorenzoni et al., 2005; Lövbrand, 2004; Gupta and Van Asselt, 2004), in the hope that, at a minimum, the process will ‘ensure rather than undermine continued scientific authority in the international climate regime’ (Lövbrand, 2004: 449).

The problem with this idea of an equal partnership between science and other forms of knowledge is that it assumes that: i) the different forms of knowledge and underlying values are already or can be made commensurate; ii) scientists will be happy to see their expertise demoted to the same level as that of people with much lower levels of education and expertise; iii) all publics will feel able, comfortable and confident in challenging the authoritative practices of science and scientists; and iv) those actors, organizations and institutions whose power rests on the invocation of science will allow that power to be undermined by an excess of democracy.

Science is not just one knowledge amongst many. It is the narrative that propels industrial modernity (Ellul, 1965). The whole edifice rests on a hierarchy of knowledge with science at its apex. Science *is* power and control (Stirling, 2014). The challenge of building a participatory dialogue is that the ‘real hope of radically progressive social transformation may lie more in the mutualities of caring, than in the hierarchies of control’ (Stirling, 2014: iii). Machin identifies the problem as one of having been encouraged historically to rely on elites and experts to solve the problem who, by definition, have less to gain by doing so. Democratizing knowledge undermines their expert status, whereas if they are left free to define the appropriate response, the resulting policies will be ones that reflect their interests and priorities (Machin, 2013: 75). Unless the public are allowed into the process at the very beginning, in the definition of what counts as a risk and what counts as an acceptable level of risk, distrust of science and politics will remain (Wynne, 2008: 22).

The very definition of issues like climate change as a scientific problem excludes the public from engaging with the weighing of the risks posed by such a phenomenon. Schudson (2006: 495) notes the widespread concern that expertise denies the possibility of equality promised by democracy: ‘The expert always turns out to be on someone’s side, and not necessarily ours.’ This divide in attitude to risk between the public and experts has been described as an issue of trust; both public trust of science, and scientists’ trust of the public (Durant, 2008: 8). Ekberg claims social theories of risk are inseparable from theories of trust, and that risk and trust are in inverse proportion to each other: ‘In an environment of high trust, risk is low, and in an environment of high risk, trust is low’ (Ekberg, 2007: 356). Expert definitions of risk rely on ‘external’ definitions of danger. External definitions are usually narrowly based on risk analyses and assessments of system characteristics of the physical or social world (Lowe and Lorenzoni, 2007: 132) interpreted through just two dimensions: probabilities and severity of consequences (Leiserowitz, 2005: 1434). By contrast, public, or internal, definitions of risk are much more complex and multidimensional, and

involve consideration of issues such as justice, morality, trust and responsibility (Slovic, 1987; Wynne and Jasanoff, 1998; Lowe and Lorenzoni, 2007). Additionally, public sensitivities to risk vary according to the type of risk, with greater adversity to artificial over natural risk, imposed over voluntary risk, the degree of control, perceived fairness and familiarity of the risk situation (Waterstone, 1991: 57).

This social divide between internal and external definitions of risk shapes, and in turn is shaped by the communication of risk that Wardman identifies as purely a top-down discourse which seeks to legitimate modernity, often promoting the upside of technological solutions and exaggerating the downsides of forgoing those solutions (Wardman, 2008: 1620). Hulme has argued that current constructions of climate change risk, such as the two degree dangerous limit, are an attempt to merge physical and cultural determinants of risk into one single metric, and it is this misconception of climate risk that lies at the heart of the failure to develop an effective response (Hulme, 2008: 6).

Participatory politics as a route to hegemony

Given the very profound and broad divisions between lay and expert ways of being, between right and left, between owners of the means of production and the worker, between the middle-class Westerner and the rice-planting subsistence farmer in Asia, what hope is there of reaching a global consensus on acceptable climate risk? Is it really credible to imagine the overcoming of globally operating contradictions by a global agreement of humanity with itself (Groys, 2009: 89)? Surely it is more reasonable and rational to accept that climate change is the terminus of modernity.

Discussions of a participatory politics of climate change seem to be a revisiting of Marx's eschatological myth of a classless society, the end of historical tensions, a myth of the Golden Age that many traditions put at the beginning and the end of history (Prawer, 2011: 287). Rather than a dissolution of class conflict, or all agreeing to worship the same god, this time the promised land will be delivered through all of humanity sharing the same perspective on what needs to be done about climate change. Middlemiss (2014) worries that participation enthusiasts are positing an idealized participatory subject fit to build a sustainable future, an individual that is willing to work with others to reach decisions or modify their lifestyle for the greater good.

Even if such ideal participants could be found, they may be disappointed to discover that participation can sometimes be nothing more than an exercise in legitimation of existing social relations (Thorpe and Gregory, 2010: 277) whilst deliberative democracy represents little more than the disciplining of public discourse by means of rationality, reasonableness and moderation. Participatory exercises that bring together conflicting voices into a forum which has already bounded the problem within particular notions of rationality are little more than thought normalization processes resulting in a middle ground that reflects an acceptable compromise. This process, then, not only reinforces dominant

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constructions of possible options but extends those technocratic elite value systems into nominally democratic spaces which are intended to be an escape from the constraints of the distortions and power play of everyday political language (Edelman, 1985; Shaw, 2013, 2015; Thorpe and Gregory, 2010). This has been exemplified by the UK's Department of Energy and Climate Change 'My2050' calculator (<http://my2050.decc.gov.uk>). The online interface allows users to choose which energy choices they would like to see employed to deliver 80% cuts in CO₂ emissions by 2050. The choices are largely limited to different energy technologies, and the result of selecting the correct energy pathways is presented as a solution to climate change, the avoidance of dangerous impacts (Shaw, 2015). Political change and the development of new social and economic norms are not part of this solution. So, rather than democratizing the debate, the process instead reduces the role of citizens in this debate to little more than that of petit technocrats (ibid.).

Building support for top-down regulation from the bottom up

Pluralist perspectives on climate change policy argue that policymakers are constrained in enacting climate change mitigation strategies where there is little public support for such policies (e.g. Carter and Ockwell, 2007). The goal then becomes one of building public support for government regulation. This Gramscian approach sees democratic deliberation as the means by which the people infiltrate the decision-making levers of power through the communication of their collective will and thus extend democratic control into the state's core (Dryzek et al., 2002: 663) – a core of decision-making power which, in respect of climate change, has to date been protected from democratic interference by claiming science has defined two degrees of warming as a dangerous limit. This green authoritarianism is beyond the pale for commentators such as Machin (2013), who see in such initiatives a denial of diversity and the quashing of true democratic politics. A truly deliberative democracy does not impose any consensus or substantive notion of the good life upon people, but 'celebrates the myriad of differences in society' (ibid.: 68). Machin may be getting near to the truth of our dilemma here, or at least she would if she followed through the implications of her conclusions, which are essentially anarchist (unless she asks that the migrant working in dangerous conditions and remaining in poverty is to celebrate the wealth of the investors getting rich from the profits generated by that labour).

For how long are we to wait for the 7 or 8 billion people of the world to agree what should be done about climate change before anything gets done? We will finish this account of the trap laid for us by the two degree framework by highlighting the potential of the middle ground detailed in the work of the economist Elinor Ostrom. In his recent account of the life and work of Ostrom, Derek Wall shows how she identified a middle route between centralized control and a fully decentralized society (Wall, 2014). Ostrom's principal interest was in how institutions worked or failed to sustain collective resource use. Ostrom

noted that self-governing entities exist on a variety of scales and can be found in both the public and private spheres. The key question Ostrom posed in the syllabus materials for her courses was: ‘How can *fallible* human beings achieve and sustain self-governing ways of life and self-governing entities as well as sustaining ecological systems at multiple scales?’ (Ostrom, 2011, cited in Wall, 2014: 193).

Rejecting Hardin’s tragedy of the commons thesis, in which Hardin argued the self-maximizing strategies employed by humans would inevitably result in the destruction of property held in common, and so common lands would be better off in private ownership, Ostrom instead argued that communication and co-operation are key and perennial features of human societies, and it is these attributes that have allowed the development of human societies over millennia. However, Ostrom did not from this position argue that no centralized co-ordination was needed for the flourishing of human societies. The knowledge and expertise that a centralized decision-making apparatus could command would often lead to problems if applied to cultures and communities distant from it. Equally, without that expertise and knowledge, communities acting independently could often make poor decisions with very negative consequences. What was required instead was a balance between the two. Wall sees this as being most closely approximated through autonomous Marxism, which recognizes the possibilities of self-organizing communities, but sees the need for a centralized body to challenge the structural forces constraining the potential of such communities to flourish and survive.

This chapter has outlined some of the possible opportunities and problems with trying to build democratic alternatives to the policies legitimated by the two degree discourse. None of the ideas offered are without their own serious problems. Yet it remains apparent that a huge divide has opened up between the ruled and the rulers in terms of aspirations for the future. The erosion of democratic controls over the actions of elites has led to the development of a world on the edge. The majority of humanity seems to be operating with different attitudes to risk which characterize the foolhardy approach championed by world leaders, none more so than the acceleration towards at least two degrees of warming. For this author it is difficult to imagine a truly democratic decision-making process would result in such a high-risk and foolhardy policy.

To critique the two degree target may seem to risk rejecting the good in favour of the perfect. It appears as though it will be very difficult, if not impossible, to limit warming to two degrees. It is the best we can do. I do not attempt in this research to articulate an alternative target to the two degree limit. The aim is simply to provide answers to as yet unasked questions, to show how important decisions that implicate us all and have potentially grave consequences are presented in public discourses (Roberts, 2010). After all, it is only if people know how their government functions that they can fulfil the role democracy assigns to them (Roberts, 2010: 7).

However, it is important briefly to provide a response to this perfectly reasonable challenge: if not two degrees, then what? The two degree target represents a

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failed strategy; it does not describe an actually existing division between safety and danger. It has not galvanized policy responses or public engagement; it appears it will not be possible to avoid more than two degrees of warming; and there is still ambivalence amongst the public about any response to climate change that has negative economic implications, and an even greater resistance to the changes needed for an 80% reduction by 2050 – a target that itself is not sufficient to prevent dangerous interference with the climate (Harvey, 2007). It is important to understand how such a failed strategy came to be constructed as a progressive and aspirational goal and by whom. The value of this study lies in its contribution to efforts to ensure the same mistakes are not made by the same institutions operating under the same values when developing a strategy to replace the failed two degree regime. Reframing the debate as one about acceptable levels of risk from harm better captures the value-laden nature of defining what is worth risking in order to reproduce existing patterns of social activity. It also demonstrates the impossibility of defining how much is too much climate change on a global scale. We thus confront, but leave unanswered, the question, ‘Does climate change represent the terminus of modernity?’

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Conclusion

Researching the construction of dangerous climate change limits

This book has examined public representations of the two degree dangerous limit, predominantly focusing on the UK, and drawing the majority of its material from public discourses around the time of the Copenhagen conference in 2009.

Barnes, Bloor and Henry (1996) argue that a sociologist, whether or not s/he evaluates a belief as true or false, must search for the causes of its credibility. This has not been a book about the science of climate change impacts. Nonetheless, in order to examine and critique public representations of the idea, it has been necessary to highlight the gap between what information climate science can provide about climate risks and the way that information is used in public narratives. The analysis has identified two salient features about those narratives. First, relatively little attention is paid to the policy goal of limiting warming to around two degrees centigrade. Second, when the idea does feature, it is only fleetingly and largely described as a limit defined as dangerous by climate scientists.

This book has argued that the cause of the target's apparent credibility cannot be found in the climate science. The climate science can be used to make the claim that climate change becomes dangerous at two degrees, just as others have claimed climate change will become dangerous at one degree or 1.5 degrees. One could equally claim the science shows three degrees or ten degrees of warming is dangerous. They are no doubt all true statements; impacts at these levels of warming will likely be dangerous for someone, somewhere. I have attempted to reveal that what the science tells us is that it is not possible to identify one single dangerous limit for the whole world.

Therefore it is necessary to look elsewhere for the reasons people may have for proposing the idea of a two degree dangerous limit as a credible means of framing policy responses to climate change. Those reasons are, in the first instance, ideological. The claim that there was a dangerous limit emerged not out of democratic deliberation, but out of a high-level UN process in 1992. This became codified as a two degree dangerous limit in a range of discussions between scientists, researchers and politicians within Europe, eventually being

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formally ratified in 2010. This goal, whilst described in official documents to be a value choice to be deliberated on by societies as a whole, was in fact chosen by a small fraction of the world's population. Those actors, as part of a science-policy institutional nexus dominated by elite actors from the world's wealthiest and most powerful countries, reflect the values, ideologies and norms of that class. That process defined the limits of acceptable thought regarding available ways of conceiving of and responding to climate change. All other commentators, journalists, campaigners, many academics and politicians have worked within this framework. All the options on the table derive their legitimacy from the claim that it is acceptable to continue warming the atmosphere to at least two degrees centigrade.

This study has been largely interpretive – ideologies are not measurable events or physical entities. Wall, recognizing the challenges of providing evidence for the results of constructionist accounts of environmental issues, claimed that what is sought is not certain and definitive social explanations but 'recurring contingencies and causal tendencies which render some explanations more powerful, more saturated with meaning' (Wall, 1999: 354). I have sought to identify these recurrent patterns by analysing a broad range of sources.

Comparison of narratives

The construction of environmental problems is a diachronic, synchronic and multitudinous performance, involving a range of actors, a variety of sites and an extended timeline. Wodak stresses that in instances such as these where there is an historical dimension to the research field, the researcher must be prepared to work inter-disciplinarily, multi-methodologically and on the basis of a variety of different empirical data (Wodak, 2008: 12). My research is characterized by a flexible and pragmatic attitude to data selection and analysis because the work, like that of Gillen and Petersen (2005: 149), is motivated by 'theoretical and political concerns, rather than a desire to use a method or particular methods'.

This need to employ a variety of different data is why I have drawn data from public outputs such as print media, online media, TV documentaries, radio broadcasts and film. I then triangulated these results against interview data. This comparison, in highlighting the differences between public narratives and what is said off the record, has revealed the ideological work being done by public representations of the two degree limit.

One of the most striking tensions between public and background commentaries was between ideas of a threshold as opposed to a continuum of ever increasing danger. This was closely related to another division in the two degree limit debate, between the global North and South. My data showed that environmental campaign materials and website statements relied heavily on ideas of distinct thresholds between a stable and a dangerous climate, whether at 1, 1.5 or 2 degrees. However, in interviews environmental campaigners were less forthright about the existence of a distinct point at which the climate becomes dangerous, with a tendency to talk in terms of a continuum of danger.

The need to recognize a continuum of danger was driven by awareness of the differences in resilience to climate change between the global North and South, with some environmental campaigners arguing that many in the South are already experiencing dangerous changes. Outside a scattering of quotes on the subject which appeared during the Copenhagen summit, media commentaries made little mention of this divide between North and South when discussing the two degree limit. Neither was there discussion in the media about the belief that all climate change is dangerous.

Two degree discourses

Discourse here means ‘the social activity of making meanings with language’ (Wodak, 2008: 6). The two degree discourse of greatest ideological value is the one that constructs the two degree limit as a fact beyond democratic deliberation. The passages and texts analysed for this book, in making meaning, ‘overlap, influence and compete with one another; they appeal to one another’s “truths” for authority and legitimation’ (Scott, 1988: 759). We can better understand the ideological and hegemonic work performed by the ‘two degree dangerous limit is a scientific fact’ discourse by assessing how it fits within Dryzek’s (1997) four categories of environmental discourse: survivalism, environmental problem solving, reformism, and green radicalism. The green radicalism discourse, as essentially anti-industry, is not a discourse identified in my data. My analysis has focused specifically on commentaries about the two degree dangerous limit. The absence of green radical perspectives from these commentaries indicates that the two degree discourse displaces such accounts. This finding would seem to support the position that constructing climate change as a phenomenon with a two degree dangerous limit is an ideological act designed, in part, to legitimate industrial modernity.

‘Survivalism’ is the category Dryzek uses to describe the limits discourse. Survivalism assumes that drastic action is needed to prevent exceeding natural limits, and thus global disaster (Dryzek, 1997: 12). ‘Environmental problem solving’ is a discourse broadly sympathetic to institutionally embedded responses, based on Enlightenment ideals of the individual as a rational actor. The primary agent of change is the expert. ‘Reformist’ discourses are aligned with the goals of sustainability and ecological modernity, which eschew ideas of limits. The two degree limit validates all three of these discourse categories. The connection with the survivalism discourse is obvious – it is the concern with catastrophic, runaway climate change which is given as the motivation for observing the two degree limit. Public commentaries on the two degree limit rely on institutional expertise for validation, an approach that is characteristic of the environmental problem-solving discourse. Though Dryzek’s reformist category does not turn to discussion of limits to justify its agenda, in positing the need for sustainable development it is closely aligned with the narratives associated with the two degree limit in so much as the two degree limit provides the ontological and temporal space for mitigation strategies that are reformist rather than revolutionary.

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In their revised analysis of repertoires used to describe future climate change scenarios, Ereaut and Segnit (2007) identify two broad discourse categories: ‘alarmism’ and ‘resolve’. Ereaut and Segnit identify three different forms of alarmism: alarmism, sober alarmism and conservative alarmism. Alarmism per se is seen as the language of shock, which leaves no room for human intervention; it is already too late. Conservative alarmism recognizes but dismisses the dangers. Sober alarmism ‘is the language of seriousness, numbers, likelihood and proof, which suggests there is more room for human intervention’ (ibid.: 6). Amongst the resolve repertoires, Ereaut and Segnit identify establishment techno-optimism as a discourse that assumes that the market and industry can provide the solutions. Non-establishment techno-optimism is seen to deal in more concrete discussion of numbers and targets, and has a rather Panglossian approach to the promises of technology. The two degree discourse displaces the ‘too late’ message of alarmism to a two degree future. This displacement activates the sober alarmism and techno-optimism discourses, which argue for human agency, expressed through the development of new, and more ecologically sensitive application of various technologies. The human agency allowed for by the two degree limit is essentially technological because it is an instrumentalist frame demanding global monitoring of emissions through the use of diverse but complex technologies, ranging from domestic energy-use meters through to networks of satellites orbiting the Earth.

Examining the two degree limit idea in light of these two categories of discourse shows that not only does the concept crowd out green radicalist discourses, but it acts as a bridge across a majority of the other discourses. In providing a unifying theme, the two degree limit accommodates a range of different perspectives, allowing a diversity of different approaches to be brought to bear on the climate change problem. Lowe and Lorenzoni, in an examination of expert concepts of dangerous climate change, suggest that the ‘dangerous’ discourse is positive in its ability to draw attention from a wide spectrum of interests and motivations to managing climate change (Lowe and Lorenzoni, 2007: 143). However, the concept excludes deep green values from the discussion, and encourages and validates those responses grounded within the paradigm of modernity. Instead of a useful and rational response to climate change, the adherence to the global limit agenda is an example of ‘that well-documented human response to failure, especially where political or emotional capital is involved, which is to insist on more of what is not working; in this case more stringent targets and timetables, involving more countries’ (Prins and Rayner, 2007: 974).

The role of the news media

Most of the data for this analysis came from news media, it being recognized that the new media are the public’s primary source of information about stories such as climate change. Television media are the most popular and trusted news source worldwide (Painter, 2014). However, the process of identifying the relevant broadcasts, recording them and transcribing the recordings is a resource-intensive

process that would not have allowed the research to include the breadth of sources necessary to demonstrate the extent to which the public space has been dominated by the ‘two degree dangerous limit is a fact’ narrative. The news reports and other commentaries analysed use the two degree idea as a frame to then validate particular understandings of what sort of problem climate change is. Frames act as organizing ideas, or cognitive windows that relate a particular version of the topic being reported (Olausson, 2009: 423). Olausson’s research into media constructions of climate change, drawing on elite theory, makes the case for an analysis of media discourse that locates the frames used within a network of cultural, economic and political factors, and argues that ‘frames, as imprints of power, are central to the production of hegemonic meaning’ (Olausson, 2009: 223). Frames appear as transparent descriptions of reality, not as interpretations.

The worldview communicated by frames is ‘uncontested, because frames are often taken for granted, not subject to any kind of questioning, and are therefore invisible in everyday practice’ (Olausson, 2009: 223). It is this invisibility that makes frames such a powerful hegemonic device (Newell, 2000: 77), allowing a range of broadly reformist policy frameworks to be debated, and in so doing, relegating more radical perspectives to the same social margins as those occupied by those who deny anthropogenic climate change is either a reality or, if it is a reality, not one we need to be overly worried about. The result of this framing is to ensure that the interests of the elites, as codified by the two degrees claim, are embedded, without challenge, into the system (Roberts, 2004: 149).

The results of this research are a challenge to pluralist organizational and cultural theories of news production, which would suggest that the reader would encounter variety in the treatment of a subject such as dangerous climate change. The results support political economy theories of media discourses, which suggest that all media output on a particular topic is likely to fulfil the same ideological function. From this perspective the purpose of the media is ‘to inculcate and defend the economic, social and political agenda of privileged groups that dominate the domestic society and the state’ (Chomsky and Herman, 1989: 298).

Outside the core state interests, there is scope for pluralist perspectives to offer some limited explanatory power. The media will offer some dissenting voices, but this is still largely a propaganda function. Ellul cites the case of *Krodokil*, a Soviet newspaper allowed to be critical of the Communist state, because the state understood it would be catastrophic to suppress criticism ‘as long as the criticisms had no serious consequences’ (Ellul, 1965: 424, emphasis added). I emphasize this last point because I understand that issue to define the limit of pluralism, serious consequences here meaning serious consequences for the core functions of the state. For the state to fulfil those core functions it must retain control of definitions of the climate change problem.

This it has done with the help of a compliant media. The news media have largely acted as an uncritical echo chamber for elite actor commentaries on the two degree limit. Ereaut and Segnit, in their examination of climate change discourse in the public sphere, state: ‘It is arguable that the wide media consensus

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on manmade climate change has removed the need for “loud talk” – the sort of urgent, quasi-religious doom mongering that was all the more urgent and quasi-religious for its detachment from the science’ (Ereaut and Segnit, 2007: 12). I understand public commentaries on the two degree limit to be a form of ‘loud talk’ which aims to quash dissent and elevate the two degree concept to the status of fact. This loud talk drowns out subaltern perspectives, and makes attempts to find other ways of understanding and responding to climate change seem irrational. Indeed, it is the bridging of so many ‘reasonable’ sustainability discourses achieved by the two degree concept, discussed earlier in this chapter, that makes any critique of the concept seem so extreme.

Maintaining the consensus

There was close agreement amongst those interviewees closely involved in climate science and the climate science-policy interface that defining a dangerous limit is a normative act, not a scientific fact. My research shows that the idea of the two degree limit as a normative concept was not apparent in public discourses, which predominantly constructed the two degree limit as the product of a scientific and expert consensus. Another compelling and consistent pattern in my data was a shared disinterest in discussing the two degree limit outside the frames provided by elite actors.

However, there were also inconsistencies. The two degree limit is a broad church, but the accommodation of such a wide spectrum of views means there is a great deal of tension surrounding the interpretation of the two degree limit because the concept – and its anchoring role – is being simultaneously pulled in a number of different directions. This tension is evident both between and within different discourse communities. It is important to explore these tensions, because the idea of a broad political and scientific consensus is one of the more prominent justifications used to support the two degree argument.

My data suggest a tension emerging between some climate scientists and the policy community on the two degree dangerous limit. The period from 2007 onwards appears to have been a time when diplomatic effort has been directed at getting the two degree limit in place as the cornerstone of international policy. Such efforts have meant leaving the concept unexamined, it being enough simply to fix a target.

Nonetheless, scientific knowledge of climate systems and the impacts of climate change have not remained static. Whilst explicit scientific validation of the two degree dangerous limit has always been tenuous, what developments there have been in climate science, along with observations of issues such as Arctic ice melt, have pushed the danger zone for many ecological systems and areas of human activity below the two degree line. Recent academic papers on the futility of trying to limit warming to two degrees, and the inadequacy of that number for preventing dangerous climate change, have not been met with any policy response.

Van der Sluijs et al.’s research into the fixing of the 1.5–4.5°C climate sensitivity range may offer some insights into the reasons for this inertia, and why a

two degree dangerous limit has remained the consensus position in policy and media narratives, despite the mounting evidence for the target's irrelevance. This 'consensus range' had remained fixed for 20 years, despite 'dramatic changes in scientific knowledge and analysis during this time' (Van der Sluijs et al., 1998: 291). The authors conclude the range remained fixed over this time period because the range holds together a variety of different social worlds, but only by being an imprecise measure that can therefore accommodate differing perspectives and needs (*ibid.*). The authors go on to note that there was no scientific rigour to the establishing or maintenance of this climate sensitivity range. Yet key actors (such as the head of the IPCC) would not be willing to change the range without a robust scientific basis, as absent any such justification, it would be difficult to secure public confidence in any changes (*ibid.*: 303). In addition, because the range was not established through the application of rigorous scientific analysis, any attempt to revisit the range would require scientists to explain how the range was arrived at initially, and there is a reluctance within the scientific community to have the shortcomings of previous work practices exposed (*ibid.*: 305).

The two degree limit differs from the climate sensitivity range in so much as it is a fixed point, not a range. However, the ability of this fixed point to accommodate all perspectives and aspirations against a backdrop of a contested and evolving empirical evidence base, alongside the large volumes of intellectual and policy capital invested in the concept, makes it very difficult to change course.

This inertia is reinforced by the manner in which the limit acts as a boundary object. Van der Sluijs et al. describe boundary objects as relatively stable and reproducible ideas which make possible communication between different social worlds. The object does not need to be a fixed value to achieve this; it just needs to be an idea constructed in a fashion that has meaning to divergent social fields (Van der Sluijs et al., 1998: 311). This research has highlighted how the two degree concept has been supported by various actors as a means of communicating climate risks between the public, policymakers and other stakeholders. In its role as an anchoring device, the concept needs to be fixed, highly aggregated and multivalent. The importance of the two degree limit in providing a shared stable meaning to a broad range of epistemic and social communities was confirmed by several respondents from the policy, policy-science and campaigning organizations examined in my research, who felt that whatever the weaknesses of the concept, a bad target was better than no target at all.

The acceptable risks of two degrees warming

Existing discussions of the two degree limit have tended to focus on external top-down expert and elite accounts, such as those of climate scientists and policymakers (Lowe and Lorenzoni, 2007: 132). These are undoubtedly important markers in the debate, but they are only part of the story. Any attempt to elucidate the socially constructed features of the two degree limit requires that equal attention be given to the other spaces in which, and means by which, the dangerous limits idea is shaped, maintained and communicated.

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Constructions of climate change as a phenomenon with a single, quantifiable dangerous limit are grounded in ‘external’ definitions of risk. External definitions of risk are generally driven by elite actors and expert bodies, working within a positivist frame of reference. The definitions used by these actors are external in so much as they draw to some extent on empirical observations of the external world to define the level of risk. The public understand risk less in terms of the objective properties of physical systems, and instead rely on ‘internal’ definitions that draw on a range of social, cultural and cognitive factors that are more personal and explicitly subjective than the resources used by experts.

Reframing the debate as one about acceptable levels of risk from harm better captures the value-laden nature of defining what is worth risking in order to reproduce existing patterns of social activity. However, the presentation of the two degree target in public discourses as scientific fact, or the product of an expert consensus, in effect substitutes a discussion about what risks are acceptable with the notion of an objectively dangerous limit. Further, the target framework prioritizes attention on physical impacts, ignoring the cultural dimensions of the climate. The absence of the public from debates about how much warming should be considered acceptable is an important issue in my research. Substituting acceptable climate change with dangerous climate change requires a focus on the words of experts and other elite actors, and an implicit acceptance of the role of global monitoring systems in achieving global targets. A discussion of acceptable changes to the climate would necessarily involve the global public, and the need to negotiate myriad differing opinions about what risks people want to take. Feyerabend (1978) argues, apropos the scientific agenda and modernity, that no way of life should implicate others who do not want to be part of that life. It is this issue that shows how climate change might be understood as the terminus of modernity’s ambition to treat humanity as an undifferentiated mass. The only means by which climate change can be responded to through the global institutions of modernity is to pretend that there is a single global dangerous limit, and a single global understanding of acceptable climate change risk. My research shows that notions of plurality, often seen as a defining feature of late or post-modernity, are in fact highly constrained; the project of modernity demands universal acquiescence to particular ideas and visions of the future, such as a willingness to live with an elite definition of acceptable climate risk.

This book has demonstrated that the two degree limit is used to constrain debate within the language of modernity – a globalized, single, quantified construction of climate change. These public accounts are at odds with the beliefs expressed by key actors in interviews, academic literature and in conference presentations. Adam, Allan and Carter argue that the media do not simply reflect the reality of environmental risk, but provide ‘contingently codified (rule-bound) definitions of what should count as the reality of environmental risks’ (Adam et al., 2000: 14). My research shows that this process, in respect of the two degree limit, is more widespread than just the media. It is, in fact, characteristic of almost all public discourses.

What this book has not discussed

The speed at which the climate changes is an important determinant of how hazardous those changes will be because it will make it difficult for humans and ecosystems to adapt. There remains continued uncertainty as to whether changes in the climate will be linear and incremental or occur in a series of rapid large-scale changes. Whilst debates about linear versus tipping point change have received a lot of attention in the literature (for example, Lowe and Lorenzoni, 2007; Dessai et al., 2004; Lorenzoni et al., 2005; Risbey, 2006), actual commentary on what rates of change should be considered dangerous are much less prevalent. That is not a lacuna this research has tried to address.

The idea of rapid non-linear change is relevant to analysis of two degree discourses; indeed, the two degree limit is often justified on the basis that it represents a threshold between two distinctly different climate regimes. Efforts by the UNFCCC to provide a set of parameters for defining dangerous climate change includes rates of change as a key parameter for avoiding dangerous impacts, alongside an upper limit for total warming:

Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

(Article 2, UNFCCC, 1992)

The WBGU equates this timeframe to a rate of warming of no more than 0.2 degrees Celsius per decade (WBGU, 1997: 13–14).

The book has not addressed questions of how the two degree message is received by different audiences and used by them. Few now hold to the idea that the communication of scientific findings will lead, in and of itself, to rational and optimal responses. Known as the information deficit model of scientific communication, it assumes that scientific research helps to discover an environmental problem; it identifies options for the problem's potential solution; scientists inform politicians of these findings; and, as political decision making can always be expected to suffer from some inertia or be distorted by interests that run counter to environmental concerns, scientists can also try to create public awareness to foment political pressure. Thus, 'the model's basic idea is that of information flow among these spheres (science, politics, public), and it assumes that, ideally, the content of the information passes on unchanged and initiates political action almost automatically, following the "rational logic" of the information obtained' (Weingart et al., 2000: 262).

This model does not reflect the extent to which political action is constrained by public opinion (Leiserowitz, 2006), media discourses (Smith, 2005; Boykoff and Boykoff, 2004; Corbett and Durfee, 2004) and the actions of corporate lobby groups (Jacques et al., 2008). Nor does the model account for the pre-existing cultural biases of different publics as discussed in the grid/group model.

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The rational communication model is further complicated if one accepts that it is virtually impossible to separate science and its use in policy when dealing with complex, uncertain systems (Kaiser, 2003: 41).

We have seen that the work of creating meaning occurs not in a social vacuum, but in a social context already populated with symbols and images that people employ in negotiating social relations. Where the shared meaning is fragile or under-determined by empirical evidence then reaffirmation is sought through the use of fixed and stable symbols (Holloway, 1997). So scientific communication occurs within an arena where different actors are using symbols to define what interpretations of that science will dominate. The reporting of the Copenhagen conference demonstrates that the news media rely on the opinions of powerful institutional actors to provide the authoritative interpretation of climate change science. These elite policy cues are a key determinant of public concern about climate change (Brulle et al., 2012), with political actors playing by far the most powerful and effective role in shaping perceptions of climate change (Carvalho and Burgess, 2005: 1478). The only way to understand how public understanding of climate risk compares with the science, news reports and elite perspectives would be to carry out interviews with the relevant parties including the public, not something this research has attempted.

Does it matter?

Maybe it is best that discussions of acceptable climate risk are kept out of the public sphere. Whilst to this author the choice facing us seems a simple one – a trade-off between the risks posed by climate change and the benefits that accrue from our use of fossil fuels – it is possible this apparent simplicity is the result of being privileged enough to be able to spend several years studying the issue.

Yet, we live in a world that extols democracy as one of the great achievements of humanity, and what is democracy if not a system which gives people a say in the decisions that affect their lives? If climate change is the greatest challenge facing humanity, what sort of democracy is it that does not give people a say in the trade-offs that responding to climate change requires?

For democracy to be the pinnacle of political organization, people at the very least deserve warnings about what ‘success’ in tackling or fighting climate change means; a high-risk strategy of warming the planet by at least an average of two degrees centigrade. The two degrees world will be very different from this one, requiring huge efforts to mitigate emissions for two degrees and massive infrastructure changes to try to cope with what is unfolding. Without a change in public representations of the two degree decision-making process, people are likely to have little understanding of what is happening, why it was the best we could do, and the political changes needed to survive this endless storm.

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