California in the Greenhouse:

Regional Climate Change Policies and the Global Environment

by

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Declaration

I Jan Corfee-Morlot, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis. ***Signed:***

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Supervisors

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ABSTRACT

This thesis explores how climate policy is developing at sub-national or "regional" scales of decision-making. It considers local-global connections on both the science and the politics of climate change by investigating four main research questions as they pertain to regional climate action: What triggers regional policy action on global climate change? What arguments and lines of evidence underlie the policy discourse? How do "winning" arguments gain salience? How does regional action make a difference to broader scale climate policy? The research is conducted through one in-depth case study in California. It shows that action on climate change mitigation in California is enabled in part by past action in related policy arenas of air pollution control and energy policy within a multilevel, social-practice environmental governance framework. More recently the emergences of a comprehensive policy framework is triggered by a unique policy window where a change in California's leadership capitalised on the void of federal policy to re-frame arguments for state-level action on climate change. The case study identifies two dominant policy frames leading to a third master frame or meta-narrative in the period 2004-6: i) climate change as a problem of regional environment risk; ii) mitigation policy as a "win-win" for the local economy and the environment; iii) climate change as a regional policy issue. This period represents a paradigm shift from a previous dominant framing that characterised climate change as predominantly a national rather than a state policy issue. The case study shows that today's dominant policy frames rely upon a process of co-construction that combine insights from expert and local knowledge, thus intertwining "facts" and " values in the policy process. "Winning arguments" or policy frames gain salience through a relatively open policy process, which permits an array of non-governmental actors -- including social movement organisations, business organisations and experts -- to operate in the outer-periphery of the policy process and generate ideas in a timely way to influence policy decisions. The research underscores the power of localising problems of global environmental change and their solutions, of taking up climate change as a regional policy issue where solutions can be tapered to reflect regional contexts and norms. It shows that there is a relatively larger scope for experimentation and social and technical innovation at regional scale, compared to broader scales of action, which can open the way for cross-scale learning and influence to emerge.

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Part I: Introduction, Methodology and Conceptual Background

1. INTRODUCTION

In the last decade, global climate change has escalated from an obscure area of scientific research to become an international political priority. Although it has risen quickly to the top of public policy agendas, climate change remains a problem in search of solutions. This research explores the interface between science, society and the politics of climate change with the aim to better understand and identify opportunities to improve climate policy responses at different scales of governance.

Climate change is a scientifically complex problem that involves broad uncertainty about how physical and natural systems interact over the long-term (Intergovernmental Panel on Climate Change [IPCC] 2001). Despite the complexity of the problem, the scientific community has made an increasingly compelling case that human-induced climate change is a problem for society that requires political attention. On the scientific side, there is broad consensus that man-made greenhouse gas emissions are driving global mean temperature increases, changes in precipitation patterns and sea level rise, and that these climate changes are presenting unprecedented risks to human and natural systems.

The principal causes of climate change are emissions of greenhouse gases (GHG), in particular carbon dioxide (CO_2) but also methane (CH_4) and nitrous oxide (N_2O), from fossil fuel use and unsustainable land use practices (IPCC 2001; IPCC 2007d). Unsustainable trends in each of these areas stem from a vast array of human economic activities – from industrial production to household energy use and urban sprawl, and agriculture and forestry practices. The causes of human-induced climate change, looking across the "sources" of greenhouse gas emissions, are interwoven within the fabric of modern, post-industrial society. Addressing climate change to effectively limit long-term climate change and to adapt to inevitable climate changes implies substantial changes in the way we live and organise economic activity, including urban and rural patterns of development as well as changes in lifestyles and technologies. Solutions that significantly limit climate change in this century and beyond suggest a radical transformation of the economy and to move away from fossil energy and away from entrenched, unsustainable consumption and production patterns worldwide. They also suggest a radical departure from the way that we govern the environment.

This research project explores how climate change policy is developing at sub-national scales and whether this matters to broader climate policy developments. The focus of the research project is sub-national decision making, however I have chosen to use the term "regional" throughout the thesis as shorthand for sub-national or state-level governing processes and activities in the United States of America (US). The research includes an in-depth case study in one state (California) situated in the US. In the California context, the term regional is referring to state government as one form of sub-national authority and as an important centre of environmental policy decision-making. It must be recognised from the outset that California is large in terms of population, economic activity and geographic area. As a result California is in a somewhat unique situation compared to smaller or more local actors. Nevertheless it is interesting as a case study location precisely because it is one type of regional or sub-national, non-state actor. Given its non-state status, what influence might California action have on the politics of global climate change, or on the technical, economic or policy frameworks that emerge to deal with it?

The California case study is designed to explore a range of issues that aim to understand the "how" and the "why" of policy at this sub-national or regional scale. It explores the evidence and argument used in decision-making processes, the interface between expert knowledge, local knowledge and politics, and the role of agency to influence policy decisions at regional scale on climate change. Relevant actors and institutions span businesses, environmental organizations, scientists and other experts, the media and various parts (and levels) of governments. The research sets regional policy in the context of historical developments and experience in areas related to energy and environmental policies, and it relates climate policy developments in California to national and international scale developments and decision-making. The research thus explores the "how" and the "why" of California's leadership position on climate change.

I acknowledge from the outset that this case study has some anomalies that may be unique to the US federal system and the tradition of decentralised decision-making in the US in areas key to climate policy, such as environmental policy. These issues are treated however in the design of the research and become part of the evidence for understanding action at the regional scale in the US, i.e. at the level of state government.

1.1. The problem: understanding local in global-local environmental governance

Despite the urgency accorded to climate change by the large parts of the expert community and internationally, concrete actions are lagging (OECD 2001b). While there is strong consensus amongst experts that human-induced climate change is underway and that, over time, it will present increasingly more serious problems for society (IPCC 2001; IPCC 2007d), there are

competing framings of the problem, what to do about it, how, where and when to act (Grubb and Yamin 2001; IPCC 2001; Lomborg 2001; Miller 2000). National governments are struggling to establish climate change as a policy priority and to reduce greenhouse gas emissions. There appears to be a divide between international agreements and the political call for action at global scale on the one hand, and slow progress in national policy implementation on the other. A recent review of national policies and emission trends demonstrates slow progress across nation-states (UNFCCC 2006) and, in some cases, outright refusal to abide by international agreements (e.g. the United States' and Australia's refusal to ratify the Kyoto Protocol) (Grubb and Yamin 2001; Yamin and Depledge 2004).[1]

The slow progress across industrialised nations raises questions about the validity of the continued emphasis on international scales of governance to address climate change. Much of the policy activity, and the policy-relevant research on the topic, have relied on a top-down model – where international action remains centre stage and guides nation-states to act collectively through an increasingly complex institutional system of coercion and cooperation. This view is captured in literature on global environmental governance and more recently climate change governance, much of which derives from regime theory and international relations literature (Haas *et al.* 1993; Newell 2000; Paterson 2008 in press; Vogler 2003). This literature builds on Krasner's classic definition of a regime: "principles, norms, rules and decision-making procedures around which actors expectations converge"[2] and extends it to understanding about how nation-states structure interactions to define and address global or regional environmental problems in a collaborative manner (Fisher 2004; Paterson 2008 in press).

More recently, social research on international regimes is covering questions of the operation of institutions at different scales or "different levels of social organisation and on examining interactions among distinct or discrete institutional arrangements" (Young 2002):xiv). This brings attention to multilevel governance phenomena (Hooghe and Marks 2003) and particularly to the growing role of non-state actors on global environmental issues (Biermann and Dingwerth 2004; Bulkeley and Betsill 2005; Fairhead and Leach 2003; Vogler 2003). While a relatively mature literature exists on the role of market, expert and civil society actors, as compared to the state or governmental actors (e.g. Gough and Shackley 2001; Hall and Taplin 2006; Newell 2000; Newell

[1] It is important to also note that there are also some encouraging trends in a handful of nation-states indicating that where action is taken early and policies are broad based, emissions can be effectively curbed without handicapping the economy (UNFCCC 2006; UNFCCC 2007b; UNFCCC 2007c).

[2] As cited in Paterson 2008.

2005), relatively less explored in empirical and theoretical terms is how sub-national or regional decision-making works and what influence it may have on global environmental regimes and governance.

An emerging literature points to the potential for bottom-up, local actions and policy processes to influence the pace and direction of global environmental governance, where social learning about global environmental change in practical national and local settings also begin to drive policy reform and change (Betsill and Bulkeley 2004; Bulkeley and Betsill 2005; Cash and Moser 2000; Harris 2001; Social Learning Group 2001). Social learning is defined as experience-based learning in the local context for policy (Hall 1993). In this model, national, sub-national and local action on climate change necessarily leads to a dynamic process of social learning, both drawing on and serving to increase "local" knowledge about the nature of the climate problem and how to deal with it in a variety of different contexts (Jasanoff and Martello 2004b).

This literature suggests a global-local model for climate risk governance and decision-making. It acknowledges the role of international policy in the form of treaties or regimes to set out broad, collectively defined rules and norms to shape a framework for action but it also focuses on how to empower bottom-up action. A bottom-up model brings into focus the political challenge of moving from relatively well-established global framings of problems such as climate change to more salient framings at local scales. It also opens the possibility to explore the insights of critical social theory and the "argumentative turn" in policy analysis (Fischer and Forester 1993; Habermas 1998; Hawkesworth 1988) to highlight the potential for experience, learning and culture at local scales to influence decision-making and eventually, in the aggregate, for local actions to shape the dynamics of national and international policies. In this bottom-up model for decision-making social practices drive change, deriving explanatory power from culture and norms at local scale (Young 2002). Furthermore, it is a model where climate change is at once a global and a local problem (Bulkeley and Betsill 2005; Jasanoff and Martello 2004a) (see also Chapter 2).

1.1.1. Why regional scale?

The research focuses on regional climate policy process, drawing in particular on the case of California. Before going into more detail about how to approach the research, a legitimate question is why regional scale policy processes are worth investigating at all: will regional policy and decision-making make a difference given the global dimensions of the climate change problem? And why focus on regional policy over and above other issues?

Aside from the gap in the social research literature underscored above on the interface between local and global decision-making, regional actors and institutions may be particularly well placed to design and implement cost-effective actions to address climate change. Any political decision to deal with climate change inevitably involves balance and tension amongst a range of choices: the balance of effort "now versus later" and tension between efforts to "mitigate and/or adapt" in any particular nation, region or local setting. Perhaps most importantly, dealing with climate change implies shifting investment patterns and redistributing public and private resources to alter existing patterns of development. Public policy will inevitable play a key role in bringing about such change and in navigating society through the wide range of choices it has to address climate change. Regional processes in particular are well-suited to design policies that are adapted to local conditions and preferences.

Regional policy processes may be uniquely well placed to facilitate decision-making on how to deal with climate change. This is in part because regional policies and institutions determine land use, human settlement patterns and influence transportation planning, which affect both vulnerability and exposure to climate change as well as the level of greenhouse gas emissions to occur from these sources over decades to come (Cash and Moser 2000). Regional policy processes also work more closely with a particular set of constituents and local actors than is possible in national or international process. In turn this means that there is necessarily a narrower set of cultural experiences, values and preferences to be addressed. Thus the potential to gather political support and build constituencies for change to address a global environmental problem might be comparatively greater at regional than at broader scales of governance.

Without more concrete regional understanding and framings of climate change, important mitigation and adaptation decision-making will inevitably be delayed. For example, global framing of science of the climate change problem -- through the use of predictive general circulation models of atmospheric change -- may not provide particularly meaningful information to regional and local decision-makers on important dimensions of the climate problem, such as how to assess local vulnerability and identify adaptation options (see Chapter 2). A different, more localised framing of the climate problem may be an important ingredient to support national, regional and local policymaking. With respect to influence over institutional factors that guide investment and behaviour, regional level governments are also well positioned to influence change and to bring attention to climate change.

Regional decisions are thus critically important to the implementation of mitigation and adaptation strategies to respond to climate change. Yet political decisions at regional scale to deal with climate change will necessarily be "nested" within institutions and policies that deal more

generally with sector or development patterns, or with climate change issues but at larger scales of decision-making (Dietz *et al.* 2003; Hooghe and Marks 2003). Regional governments are certainly not the only important actors as we will see, but they are central to design and implementation of policy decisions and governance process that can bring climate change more fully into public and private sphere decision-making.[3]

1.1.2. Why California?

I have chosen California as the location for a single in-depth case study to explore the question of how important regional climate policy processes may be to broader scale policy efforts to deal with climate change. California is interesting as a case study location because it has a large level of governmental power, albeit under a federal system. It is unlikely that any other state in the United States (or other "regional" government elsewhere in the world) operating on its own would command similar market power (see Chapter 4). However, as California is not a nation-state it is not part of the formal multilateral climate change regime. As a player that stands outside of the multilateral process, it has no formal influence in international policy circles. Nevertheless the large size of California's economy, and its market power linked through trade to the global economy, suggests that it does have the potential to influence the landscape of national and international policy as well as the pace of technological change through increasingly global markets. In the area of air pollution regulations, pollution control and clean vehicle technologies California's leadership influence has already been documented (Vogel 1995). While identifying and taking into account "California differences" is important, the aim of the in-depth case study conducted here is to think more broadly to explore the comparative advantages and disadvantages of working at regional scale to facilitate pro-environmental change compared to national or international platforms for action.

The choice of California as location for this research relates in part to me as the researcher: I am a native Californian (see below). I was born in California and spent the first half of my life there. I still have strong personal and family ties there. I thus had a particular interest to look carefully at how and why climate policy was emerging there.

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[3] I use here Habermasian notion of the public sphere as the area of public life which mediates between and connects the political system to the private sphere on key "public" issues such as the environment. While the private sphere operates largely behind closed doors through face-to-face interactions that are outside of public scrutiny, the public sphere is "a highly complex network that branches out into a multitude of overlapping international, national, regional, local, and subcultural arenas" (Habermas 1998: 373).

1.2. Aim and approach of this research

Broadly this research aims to contribute theoretical and empirical findings on the nature of this global-local model for climate risk governance, looking in particular at the unique set of opportunities and challenges for regional action to advance socio-political change to better protect the global environment. It considers how and why climate change policies are developing at regional scales and whether and how these matter to climate change policy dynamics, politics and governance at national and international scales of decision-making.

This research project explores these issues through a single, in-depth case study: the state of California in the United States. It looks at how different actors and institutions influence the discourse and, in particular, how the policy process interacts with expert and local knowledge to advance decisions.[4] It sets California policy developments in the context of national and international climate policy and considers the linkages between these different scales of policy action. It also explores the unfolding of climate policy in key sectors, in particular the electricity sector and to a lesser extent in the water sector, to consider whether and how issue-linkage shapes policy processes and outcomes. Relevant actors and institutions span businesses, environmental organizations, scientists and other experts, as well as media actors and various parts (and levels) of government. The objective is to better understand the constraints and opportunities of regional climate processes to promote meaningful change across society to address climate change, looking from the "inside out" or through the eyes of those involved in the policy process.

The working hypothesis of the research is that the growing scope and level of policies to deal with climate change at regional levels of governance have potential to exert a "bottom-up" influence on the politics and patterns of governance at national and international scales. The presumption from the start is that international policy will continue to recognize and emphasise sovereignty of nation-states to determine and implement the precise design and mix of policies to stimulate change (Putnam 1988), while the international process continues to guide the direction and the pace of the uptake of such policy action but not the precise form (Gupta 2005; Yamin and Depledge 2004; Young 2002). Serious consideration of social learning with respect to climate change is therefore usefully approached through the study of national, regional and local policy-making processes, where policy decisions concretely aim to influence a broad range of

[4] At the time that I began this research project, there were to my knowledge no academic articles on the origins and drivers of California's climate policy process. However after I interviewed a number of elite actors early in 2006, two different articles have since appeared on some of the questions investigated here (Hanemann 2008; Franco et al. forthcoming 2008).

actors and organisational decisions across civil society, investment and development patterns in a particular place (Social Learning Group 2001).

In particular, the research is designed to explore a hierarchy of research questions, focusing on four themes that concern the influence of regional scale action in climate change, as follows:

1. **What triggers climate policy action at regional scale?**
   - Is the apparent slow regulatory policy response to global climate change a problem of a knowledge gap or of knowledge interpretation or something else?
   - Is policy driven by what we know or how we interpret it and by how we construct arguments for action?
   - To what extent is regional action driven by developments at national or international scale versus more local interests and institutional structures?
2. **What are "winning" arguments driving climate action at regional scale**
   - What is the role of expert information and knowledge (*e.g.* through scientific discovery, or economic analysis)?
   - What role for experiential or local knowledge (*e.g.* through business, regulatory, public opinion and interests)?
   - How do different types of knowledge interact at regional scale to advance salient arguments for policy?
3. **How and why do different policy arguments gain salience? What institutional forms of decision-making facilitate closure and action at regional scale, when science and economic evidence remain ambiguous, and political controversy high?**
   - What is the nature of the interests and the relations between state and non-state actors, experts in governance and decision-making?
   - How does engagement of different types of actors affect their interests and vice versa? How does the policy process affect the pace and the nature of decision-making and outcomes?
   - What governance structure(s) facilitates experimentation, social learning, decision-making?

4. **In what ways do regional actions influence national and international climate policy discourse?**

   - How does experience gained at regional level filter up or over through nested institutions and transnational networks of actors and organisations?
   - What role do increasingly globalised markets for investment, technology and services play in spreading influence of regional action?

Beyond these general research questions, the California case study is used to explore three specific cross-cutting themes that are hypothesised to influence the how and why of policy decision-making on climate change[5]:

- *Regional risk characterisation of climate change and the science-policy interface*: framing or "sensemaking" of climate change in a regional context, including whether and how scientific expert knowledge combines with local knowledge in decision-making on policy;
- *Issue-linkages*: how do climate policies build on, fit or interact with other policy issues at this scale (referred to as issue-linkages);
- *Scale-linkages*: how does governance of climate change at regional scales interact with national and global scale policy developments (referred to as scale-linkages) and with the features of global climate change as an environmental problem?

These themes derive from a growing literature in the social sciences, which provides a backdrop for the research and is briefly reviewed in Chapters 2 and 3. Before moving on to this backdrop for the thesis, it is first useful to highlight the choice of methodology and some more of my own background with respect to how I fit into the research project. In the end the choice of methodology and initial use of it to gather a first round of empirical data, led to a broadening of the conceptual framework for the thesis. Thus it is useful to describe the methodology here, in advance of the conceptual framework and literature review to follow.

[5] These cross-cutting themes are addressed in very general terms in Oran Young's work on the institutional dimensions of environmental change, albeit in some instance with a different set of terms and largely in relationship to international regime theory (see Young 2002).

1.3. Methodology: ethnography of the California expert-policy network

This research is conducted using interpretive social research methods and develops a single, in-depth case study in California. The methods used for the field work are ethno-methodological and thus qualitative and interpretive (Glaser and Strauss 1967; Strauss 1987; Yanow 2000). The choice of methods facilitates an investigation of co-constructed meanings of climate change and climate change policy in California's regional policymaking context (see also Chapter 3).

The focus of the research is on the process, the context and the outcomes of climate policy decision-making, taking into account the knowledge, institutions and actors and the events that influence decisions. Empirical data for the research are gathered principally through interviews with elite participants in the California policy process. Analyses of empirical data from interviews and primary source documents are combined with a review of contextual variables to provide the basis for "thick" description (Thompson 2001). Thick description enhances understanding of the patterns of discourse and decision-making in California as they relate to broader policy developments elsewhere at national and international scale.

Interpretive policy research is grounded in face-to-face contacts and discussions with elite actors. The term elite actors (McDowell 1997) is used here to refer to those who are formally part of the decision-making process either from within or from outside of government. For example, elite actors include researchers, experts or representatives of non-governmental organisations that participate in activities that influence climate policy discourse and outcomes, however the definition excludes the much larger numbers of people who are "affected stakeholders" or consumers of policy decisions.

This type of ethnographic data gathering and research permits the researcher to investigate "what matters" within this exclusive world of elite policy actors and within the context of a particular policy process. It allows the researcher to tell the policy story from the "inside out" – through the eyes of the elite actors engaged in the policy process -- about how and why climate policy is developing at regional scale. Penetrating the network of policy elites is part of this research approach. It is necessary to meet and discuss policy issues on a "one-on-one" basis with individual policy actors. Each individual participant is "reflective" and each individual can provide insights into whether and how decision-making is "reflexive" drawing on the ideas and the experiences of those engaged in the policy process.

The interviews provided a means to gather ethnographic data and these data were used to develop "thick description" of contextual background and experience within the policy process (Denzin 1997; Geertz 1973; Thompson 2001). Thick description as used here is both descriptive and

interpretive as it provides "a means to discover and reveal the depth and meaning that actors inscribe in their language and actions" (Thompson 2001: 64). Thompson (2001) suggests that it can be defined along four axes: i) provides the context of an act; ii) states intentions and meanings that organize the action; iii) traces the evolution of an action; iv) presents the action as a text that can then be interpreted. In this way, thick description is more than just the reporting of facts. Denzin (1989: 83) notes that thick description allows one to hear the "voices, feelings, actions, and meanings of interacting individuals" (as cited by Thompson, 2001). Thus an ethnographer's notes become "thick," not just with description but with interpretation of those descriptions, bringing out "underlying inferences and implication. Analysis becomes the determination of what is important and what is the basis for that importance" (Thompson 2001: 66). Thick description is therefore a way to "add layers of understanding" to triangulate events and their meaning from as many directions as possible (Thompson 2001 citing Dear 1995).

Combining the "thick description" approach outlined above and interpretive analysis of texts from primary source documents and interview transcripts, the research aims to develop "grounded theory" (Glaser and Strauss 1967; Strauss 1987). Interviews were typically audio-recorded and later transcribed to become texts. Grounded theory provides a strategy for interpretive analysis of the textual data and this was used to guide the research from the outset. The notion of grounded theory is that theory can be usefully generated from the analysis of data, as contrasted to its development from logical deduction and a priori reasoning (Glaser and Strauss 1967). Grounded theory is based on comparative analysis and prioritizes a triad of operations aiming first to identify key conceptual categories and then conceptual properties and finally to elaborate theoretical implications through comparison and analysis. The triad includes data collection, coding and memoing or assessment (Glaser and Strauss 1967; Strauss 1987).

The research conclusions aim to extend theoretical insights that focus on the science, policy and global environment interface, focusing on the relationship between expert and local or experiential knowledge, and particularly on the use of argument and persuasion to interpret and to frame scientific and other expert evidence in meaningful ways in regional scale public decision-making.

My insights draw on my own experience as a climate policy expert. Inevitably, I have interpreted what I was told and observed in California within the broader context of my own experience and knowledge of the international policy discourse and decision-making process. As noted above, I am also a native Californian and although I have not lived or worked in California for more than twenty years, my attachment to the "place" known as California dates back to the beginning of the 20th century when my grandmother was born in northern California.

The choice in methodology is thus influenced by my "position" within the broader international network of policy elites. Given this it is clear that I was not setting out to conduct "objective" research, but rather to establish a project where I am both the researcher and an integral part of the policy-relevant research (Denzin 1989; Yanow 2000). Strauss (1987) and McCracken (1988) advise that the researcher should acknowledge and draw upon her "experiential data" or own experience and understandings of issues in conducting qualitative social research. McCracken (1988) refers to this using a metaphor where the researcher is seen as an "instrument" or tool in the research. Yanow (2000: ix) extends this understanding to policy research to outline an interpretive approach that focuses on "values, beliefs and feelings as a set of meanings" and emphasizes the "centrality of human interpretation" in sense-making of policy problems. Such an approach is necessarily subjective since it places the "subject" or actors in the policy process at the centre of the research.

My interest in environmental policy stems from two decades of professional experience on climate change, energy and environmental policy issues. For most of this time, I have worked with an intergovernmental organisation known as the Organisation for Economic Co-operation and Development (OECD) (see Box 1.1). Working first as a policy analyst and later as a manager, I have worked closely with national government representatives and decision-makers as they struggle to address climate change. I am also active as an expert author in the Intergovernmental Panel on Climate Change, where I contributed most recently to the Working Group II and III volumes of the Fourth Assessment Report. I am therefore knowledgeable about the practical aspects of the international politics of climate change and about national and international policy practices. Thus I also have some firsthand experience with the linkages between international policy processes and epistemic networks in the area of climate change.

Box 1.1: Organisation for Economic Co-operation and Development

The OECD is an inter-governmental forum for dialogue and policy assessment. The OECD does not make policy decisions but it facilitates international consensus on a range of policy issues, facilitates frank exchanges and promotes understanding of "good practice" among Member countries. It is a knowledge-based organisation, based on discursive practice, albeit one that is largely confined to OECD government representatives.

The OECD conducts applied policy research and sometimes acts as a mediator between experts and policymakers, thus to some extent playing the role of a "boundary" organisation (Eden 2005; Gieryn 1983a; Jasanoff 1990). Typically a boundary organisation or function refers to a science-policy interface however in this case I refer more generally to an expert-policy interface where the principal area of expertise of concern to the OECD is that of economics. When the process works well, analytical reports are grounded in real-world challenges and policy experience within OECD Member countries. When it works poorly, analytical reports may never be formally published or released, or they may be diluted of politically controversial findings. Even when the process "fails" there is often an appreciable amount of progress in establishing common framings for issues and understanding of different points of view, constraints and perspectives amongst Member countries.

Reflecting the norms and preferences of its Member countries, the dominant paradigm in the OECD is welfare economics. Governments look to the OECD to promote national and international environmental protection through principles of environmental economics and open market systems (Hajer 1995). That is, firstly, to identify and establish a "value" for the environment and, secondly, to use market instruments and incentives to incorporate environmental values into market systems. Indeed, ecological modernisation as a social theory (see Chapter 3) fits neatly into this paradigm and reinforces linear or techno-rational models of policymaking (Hajer 1995). In the OECD, ecological modernisation is not a "theory" - something to be tested and explored - rather it is a starting point for discussions.

This research project has provided a vehicle to expand my understanding about policy practice, to connect my experience to a broader foundation of conceptual and empirical findings available in academic social research. The research differs from my professional experience and writings to date in two fundamental ways: first it is grounded in conceptual understanding of political and social theory on the environment; second it is regional or place-based in its focus and thus only indirectly related to the international and national policy processes with which I am more familiar.

1.3.1. Why this approach?

A central theme of investigation is the context for decision-making on global environmental change. The importance of context in policy analysis was recognised by the founder of the policy movement Lasswell (1971). Lasswell outlines the policy process in seven phases, the first of which is "intelligence" or problem recognition. In an argument for an alternative, non-linear model of policy-making and analyses, Kingdon (1984) also identifies three major process streams for policymaking: i) problem recognition and agenda setting; ii) formation and refining of policy proposals; iii) politics (see also Chapter 3). Agenda-setting refers to why a particular problem is

added to the agenda or not. Kingdon (1984) highlights problem definition and participants as well as politics in the policy process as the most significant determinants of "agenda-setting." Thompson (2001) notes that the intelligence phase, or what Kingdon refers to as problem recognition and agenda setting, may be the one phase where thick description can be most helpful to policy analysis. This is especially important to the issue of framing or alternative ways of understanding and presenting the policy issues, both the problems and solutions that derive from climate change.

The use of thick description can help to identify how the policy agenda is shaped through problem definition, who is influencing the policy agenda and why. This approach includes looking at conceptual and methodological assumptions used to describe the problem, including evidence and development of arguments as well as the identification of policy alternatives. If, in the past, policy analysis was intended to avoid the 'problem' of politics, the new approach to policy analysis advanced by Hawkesworth (1988), Dryzek (1990) and DeLeon (1997) and others confronts it but requires a methodology in which underlying meanings, that is, politics, are laid bare. Understanding meanings requires context; thick description provides that context (Thompson, 2001:70).

Potential drawbacks of thick description and the use of grounded theory in policy analysis include problems of the validity of the claims after data are gathered (Glaser and Strauss 1967; McCracken 1988; Thompson 2001). Relevance is a test of validity and can only be known after analysis is completed depending on whether conclusions and recommendations from the analysis are adopted (Thompson, 2001: 74), i.e. on whether policymakers find the analysis useful. Another problem is subjectivity – but Yanow (2000), Thompson (2001) and McCracken (1988) reject this criticism, as there are multiple ways of seeing, depending upon the standpoint of the observer, and from this perspective all research could be said to be subjective. What one person may see another will miss (Denzin 1997; McCracken 1988; Thompson 2001). Another drawback is that thick description and grounded theory strategies are time-consuming activity (Glaser and Strauss 1967; Strauss 1987; Thompson 2001). Overall Yanow (2000) argues that the subjectivity of interpretive research is its strength and that the approach is equally as systematic, rigorous and methodical as are alternative approaches.

1.3.2. How did I use the approach?

The research is developed through a single in-depth case study to explore the development of regional climate policy. The case study of California is constructed through the collection and

analysis of ethnographic data. These data were collected largely through long, semi-structured interviews with a large number of elite policy actors.

In total, I interviewed fifty-three individuals over the year of 2006 (see Table 1.1; and Appendix for more detail). The year of 2006 was important for two reasons. First, the state government, under Schwarzenegger's Executive Order of 2005, took a careful look at alternative emission reduction strategies to mitigate greenhouse gas emissions, in an effort to come up with a concrete plan of action to meet to Governor's short and medium term emission reduction goals. Second, and perhaps more importantly, several major new pieces of climate change legislation were debated and ultimately approved in the September 2006 session of the legislature (see Chapter 4). Thus it was an exciting time period for the research, as it was a period of great movement on the policy front. It is important to remember that all of the interviews were conducted prior to conclusion of the September 2006 legislative session, thus there was still great uncertainty about the timing and the shape of the emerging policy framework for climate change. Nevertheless, most of those interviewed held the view that climate change was a priority for the California policy agenda and was there to stay for the foreseeable future.

With few exceptions, the selection of interviewees was limited to include only "elite actors" in the climate policy process in California (referred to also as the "policy elite"). I chose to focus on policy elites to attempt to better understand the decisions on climate policy from the perspective of those directly engaged in the policy process. This approach has been demonstrated elsewhere as a valid approach to interpretive policy analysis and research (McDowell 1997). Interviewees were selected to include a range of different types of actors, political interests and persuasions, and disciplines. The interviews covered people who were both "governmental" and "non-governmental actors," including those from within the government and those external to it. Within these two broad categories, I attempted to include individuals that would represent a wide range of different interests (see Appendix).

The choice of interviewees was a multi-step procedure. First, an initial list of interviewees was developed based on a quick review of the grey literature,[6] media and website information on recent climate policy developments in California over the course of 2005. Second, I complemented this with numerous conversations with expert colleagues and friends working in the field in California. Some of these people are international experts, however, I also contacted a number of local experts on related policy issues (e.g. energy efficiency). I also used the snowballing approach asking initial interviewees about who would be important to include in the research. In the process of covering the question of: "Who was influencing the debate and the outcomes in the emerging climate policy process?" This was particularly important in the first round of interviews to identify further interviewees. As outlined below the first round of interviews was conducted in January 2006 and a second round of interviews was conducted in May to June 2006.

Table 1.1: Interviews and interview data characteristics

Type of actor	
NGO-Business sector	10*
NGO-Environmental Advocacy	8
Experts – Academia or Other	11*
Media	1
City government	1
State government	14
State legislative, Governor's office or political appointee (i.e. Commissioner)	5
Total	50
Timing and Interview Protocols	
January 06 – Protocol I	15
May-June 06 – Protocol II	35
Type of interview	
Face-to-face	43
Telephone	7

* Three interviews were conducted informally to provide background information; two of these were with NGO-business people and another was with an Expert. Only 4 of the 50 formal interviews were not digitally recorded; instead these were recorded through hand-written notes.

Of the total of 53 interviews, 50 interviews followed the long, semi-structured interview format, and were recorded for later analysis (See Table 1.1).[7] The remaining three interviews were essentially unrecorded or off the record entirely, providing only background information for the research; as they were not recorded, they were not formally analysed for the research. The principal recording

[6] Grey literature is a term referring to analytical reports that are targeting the policy audience, designed to influence the policy elite that were the core participants in this research. An example of grey literature is: (Milford *et al.* 2005).

[7] Three other interviews were informal (no formal record was made), however they provided useful background information.

method used was audio-recording; however four of the interviews were recorded through hand-written notes. The large majority of the interviews were conducted "face-to-face" or in person (43), with several others (7) conducted, in the same long interview format, but over the telephone. I also engaged some interviewees in follow up discussions over the period 2006-07 by telephone or occasionally in person, however most often through written exchanges. Also each interviewee whose words are cited in the thesis was given the opportunity to review the extracts of the transcripts that are used here, and to correct them if necessary. They were also given the opportunity to request that transcript material not be attributed to them directly. In all instances this interaction was fruitful, leading to small, often editorial changes in the material used to construct arguments in the thesis.

The protocols supporting the semi-structured interviews evolved over the course of the project with two main protocols being used across the fifty different formal interviews. The protocols and background documentation for the research were provided to interviewees in advance of the interviews (see Appendix 1).

There were two distinct phases of interview data collection. First I conducted an initial or "pilot" round of interviews in January 2006 using an initial pilot protocol (see Appendix). This first stage of the data collection included little less than 30% of the total number of people interviewed. Interview questions were designed to focus directly on some of the research questions identified during the conceptual literature review (see Chapters 2 and 3). For example, the questions covered: what types of knowledge, and which actors and networks were most influencing the policy process and its outcomes? After working with this protocol in the course of these interviews, I learned that interviewees found the questions to be too abstract and they struggled to respond to them. Working as they were in the day-to-day policy process, the interviewees were inclined to want to talk about what the important issues were and how they were being addressed, rather than to think through and discuss why and how these issues had moved onto their policy agenda.

Second, and as a result of these first interview experiences, I again reviewed relevant conceptual literature (Chapter 3), this time with a particular focus on policy sciences and policy research (Herrick 2004; Kingdon 1984; Majone 1984; Majone 1989; Schön and Rein 1994; Grindle and Thomas 1991). This literature is often combined with case study material, thus providing practical suggestions about how to approach the same types of questions (e.g. insights into what types of knowledge and which actors were influencing the process) from the pragmatic perspective of an actor engaged in this process. In particular, I found that Kingdon (1984) in his classic policy research project in the United States obtained insights into many of these questions

with a much simpler interview protocol. I therefore revised the interview protocol to be based partly on the model that Kingdon had developed for his research.

The second and final interview protocol (see Appendix) was therefore designed to focus more on questions about what participants perceived to be the main policy issues and on how the issues were being framed by policy elites. I asked interviewees to tell me what they saw as the main challenges for climate policy and the policy solutions (i.e. what is the problem that you are trying to address? What are the main solutions, and why?). In this way I was able to learn what the policy actors saw as the main issues, and what evidence was influential in the debate about policy solutions. Following Malone (1989), Schön and Rein (1994) and Herrick (2004), I became interested in how the debate was being shaped not only by scientific and expert knowledge but also by active framing of this knowledge through argument and choice of evidence. This argumentative policy process appeared to be driven by different types of actors and by different types of knowledge – not solely expert knowledge. The ideas and arguments that were circulating were not originating solely from within the policy process per se, but sometimes on the peripheries through the non-governmental actors or institutions working in parallel with the formal policy process.

The second protocol was therefore designed to relate to the policy practitioners' day-to-day challenges of decision-making. Rather than asking them to think about my research agenda directly, the broad questions underlying my research were left to the background. This second protocol worked successfully as a vehicle to get the interviewees talking about how climate change policy was developing in the State of California. It was easily accessible to interviewees and provided a platform for them to talk about climate change as a policy issue in California, why both the decision-makers and the public cared about it, and what the main lines of evidence were in the policy debate.

Texts from the interviews became the basis of the interpretive analysis, which followed the interviews, in a search for recurring themes and perceptions among different actors. "Factual" references from the interview transcripts were also verified through both primary and secondary source documents, for example, with respect to the links between current climate policy decisions and past action in the areas of energy and environment or air pollution. Key interpretive themes were identified from interview data and coupled with concepts in the theoretical literature and further confirmed (or rejected) for further assessment through the analysis of primary and secondary source documents.

Importantly, it was during this interview process that I discovered a number of "new" theoretical issues. In particular, a clear underlying theme emerged from the interview data about the strong connection of climate change policy to "experiential" or "local knowledge" about other environmental and energy issues across the state. Although I had understood that this past "institutional" experience was important right from the start, I had underestimated the role that it would play in the stories that people told, and in terms of the understanding and the evidence that this experience provided for doing something about climate change. As a result of this emergent conceptual theme, I added a new dimension to the thesis on the role of local knowledge, referred to here as "experiential knowledge", in the policy process.

The interview data and supplementary documents were analysed using a framework that derived from both the conceptual literature (Herrick 2004; Kingdon 1984; Majone 1984; Majone 1989; Schön and Rein 1994) and the interviews themselves. From the interaction of the conceptual literature and the interview data, I identified four different drivers of change that could be used to structure analysis and provide insights to answer the main questions of the research (see above). In particular four different themes emerged as the basis for an analytical framework to guide the research: i) "framings" for climate policy problems and solutions; ii) different types of evidence used to support these framings; iii) key events, turning points or windows of opportunity for action; iv) social interactions in the policy process including: who the key actors are and how they interact with each other.[8] These driving factors provided a framework for analysis of the interview data and also guided analysis of primary and secondary source documents. This analytical framework is further elaborated in Chapter 3.

Beyond interview data, the research included the collection and analysis of numerous primary source documents. This included review of written and audio records of workshops and other public meetings supporting the California policy process. Records of public meetings and workshops on climate change in California go back to 1990, however policy in related areas moved forward much earlier. Public media, both newspaper and magazine reporting as well as local radio broadcasts were also surveyed to provide another source of information on how climate policy in California was developing, focusing particularly on the period 2004-2006, but also continuing to the completion of the core thesis writing (to the end of 2007).

The research also builds on secondary sources including general academic and state institutional literature on climate policy and other related policy processes in California as well as "grey

[8] This became a part of the analytical framework for the research; see Chapter 3.

literature" on these topics. The latter are reports and papers publicly available, for example on the internet or on request in paper form, but they are not formally published or to be found in the peer-reviewed literature. Such literature provides prime examples of how different types of knowledge are being used to provide evidence and construct argument to support climate policy decisions.

Experience in air pollution policy and energy and environmental policy was identified early on in the interview process as central to the climate policy debate and to pro-policy arguments. Two institutional histories exist on air pollution policy (CARB 2006; SCAQMD 1997) and a number of other legal reviews (Carlson 2003; Revesz 2001) proved to be valuable as a means of cross-checking interviewee statements about past events or roles of people or legislative developments. However, on the issue of energy efficiency in the power sector in California there does not seem to be a comprehensive institutional history available, however there are some partial sources which proved helpful (e.g. Rosenfeld 1999). A small academic literature also documents and analyses the history of California's leadership in environmental policy (e.g. Bernstein et al. 2000; Carlson 2003; Kamins 2006; Roe 1984; Vogel *et al.* 2006). This information is more synthetic and easier to work with than primary sources and offers different storylines and perspectives on some of the issues related to climate change policy treated here (e.g. on the role of federalism in environmental policy). The research therefore drew upon secondary source material as one input to support the analysis. Where information was not available from secondary sources, I referred back to primary source documents (e.g. the texts of laws or of the regulatory decisions themselves) to gather information and crosscheck interview transcript data on factual events and institutional developments.

1.4. Roadmap for the thesis

In summary, the research investigates regional climate policy processes from the "inside out" attempting to understand the meaning of the climate change problem and the emerging policy responses through the eyes of those shaping the policy. What framings of the climate problem were dominant and why? How and who were shaping arguments for action? What influence and interaction occurred with national and international policy processes and decision-making? Emerging from the iterative nature of grounded theory development, several key questions and ideas about how to approach the research arose in the course of the field work in California. Importantly this included how the policy processes use local or experiential knowledge to complement or in place of scientific and expert knowledge to construct arguments for policy?

The roadmap for the thesis is as follows. Chapter 2 contains a focused literature review on the nature of the problem of global climate change and of the policy challenge. This includes a brief review of how the environmental risk dimension of global climate change is being treated at different scales of public decision-making. Chapter 3 provides a conceptual backdrop for the research, which is used to anchor the project in social research on the relationship between society, science and global environmental decision-making. The literature reviews contained in Chapters 2 and 3 provide the conceptual framework and the basis for the main research questions outlined above.

Chapters 4 to 8 contain the core of the case study and its findings based on primary data collection and analysis. Chapter 4 sets out the geographic, economic and social context for decision-making in California and the 2006 emergent framework for climate policy. Chapter 5 traces a number of key early developments in the long history of environmental and energy policy in California. Chapter 6 highlights how the policy process on climate change is unfolding, beginning with early legislation to "study" the problem following through to early policy developments that are extensions of air pollution and energy policy. It provides an overview of the more focused climate relevant policy actions in recent years. Combined, both Chapters 5 and 6 point to significant experiential or local knowledge in air pollution control and energy efficiency policy arenas as key sources of knowledge, evidence and argument and thus as a driver of change in the climate policy arena. Chapters 7 and 8 shift the focus of the analysis to the structure of arguments and evidence found in the California policy discourse. Chapter 7 sketches the emergence of the framing of climate change as a problem issue of environmental risk pointing to the use of regional impact science assessment in the regional policy process. And Chapter 8 sketches the framing of regional policy solutions as win-win for both the local economy and the environment. Chapters 4 to 7 broadly combine to examine the interaction between expert and local knowledge, both used as evidence to shape pro-environmental policy arguments and to influence the active framing of climate change issues in the policy debate.

The last two chapters conclude with Chapter 9 looking across the empirical evidence to highlight issues of scale and agency as drivers of change in the context of multilevel governance. Chapter 9 explores the back and forth between state and federal authority in key areas related to climate change and underscores the role of non-governmental actors and networks in state decision-making as well as institutional and individual leadership in California. Chapter 10 concludes by relating the findings of the research to the conceptual literature and responds to the main questions set out at the outset of the research. This concluding chapter generalises the lessons learnt for multilevel governance and adds insights into more general theoretical understanding of how

global change decision-making connects to sub-national or regional communities of people and, more broadly how this reflects on our understanding of relationships between science, society and nature.

2. GLOBAL CLIMATE CHANGE PROBLEM AND THE POLICY CHALLENGE

2.1. Introduction

The scientific study of climate change has evolved over the last century or more. Only in the late 1960s did climate change become a focused area of research (Corfee-Morlot *et al.* 2007; Hart and Victor 1993; Maslin 2004). Much of the scientific research on climate change centres on two main challenges: detection of past climate change that can be attributed to human causes; and prediction of climate change associated with alternative socio-economic development pathways in the coming century or beyond. However given long-time spans and complex system characteristics of climate change, scientific observations and predictions are associated with a certain amount of ambiguity and broad uncertainty. The science is thus difficult for the non-specialist or expert audience to access, interpret and use to guide decision-making. In an effort to make the growing body of scientific research more "useable" for policy decision-making, the World Meteorological Organization and the United Nations Environment Program established the Intergovernmental Panel on Climate Change in 1988 and tasked it to provide a periodic review and assessment of the science of climate change (Agrawala 1999a; Hecht and Tirpak 1995).

The 2007 IPCC assessment concludes that observed climate changes showed an increase of 0.74 degrees Celsius (^{o}C) for global mean temperature above pre-industrial levels (1906-2005) (IPCC 2007a; IPCC 2007d). Consistent with the previous assessments (IPCC 2001, p.5), the 2007 assessment notes that most of the rise in global mean temperatures over the last fifty years can be attributed to human activities and highlights a range of other 20th century changes in natural and human systems that are thought to be early signs of a warming world, from rising sea levels with impacts on coastal settlements and ecosystems to retreating glaciers with impacts on water supply and quality as well as mountain habitats (IPCC 2007d).

Global climate models predict a wide range of possible climate changes, which can be related to different visions of the future as well as scientific understanding of atmospheric-oceanic interactions. A few robust conclusions can be drawn when looking across what is now hundreds of model runs in the literature. A doubling of atmospheric concentrations of CO_2 compared to

pre-industrial levels will increase equilibrium (long-term) global mean temperatures from 2.0 to 4.5 ^{o} Celsius (IPCC 2007a). If left unchecked, current rates of growth in GHG emissions lead to such a doubling in atmospheric concentrations by the middle of this century with significant risks of serious impacts (IPCC 2007b). Current baseline, or "no policy" reference scenarios suggest that global mean temperature change could reach 6^{o} C by the end of the century (IPCC 2007d). The IPCC assessment shows that it is possible to significantly curb the pace and the extent of global climate change this century and beyond through aggressive mitigation efforts that begin early to reduce greenhouse gas emissions. Such mitigation efforts can only be possible if policies establish incentives to trigger social, behavioural and technical changes to curb global GHG emissions growth in the near term, eventually reducing global emissions significantly below current levels (IPCC 2007c). For example, the IPCC outlines that limiting the extent of global warming to the range of 2.4-2.8^{o} Celsius (best estimate) above pre-industrial levels in the very long term would require global emissions of CO_2 to peak by 2020, if not before, and to fall -30 to -60% below 2000 emission levels by 2050 (Fisher *et al.* 2007).

2.2. Unique-features of climate change as a policy problem

Previous reviews of the politics of climate change have identified a number of unique features of the problem that complicate political decision-making (Newell 2000). Four are highlighted here and used to structure the discussion that follows. First, climate change is a global problem that requires significant cooperation amongst diverse (nation-state) actors with vastly different geo-political interests (Newell 2000). It is widely recognised that the challenge of establishing agreement amongst diverse nation-states inevitably complicates and slows international decision-making (Fisher 2004). Second, the inter-linkage of climate change to a wide range of other policy issues makes it difficult to govern, to coordinate across different interest groups or governmental agencies and to speak with "one voice". In this sense, climate change can be fitted into a number of other on-going policy agendas, from energy policy and urban planning to agriculture, forestry and land-use management policies.[9] Third, climate change is most often seen as a distant and abstract problem (Leiserowitz 2005). It has uncertain physical and socio-economic impacts, which are expected to be lagged in time and space compared to causes of impacts. The ambiguity of the meaning of climate change in local contexts makes it difficult to prioritise policy action and incites delay (see Box 2.1). Finally, political understanding and responses to climate change, as with other problems of global change, depend upon scientific

[9] In this study, I refer to this challenge as one of "cross-issue linkages."

advice to interpret complex science and to frame inevitable uncertainty in a meaningful way for policymakers (Beck 1992a; Giddens 1990; Miller and Edwards 2001b). This science-policy interface is a fourth key feature of the problem. Literature on each of these issues is briefly reviewed here to set the scene for this research.

2.2.1. Climate change as a problem of global cooperation

In recognition of the need for global collaboration to address the problem of climate change, more than 150 nations signed the UN Framework Convention on Climate Change into international law in 1992 (UNFCCC 1992). The Convention establishes an international framework for collaborative action to limit human-induced climate change as well as to adapt to inevitable climate changes. The objective of the Convention is:

> "*to achieve … stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. 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).

In addition, the Convention calls for "precautionary, cost-effective and equitable measures to address climate change" (Article 3.3). It also works off of the principle of common but differentiated capacities and responsibilities to act across world regions, with the most developed nations of the world agreeing to lead mitigation efforts worldwide (UNFCCC, 1992). The Convention has been ratified by more than 180 nations to date, including all major developed and developing countries of the world.

The Kyoto Protocol was signed in 1997 yet only entered in to force in 2004 when the fifty-fifth nation to ratify it, Russia, took action (Yamin and Depledge 2004).[10] The Protocol sets out ambitious emission targets for all "industrialised" nations of the world in the 2008-2012 timeframe and establishes the broad framework for the use of a variety of international market mechanisms -- international emission trading, joint implementation and the clean development mechanism -- for countries to work together to reach these targets (UNFCCC 1998). These

[10] Entry into force of the Kyoto Protocol was contingent upon fifty-five nations representing fifty percent of global emissions of GHG or more to ratify the agreement.

market mechanisms are designed to deliver least-costs emission reductions Other key features of the Protocol are also found in the Convention, notably, all countries agree to take action to mitigate and adapt to climate change however industrialised countries agree to provide financial support, technology transfer and capacity building to support developing countries in these efforts.

The Kyoto Protocol represents the first major international effort for countries to work together to curb GHG emissions to bring climate change under control. It followed nearly a decade of work led by the Intergovernmental Panel on Climate Change, which in 1996 presented an increasingly convincing and consensual case from the scientific community that human activity was making a "discernable" difference to the climate and raising global temperatures (IPCC 1996; Grubb et al. 1999; Corfee-Morlot et al. 2007). The inclusion of the Kyoto mechanisms built upon experience, particularly in the US, with the use of emission trading to achieve ambitious regulatory targets by creating a permit market and allowing flexibility about where emission reductions occurred (OECD 1992).

The Convention also recognizes the need for adaptation (Najam *et al.* 2003; Yamin *et al.* 2005; Yamin and Depledge 2004). Adaptation is expected to rise in prominence in policy strategies in part out of necessity. Even if aggressive mitigation policy moves forward, mitigation strategies require time to have an effect and thus some amount of climate change in the near-term is inevitable. Unavoidable climate changes that extend beyond the range of natural variability are expected to occur through the middle of the 21st century and possibly beyond (Corfee-Morlot *et al.* 2005; IPCC 2001; IPCC 2007b). This leads to a need to plan adaptations that will limit vulnerability to climate change by addressing the worst of near-term, unavoidable climate impacts (Agrawala 2005; Yamin *et al.* 2006).

While the international regime establishes the broad objectives for collective international action, only sovereign nation-states can negotiate climate policies to curb emissions and limit or avoid impacts. This makes the international regime an extremely slow and blunt instrument to address the nuances of climate change, especially as it plays out at more local scales. Increasingly it is recognized that sub-national, or local governments and communities have a role to play to govern climate change from the bottom-up, along with a range of non-state actors, such as business and environmental organizations (Bulkeley and Betsill 2005; Newell 2000). At a more theoretical level, Putnam (1988) points to the two-level game dimensions of any international negotiation, where diplomacy and domestic politics are inevitably linked and being played out simultaneously across both international and domestic levels, each influencing the other. Fisher (2004) points to the dynamics of national-international policy dynamics as well as to how national governments

relate to different types of actors and institutions in the policy process as a determinant of national policy positions in the international negotiations on climate change. However so far this literature has ignored the influence of sub-national action on either national or international policy developments.

2.2.2. Inter-linkages to other policy issues

Another important set of questions for governance has to do with cross-issue linkage where climate change is connected to other policy issues that may be better established on the political agenda. Many sectors are relevant, ranging from energy to water and agriculture. Lindseth (2004) suggests that cross-issue linkage may be especially important at national, sub-national and local scales of governance especially since there is no clear link between emissions at this scale and climate impacts. Connecting climate change to sector themes is important as it may serve to open long-standing coalitions of actors and unlock power for change to deal with global environmental change across conventional boundaries (e.g. across spatial scales of governance).

A key question is whether and how global environmental problems are being effectively integrated into national or sub-national institutions that are designed to address other, long-standing, and perhaps more widely accepted, policy issues (Warrick and Riebsame 1983; Young 2002). Better integration of global environmental concerns into mainstream policies in other (non-climate) areas may offer a range of opportunities to improve the effectiveness of efforts to protect the climate by building this concern into issues that are higher priorities and thus receiving greater attention from governments than climate change ever will (Agrawala 2004; Beg *et al.* 2002; Heller and Shukla 2003). Efficiencies in carrying out necessary functions may also be possible, for example, policy design and implementation or even monitoring, might be at least partially carried out through pre-existing institutions designed to deal with sector issues rather than global environmental change per se. Issue linkage is one means to extend networks for action at national or local scale to bring meaning to global issues, however it necessarily complicates action and may slow it as it requires consultation and coordination across many different institutions and actors with different and sometimes conflicting policy agendas.

On issue-linkage there is less focus in academic social research[11] but a great deal of information exists in the "grey" literature that circulates amongst policy practitioners (OECD 1999; UNFCCC 2006). Some researchers have criticised the policy communities growing up around climate

[11] One exception is Young, 2002, who addresses issue linkage in the context of institutional dimensions of environmental governance.

change as defining the policy problem narrowly either as an energy problem (Lindseth 2004) or an emissions problem (Gupta 2005), thus avoiding more difficult dimensions of the problem (e.g. social justice, or long-term risk aspects). Yet the linkage to sector or resource management policies is inevitable, as the champions of climate policy do not have the choice of starting from scratch and inevitably must layer climate objectives into pre-existing policy frameworks in related areas. For this reason, climate policy processes at national levels, are often organised around sector themes focusing to a great extent on mitigation (OECD 1999). Some of the most common targets of early climate mitigation policy therefore are found in the areas of energy efficiency (appliances and buildings), waste management, urban traffic and/or land use policy, where there are large co-benefits for climate policy reforms (OECD 1999; UNFCCC 2007b; UNFCCC 2007c). More difficult challenges lie in formulating climate-specific policies to achieve deeper emission reductions. Climate-specific policies have only recently emerged to be significant forces of change, for example in the form of greenhouse gas emission trading in Europe which has targeted large stationary sources in the power generation and industry sectors (UNFCCC 2006; UNFCCC 2007d; UNFCCC 2007e). Although adaptation is also an essential part of national climate policy, it has only recently begun to receive attention even in the most developed nations where resources are greatest (UNFCCC 2006). Lessons from the "bottom-up" on how adaptation and mitigation can be integrated into mainstream sector policies and how far this might take cities, sub-national governments or nations towards achieving ambitious climate objectives – whether mitigation or adaptation responses -- may eventually provide useful policy insights for broader scale policy efforts.[12]

2.2.3. Global-local understanding and decision-making

As a political issue at national and sub-national scales, human-induced climate change presents major challenges to decision-makers. Science and politics clearly intertwine in the policy discourse (Miller and Edwards 2001b), with interactions becoming even more prominent at more local scales (Cash and Moser 2000). Contested and complex scientific knowledge is another central feature of the policy debate on climate change, notably in the United States (Crowley 2005), yet scientific arguments also establish a foundation upon which policymakers build the case for climate change as a problem that requires political action (e.g. see Box 2.1).

[12] At the international scale, mainstreaming or the integration of climate and other sector policies has received some attention especially in recent years (see Agrawala et al 2005; also Heller and Shukla 2003). It is also formally part of the Climate Convention (see Article 4.1.f which requires Parties to take climate change into account in non-climate policies).

Box 2.1: Reasons for Concern About Climate Change

In an effort to lay out scientific evidence as it relates to the ambitious objective as found in Article 2 of the UN Convention, the IPCC (2001) identified five "reasons for concern" about predicted climate change in the coming century. This framing of the problem was recently reaffirmed in the IPCC's 2007 assessment (IPCC 2007d). These reasons include uneven distribution of impacts across regions and peoples, shifts in extreme weather events and irreversible changes to unique and threatened systems, such as coral reefs (IPCC 2001, p.11). In the face of various sources of uncertainty, it is clear that the stakes for society of inaction are also high. Inaction could lead to serious negative and irreversible consequences for society over the long-term (IPCC 2007c; IPCC 2007d; Schneider and Lane 2006).

This characterisation of reasons for concern highlights distributional or social justice issues as central to the climate change problem. Historical emissions that cause climate change have largely originated in industrialised countries, yet vulnerability to climate change may be highest amongst developing countries (IPCC 2001; Tol *et al.* 2004). Thus there is a fundamental asymmetry between the causes and the effects of climate change. At least on the surface it appears the largest of the direct benefits of mitigation policy action, in the form of avoided climate change impacts, will not necessarily accrue to locations that spend the most to abate emissions (Corfee-Morlot and Agrawala, 2004).

Yet a number of new developments in understanding about climate change and its impacts could also shift this conclusion to show significant vulnerability to climate change also in developed countries. One example is greater attention to extreme events, rather than mean climate change into integrated assessment of climate change and policy analysis. Extreme events include heat waves, droughts, floods, fires and storms. Increasingly a link has been made between the intensity of hurricanes and climate change (Emanuel 2005) (IPCC 2007a) through rising surface temperatures in the ocean. Hurricane Katrina and its devastating impact in New Orleans demonstrated the vulnerability of even wealthy nations to extreme events, where the poor are more exposed and more vulnerable (Mathew 2007). All types of countries, rich and poor, are vulnerable to extreme events (IPCC 2007b).

Another example is that of potentially catastrophic events, such as the melting of the Greenland Ice Sheet or the West Antarctic Ice Sheets. This could alter the pace and the magnitude of global sea-level rise and a large share of the world's population on or near the coast.[13] Considering these risks in integrated assessments implies higher global benefits of earlier and stronger mitigation, or alternatively radical adaptation strategies (Nicholls *et al.* 2008).

While scientific evidence outlines the principal features of climate change, its possible impacts or reasons for concern, and its causes, technical and economic analyses suggest the main lines of required responses to effectively mitigate or adapt to climate change (e.g. see IPCC 2007d). Increasingly these expert assessments point to the urgent need for policy intervention to mobilise large scale shifts in investment and development patterns to limit the risks of climate change, through both preventive mitigative action and through adaptation to limit the vulnerability of society to inevitable climate changes (IPCC 2007b; IPCC 2007c).

Despite some convergence around the global science and dimensions of the policy challenge, at the local scale, predictions of the impacts of climate change remain uncertain and action to

[13] NOAA estimates that 53% of United States' population coastal regions (Crosset et al. 2004).

address it is fragmented. Climate change impacts are a key issue for policymakers faced with the challenge of communicating climate change to their constituency, of relating it to the daily lives of people, either today or in the future. Choices between the building of higher and stronger dikes or not, or investing in cleaner energy sources, or not, are as much social choices as they are economic or technical ones. Communication about what climate change is, and why it is significant enough to warrant political attention, is a first step to facilitating action. Some research suggests that establishing an understanding of climate change risk at local scale is potentially empowering and thus may be a central task of the policy process as it provides a means for "localizing" climate change and for dealing with scientific uncertainty to establish a rationale for policy action (Brunner 1996; Harris 2001).

A literature on multilevel governance provides a useful framework for understanding how nested institutions and decision-making may operate across different tiers of government (from local to international); parallel decision-making and authority may be exercised through issue-based institutions to manage where necessary across the typical tiers of governmental authority (e.g. water or air basin management) (Hooghe and Marks 2003; Foster 1997). A key driver is the embedded nature of decision-making authority, most typically anchored in higher tiers of governmental authority (Gray 1997; Hooghe and Marks 2003).

Multilevel governance is seen by a growing number of analysts as central to advancing policy responses to global environmental change, since both the impacts and solutions to such problems are local in nature (Bulkeley and Betsill 2005; Dietz *et al.* 2003; Fairhead and Leach 2003; Jasanoff and Martello 2004a; Young 2002). Stronger understanding and capacity to address climate change at the local scale, when combined with the broader institutional forces that operate nationally or internationally, may provide a means for local-scale social learning and breakthroughs to address difficult issues that may be deadlocked in larger scale contexts. These global-local connections may be a key to moving climate action forward – indeed a key to altering public perception of climate change from that of an "abstract and distant" problem (Leiserowitz 2005) to a problem that is at once global and local.

2.2.4 Climate change as a risk governance problem: the science-policy interface

A large social sciences literature suggests that dealing with climate change, as with other global environmental change issues, represents a trans-science challenge, where knowledge must be co-constructed in the public sphere (Weinberg 1972). Global environmental change encompasses a complex array of interactions between a large number of human and natural systems across vast spatial and temporal scales, which in turn challenges scientific assessments and policy efforts that

aim to identify and manage these changes (Rayner and Malone 1998; Schellnhuber *et al.* 2004). Despite growing recognition and understanding of global environmental change, the nature of such change is necessarily uncertain especially with respect to the future, hence the broad use of the terms risk and risk governance (De Marchi 2003; Renn 2001).

Science is central to understanding global environmental problems and to climate policy decisions yet it is also complex, uncertain and ambiguous, and thus contested. When a policy challenge combines broad uncertainty with potentially high decision-stakes for society as a whole, political legitimacy requires special attention to how decisions are made (Funtowicz and Ravetz 1993; Jasanoff 1990; Ostrom *et al.* 2002; Stern and Fineberg 1996). This procedural question will be as important to determining the success of climate policy over time as what the decisions are (Dietz *et al.* 2003; Dietz 2003b; Hajer and Wagenaar 2003). While substantive expert knowledge remains important, it is not sufficient to provide a political basis for policy decisions (Jasanoff 1990; Renn 2001). Robert Watson recently noted that science is a "necessary but not sufficient" precursor to the formation of an effective international regime, qualifying it as "one small input" to a broad policymaking exercise (as cited by Fisher 2004: 147). Although scientific knowledge establishes an important set of "facts" or common technical understanding about environmental issues, how these "facts" are interpreted can and does vary widely depending upon who is interpreting and the argument presented (Herrick 2004; Majone 1989) (see also Chapter 3).

Risk and uncertainty is not a new concept in environmental policymaking. In an environmental context, typically risk is defined as probability times consequence, and in this case the consequence is an environmental impact. Dealing with risk in a policy or other decision process attempts to identify and describe possible risk outcomes such that they can be managed (Adams and Thompson 2002; Morgan and Henrion 1990). Where risks are assessed to be too uncertain, there may be an explicit decision to delay policy action and this is in itself a policy decision. Policymakers may also decide to regulate even uncertain risks, should the possible hazard to society be judged to be sufficiently high (Jones 2001; Morgan and Henrion 1990). There is also a link between environmental risk and application of the "precautionary principle" in environmental policymaking (De Marchi 2003; Stirling 2003), where precaution is seen as a means to limit the risk of an event which has a small probability but very significant environmental outcome, for example committing the Earth to sea level rise of more than several meters due to the melting of the Greenland and West Antarctic Ice Sheets.[14] Precaution is also a means to deal with ignorance,

[14] De Marchi refers to the use of precaution as a way to avoid Type II error – the false negative, *i.e.* that climate change is not predicted to occur at levels that cause damage to society but in fact does. This

or with impossible to predict but plausible events, a category in which one might place abrupt climate change (see also Schneider and Kuntz-Duriseti 2002).

Although several relevant strands of social theory can be related to environmental risk, Krimsky (1992: 21) concludes that only cognitive and cultural theories "come closest to fulfilling the role of a mature paradigm." He sees risk, at best, as "a field of study among and beyond traditional disciplines." Social scientists have long understood that judgements about risk are required, hence there is a role for the social sciences in risk assessment and management (Golding 1992). Cognitive and cultural theory highlights that these judgements are culturally-based (Douglas and Wildavsky 1982; Jasanoff 1990) and that they are based on human perceptions and values. In this sense, judgements about the risk of global environmental change are normative as well as empirical decisions (Slovic 1987).

Global environmental risk acceptability raises questions about who decides what is acceptable. Climate change, as with other global environmental risks, inevitably implies changes on a global scale that are distributed unevenly, thus raising issues of social justice. In turn, this raises questions about power and authority of different actors (Redclift and Benton 1994). Although risk and global environmental problems are characterised as highly technical in nature due to the need to understand them by integrating different strands of scientific and expert knowledge across conventional disciplinary boundaries (Krimsky 1992; Stern and Fineberg 1996), the equity implication of the uneven distribution of climate change consequences suggests the need to include lay knowledge in problem definition, policy- and decision-making processes (Irwin and Michael 2003; Jasanoff and Martello 2004a).

Given the importance of science to climate change or other global environmental policy, an important notion is "boundary" work, which operates between the domain of science and that of politics. Boundary-work was originally introduced by Gieryn (1983a) to describe actions that demarcate the differences and competing authority between scientists and others. Jasanoff (1990) uses this notion in a different way, to identify the boundary between policy or regulatory agencies and science advisory processes which officially mediate the science to support decision-making. This approach advances understanding scientific knowledge and its relationships to political power (Jasanoff 1990: 18), noting that a blurring of the boundary between science and politics allows for essential negotiation leading to the definition of "acceptable risk." Acceptable risk is

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differs from a "Type I error" or the false positive that climate change is predicted to occur at levels that cause damage to society, but never does.

necessarily a socio-political decision even if it is couched in technical evidence. Negotiation among scientists to bring together divergent technical opinions is necessary but not sufficient to bring closure on a public policy issue (Jasanoff 1990: 234-5). In this thesis, the notions of boundary work and boundary organisation are used to refer to activities that intentionally blur the boundaries between science and policy to influence the latter.

Further, Jasanoff (1990) suggests a circular model where negotiation iterates with construction and deconstruction of validity claims to provide "the construction of regulatory science" which, in turn, interacts with boundary work that establishes legitimacy for science advice. Involvement of science community through this iterative process is shown to be important to help establish stronger consensus for policy decisions. Jasanoff explains how risk constructions and how negotiation and boundary work shape policy. She states: "what emerges from a successful recourse to scientific advice, then, is a very special kind of construct: one that many, perhaps most, observers accept as science, although it both shapes and is shaped by policy" (Jasanoff 1990: 234). Jasanoff (1990) also notes that flexible role-playing is important to successful boundary work and risk management outcomes. In this case, scientists serve in various professional capacities such as technical consultants, educators, advocates, judges and mediators. Habermas (1996: 351) also states that it is unrealistic to try to separate specialised knowledge from values and moral points of view since problems of "functional coordination, when handled politically, are intertwined with the moral and ethical dimensions of social integration." More pointedly, Habermas (1991: 351) argues for deliberative politics, "shaped by the publicly organized contest of opinions between experts and counter-experts and monitored by public opinion." Especially on complex issues such as climate change, this literature suggests that science interfaces through a variety of socially-mediated pathways to build understanding and knowledge and to facilitate decision-making (Corfee-Morlot *et al.* 2007).

2.3. Climate change policy as a risk governance challenge

Given the broad social implications of climate change and the wide uncertainties in our scientific knowledge of the problem, there may be special value from a policymaking perspective to framing climate change as an environmental risk problem (Corfee-Morlot *et al.* 2005; IPCC 2001; Lindseth 2004). This author has argued with others elsewhere that environmental risk framings of climate change could reformulate political boundaries that currently divide diverse geopolitical groups of countries in the international negotiations on the issue of mitigation, for example to reflect on post-2012 commitments (Corfee-Morlot *et al.* 2005). In a recent example, the Stern Review highlighted climate change as a global risk management problem, underscoring the costs

of inaction (Stern 2007). Focusing on national and local (sub-national) geographic scales, Lindseth (2004) also suggests that a risk framing in policy discourse could bring meaning to climate change. Indeed, a different situation and set of opportunities for meaningful risk characterisation on climate change may exist at the local level.

Framing climate change from a local environmental risk perspective also provides a means to address two other challenges implicit in climate policy. First, it may also help to bridge the current divide in the climate policy community between adaptation and mitigation, as risk relates both to adaptation and mitigation responses (Corfee Morlot and Höhne 2003; Corfee-Morlot *et al.* 2005). Second, social research on risk suggests that contrary to techno-rational approaches that aim to provide more and better information (see also Chapter 3), there will be a need for new institutions that embody principles of governance through democracy, competence and fairness to guide understanding and any policy or decision process on the meaning of what is acceptable risk (Bohman 1996; Rydin 2003; Stern and Fineberg 1996). This pertains to issues of global environmental governance, a dimension that has only begun to emerge in the social research literature (Jasanoff and Martello 2004a). In the climate policy debate such an approach appears to at least partially respond to concerns that equity and justice dimensions be more fully integrated into decision-making (Brown 2003), but to date there is little attention to the local dimensions of decision-making.

2.3.1. International climate assessment and policy

The notion of climate change as an environmental risk issue is still not widely used in national and international climate policy circles, which to date have focused on mitigation. However it is a prominent feature of scientific assessments. This may be because other framings are more salient or understandable to key policy stakeholders and decision-makers (Lindseth 2004; Miller 2000).[15] Clearly a starting point in international negotiations is the objective of the UN Framework Convention on Climate Change, which embodies a "risk" based notion as the ultimate goal of international collaborative action. Impact science and notions of climate change risk were central to early science-policy studies of climate change dating back to the start of the IPCC. At the international level, tolerable rates and ecological thresholds as a driver for climate policies were discussed by the UNEP and WMO advisor to the Advisory Group on Greenhouse Gases (AGGG)

[15] Alternative framings vary but include: climate change as an energy problem (where the alternative responses are various forms and combinations of mitigation policy); climate change as a problem of vulnerability or disaster prevention and management (where alternative responses come in the form of adaptation policy). See Miller 2000.

in the late 1980s and also in the Villach/Belagio conferences of the same period (Agrawala 1998; Agrawala 1999a). This select group of science advisors – as predecessors to the Intergovernmental Panel on Climate Change (IPCC) -- proposed numerical estimates for tolerable rates of climate change to policy makers before the drafting of Article 2 of the Framework Convention. In the end, the ultimate objective of the UNFCCC is to achieve: "…stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system…" This objective remains open to interpretation today.

2.3.1.1. Science advisory processes on climate policy: the IPCC[16]

The creation of the Intergovernmental Panel of Climate Change in 1988 established a process whereby different expert communities "negotiate" to interpret and synthesize a wide-range of expert literatures on climate change. IPCC assessments are also shaped by extensive and open peer-review from national governments and other outside experts (Agrawala 1999b). This process is consistent with what some social research scholars have recognized as a need for diverse expert communities to conduct an "epistemological discourse" (Renn 2001) or the need to mediate amongst themselves to reach consensus on conclusions inherent in an otherwise disparate knowledge base (Jasanoff 1990).

The mandate of the IPCC is such that it stops short of recommending policy at any scale of action. And a number of other features of IPCC procedures can be argued to prevent it from creating "usable knowledge" for the climate policy process (Haas 2004). At least with respect to providing a basis for the interpretation of Article 2 of the UN Framework Convention on Climate Change (UNFCCC), this would appear to be true.

After the adoption of the Framework Convention in 1992, the IPCC was asked by governments through its inter-governmental management structure to address issues related to its Article 2 objective, leading to a workshop on this topic in 1994 and to some treatment relevant issues in the Second Assessment Report (IPCC 1996). Even these relatively early reports carefully avoid taking a stance on this issue, noting instead that it is the work of policymakers rather than of scientists and researchers to balance different perspectives on risk, to value risk avoidance and to make judgements about what is acceptable (IPCC 2001; Agrawala, 1999 & 1998). This cautious

[16] This section is updated from a discussion that was published in Corfee-Morlot and Höhne 2003.

position has continued in subsequent IPCC reports and eventually led to the framing of the issue as a problem of risk management or decision-making in the context of uncertainty (see Box 2.2).

Box 2.2: IPCC – framing of the climate change as a risk problem

Much attention in international research and scientific assessment communities currently focuses on the effective integration of the wide range of relevant scientific knowledge into comprehensive assessments of climate change. A textual analysis of the third IPCC assessment shows that climate change is framed as a risk problem. For example, the Synthesis Report of the Third Assessment states (IPCC 2001: 3): *Decision making has to deal with uncertainties including the risk of non-linear and/or irreversible changes and entails balancing the risks of either insufficient or excessive action, and involves careful consideration of the consequences (both environmental and economic), their likelihood, and society's attitude towards risk.*

In its Fourth Assessment Report, the IPCC underscored again the risk management challenge of climate change in stating: *"Decision-making about responding to climate change involves an iterative risk management process that includes both mitigation and adaptation, taking into account actual and avoided climate change damages, co-benefits, sustainability, equity, and attitudes to risk."* (see IPCC 2007d & IPCC 2007c).

The IPCC was again asked to address Article 2 in its Third Assessment Report where the Synthesis notes only that "scientific evidence helps to reduce uncertainty and increase knowledge…" about what might constitute dangerous interference with the climate system, but that decisions on this "…are value-judgements determined through socio-political processes, taking into account considerations such as development, equity, and sustainability, as well as uncertainties and risk. …" (IPCC 2001, p. 38; see also Box 2.2). Thus the IPCC has not been entirely silent on this issue but it has made clear that they see their role as limited to providing technical input to policymakers' inevitably normative decisions on the issue of what is acceptable risk (Agrawala 1999a; Oppenheimer and Petsonk 2005).

The IPCC's Fourth Assessment reinforced this view while also presenting evidence of even higher levels of risk to natural and social systems for a given level of global mean temperature change, which can be used as a proxy for levels of climate change more broadly (IPCC 2007d). The Synthesis Report of the fourth IPCC assessment reiterates its previous view on this when it states: "Determining what constitutes 'dangerous anthropogenic interference with the climate system' in relation to Article 2 of the UNFCCC involves value judgements. Science can support informed decisions on this issue, including by providing criteria for judging which vulnerabilities might be labelled 'key'" (IPCC 2007d). In this way, the IPCC has consistently attempted to highlight evidence for what might be considered "dangerous" while not crossing the boundary to make such a judgement. In their view, such a judgement is necessarily a normative, political judgement and would thus not be an appropriate judgement to make as an "expert" body. This position draws a relatively clean line between science and policy advice.

Jasanoff and Wynne (1998) point to the IPCC as an example of standardised science – or normalisation process – that frames diverse, trans-scientific issues for decision-makers (Weinberg 1972). 'Normalisation' is a Foucauldian concept that establishes a common understanding of science (or other expert knowledge) into "what is normal" and institutionalises this understanding into routines that shape behaviour (Foucault 1980; see also Chapter 3). The notion of normalisation of science in this context maintains a certain amount of "plasticity" as IPCC products can be used to serve different ends and support different framings of climate issues (see discussion Jasanoff and Wynne 1998: 23).[17]

This literature combines with the significant science-policy experience encapsulated in the IPCC's products and processes to highlight its co-production of knowledge about climate change, drawing on scientific endeavour as well as on social means of interpretation. The combination of experience and analytical work embodied by the IPCC also underscores the role of agency, institutions for deliberation and epistemic networks in knowledge creation designed to address global change (Jasanoff and Wynne 1998). Interpretation and argumentation, building on the scientific evidence presented by the IPCC (and possibly other similar networks operating at more local scales) could play a key role in any policy process aiming to identify what is "dangerous" and therefore what is safe and acceptable in terms of climate change and its impacts. The work of the IPCC is helping to advance understanding of climate change risk and this may influence decision-making. But to date it has had limited direct influence and there is no practical international agreement on how to interpret what is "dangerous" climate change.

2.3.1.2. The political process: UN FCCC

Internationally, the central institutional mechanism for policymaking is embodied in the UN Framework Convention on Climate Change (UNFCCC) and the Conference of the Parties (Yamin and Depledge 2004). The principal means of decision-making is through negotiation among nation-states (Depledge 2001; Yamin and Depledge 2004). There is no formal advisory function where negotiators seek and consider expert advise for their decisions, either from the IPCC or from other knowledgeable experts in either an institutional or individual capacity. The design of the Subsidiary Body for Science and Technological Advice (SBSTA) reflects this gap between expert advise and political decision-making, operating as a shell for the pre-negotiation on scientific and technical issues that must pass through the Conference of the Parties (COP)

[17] There are different views about the legitimacy and policy relevance of IPCC's work on climate change. See (Agrawala 1999b; Boehmer-Christiansen 1994; Haas 2004; Jasanoff and Wynne 1998).

(Agrawala 1999b; Miller 2001). Technical and science assessment background information targeting the negotiations is prepared long in advance, either through other formal mechanisms such as the UNFCCC secretariat "technical papers", the IPCC assessments or informally through other ad-hoc advisory bodies.[18] Despite its label, the SBSTA has never had the ambition nor the mandate to play a truly scientific or technical advisory role, but rather operates within the highly political context of the Convention negotiations with its membership exclusively limited to governmental officials.

With respect to the role of the SBSTA within the Convention process, the situation regarding a political interpretation of "what is dangerous?" under Article 2 could be said to be much different as it is presumably part of the SBSTA mandate to consider and speak out on this issue. Negotiators are not climate scientists nor are they experts. Further, the non-expert character of negotiating bodies under the Convention could be an opportunity for reflection and dialogue about science and other expert knowledge and to combine this with political judgements on what constitutes salient public risk.

There is some history of dealing with the notion of "dangerous" in the UN FCCC but negotiations to date they have not led to any closure (Depledge 2001; Oppenheimer and Petsonk 2005; Yamin and Depledge 2004; Corfee-Morlot and Höhne 2004). As attention turns to a post-2012 or post-Kyoto Protocol agreement, there is again discussion of how much mitigation is enough and of the notion of what is "dangerous" climate change (UNFCCC 2007f; UNFCCC 2007g).

Although the issue of defining "dangerous" appears to be moving back into the political debate internationally, there is still only a weak link at best between political decisions under the UNFCCC and IPCC expert assessments. Some observers remain optimistic that an interpretation of "dangerous" climate change in the form of some type of long-term target will emerge with time through the international negotiations (Berk *et al.* 2002; Corfee-Morlot and Höhne 2003; Metz *et al.* 2002; Oppenheimer and Petsonk 2005; Yamin and Depledge 2004), while others remain more sceptical (e.g. Pershing and Tudela 2003). There are of course other ways to reach similar end points, such as through the negotiation of emission targets, which may or may not be directly linked in negotiations to climate change targets or to a definition of what is dangerous climate change.[19]

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[18] For example the OECD operates one such mechanism in the form of its Ad-hoc Annex I Expert Group on the UNFCCC.

[19] Meanwhile other "dangers" appear to have received more attention in negotiations to date including the fear that too much mitigation too soon might brake economic growth. Some would argue that these

2.3.2. National, sub-national or trans-national scales of action and assessment

In contrast to limited attention to the risks of climate change in formal international negotiations, several national governments have advanced views on this topic and made hortatory statements about long-term objectives for climate policies, which are driven by concern about dangerous impacts. This includes actions in the UK, and the Netherlands and more recently Sweden, Germany and Canada (for a detailed, historical account see Oppenheimer and Petsonk, 2005). In 2005, the EU formally reaffirmed its view on the Convention objective by stating that global mean temperature should not exceed a 2^{o}C increase above pre-industrial levels (EU 2004; EU 2005). This consensus view across EU states was confirmed again in 2007 with a clear statement about the implication of such an overall risk target for emission reductions to be achieved in developed nations (EU 2007) (see Table 2.1). At the level of full governmental commitment, as established through law or legally-binding policies, only a few emission targets have been formally agreed. Even when such targets exist, there is often extensive debate about how to implement them.

questions are linked in an implicit if not explicit cost-benefit framework (e.g. Jacoby 2004). My personal experience is that this link is weak at best in the negotiating context and that goal-setting is often addressed with only vague attention to the costs of goal achievement. Once the goal is set however, attention turns to the question of how to achieve it in the most cost-effective manner (see also Chapter 7).

Table 2.1: Overview of national and sub-national greenhouse gas targets with "all of government" support

Country or Sub-National Government	Source, status of objective	Reference Year	Horizon	Target
European Union (EU 2007)	European Council (Presidency conclusions, of the Brussels European Council; 7224/1/07, REV 1, 2 May 2007)	1990 1990	2020 2050	2°C above pre-industrial levels -20% GHG or -30% GHG (if other developed nations do likewise) Developed nations long-term aim: -60 to -80% GHG
United Kingdom - Federal Government	Recommendation White Paper on Energy (24 February 2003)	1990 1990	2050 2020	-60% CO_2 -10 to -20% CO_2
Germany - Federal Government	National Climate Change Programme – 2005 (Law, 13 July 2005)	1990	2020	-40% GHG If the EU establishes a target of -30% in the 2020 timeframe
Sweden - Federal Government	National Climate Change Strategy (Decision no. 2001/02:55)	1990	2050	4.5 tonnes CO_{2eq} per capita per year
California* (CA-Code 2006a; California 2005a)	Executive Order (E-3-05; June 2005) Global Warming Solutions Act (State law, September 2006)	2000 1990 1990 1990	2010 2020 2050 2020	GHG to 2000 levels GHG to 1990 levels GHG to - 80% 1990 levels GHG to 1990 levels
New Jersey* (NJ-Code 2007)	Executive Order 54 & Global Warming Response Act (State law, July 2007)	1990 2006	2020 2050	GHG to 1990 levels GHG to - 80% 1990 levels

Source: Original documents as cited, also see (MEFI and MEDD 2006).

* Notes : Both California and New Jersey have legislated that GHG emissions from power generated out of state but consumed in state should be accounted for in achieving the state-wide emission targets for 2020 & 2080.

Transnational activities, that link networks of non-state actors in new ways across national boundaries, are also increasingly active in their attention to climate change and the need for long-term climate policy goals. In an effort to influence a G-8 ministerial, a multilateral task force of prominent scientists and policymakers recently recommended the establishment of the same long-term temperature change goal as a guide for further policy actions (ICCT 2005). The

G-8 did eventually recognise the threat of climate change and the urgency to respond to it, stating recently: "Since we met in Gleneagles, science has more clearly demonstrated that climate change is a long term challenge that has the potential to seriously damage our natural environment and the global economy. We firmly agree that resolute and concerted international action is urgently needed in order to reduce global greenhouse gas emissions and increase energy security" (G-8 2007).

More recently, an environmental initiative linking cities across nations – known as the International Council of Local Environmental Initiatives (ICLEI) – coordinated an hortatory statement of the intent of more than 100 cities to work towards the achievement of Kyoto objectives (ICLEI 2004). These actions demonstrate an ongoing political interest in some countries, regions and among some communities of experts to interpret the Convention's objective in a practical way. Since this time, interest has grown in the power and influence of city scale governments to move action forward on climate change. For example, following an initiative of city of Seattle's Mayor Nickels, by mid-2005 more than 130 US cities had announced plans to achieve Kyoto-like emission reductions (Brown 2005a). Focusing on a more limited but international effort, in August 2006 the Clinton Climate Initiative joined Mayor Ken Livingston's international initiative to network and work together to reduce emissions from urban areas in across at least 40 or more of the world's largest cities (C40-Cities 2007a; C40-Cities 2007b).

Within the US, state level initiatives have also grown with initiatives ranging from the Regional Greenhouse Gas Initiative which is a collaboration among North-eastern US states to California, all of which are working toward mandatory emission goals and regulation of greenhouse gas emissions across sources within state boundaries (Rabe 2002; Rabe 2004b). Some states are also aiming to have influence beyond national boundaries.[20] For example, California and the Brazilian state of Sao Paulo have signed a Memorandum of Agreement as have California and the Government of the United Kingdom, both of which to extend collaborative efforts particularly with respect to climate-friendly technology (California 2006a; Reid *et al.* 2005). There is also an agreement between the state of California and the Province of Jiangsu in China (CPUC 2005). Beyond its actions internationally, California was the first US state to legislate long-term mitigation goals (i.e. 2020; see Table 2.1). New Jersey has followed and recently adopted a law

[20] See also the Pew Center on Climate Change website: http://www.pewclimate.org/what_s_being_done/in_the_states/emissionstargets_map.cfm [accessed 28 October 2008]. An interesting recent development with respect to California is the Western Climate Initiative linking governors from numerous western US states and premiers from several Canadian provinces; see: http://www.westernclimateinitiative.org/ [accessed 5 October 2008].

with mandatory near-term and long-term GHG emission targets. Given its size and influence in the global economy, California's move has been heralded as an important development to demonstrate international and national leadership on climate change (Koizumi 2006; Martin 2006).

Climate change risk assessment has to some extent accompanied and supported policy-making on climate change at national and sub-national scales. In particular regional risk assessment in the last decade is characterised by:

- regional climate modelling and impact assessment methods which now make possible the assessment of global climate change and climate impacts in regional planning contexts;
- growing experience with analytic-deliberation in climate policy processes at national and sub-national regional scales.

Some regional and local climate change impact assessments have featured state-of-the-art deliberative processes to engage stakeholders from the start to shape the framings and findings of assessments. In Canada, for example, there is now some experience with regional (sub-national) participatory integrated assessment to support watershed management and climate change adaptation decision-making (Cohen *et al.* 2004b; Vescovi *et al.* 2007; Yin and Cohen 1994). An example of multilateral collaboration using deliberative methods exists in the recent assessment of the Arctic region. This study was unique as it was both deliberative, employing a number of different methods to engage affected stakeholders, as well as an international process to facilitate deliberation among state actors with an interest in the region. The Arctic Climate Impact Assessment was published in 2004 and, importantly, sponsored by the Arctic Council, which represents eight member-state governments (Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden and the US) and six permanent participants including two indigenous peoples non-governmental organisations (ACIA 2004).[21]

Relatively recent policy-driven scientific efforts to predict regional climate changes are also found at local and regional scales, for example, in the UK (McKenzie Hedger *et al.* forthcoming; West and Gawith 2005) and in the United States (Hayhoe *et al.* 2004; Moser 2005; Parson *et al.* 2003). The UK programme is somewhat unique in that it is initiated, organised and to a great extent

[21] See also http://www.amap.no/acia. It is interesting to note that the report stopped short of having powerful policy recommendations in part because of reluctant state actors.

funded by local and regional stakeholders, although the institutional mechanism overseeing the coordination of such regional efforts is national (McKenzie Hedger *et al.* 2006).

In the US, initial climate impact assessment was conducted through an extensive nationwide effort (NAST 2000). This national process featured a state-of-the-art process to engage local stakeholders (Moser 2005; Parson *et al.* 2003). However a change in political administration in the White House in 2000 brought a shift in stance towards climate change issues. This led to a discontinuation of the national led effort to coordinate ongoing climate impact assessment across US regions. This void has been filled to some extent by a combination of non-governmental activity, building on on-going federally funded research activities (see Hayhoe et al. 2004; also Chapter 7).

2.4 Conclusion

In summary, there are at least four unique dimensions of the climate change problem that challenge policy decision-making. These features render climate policy-making complex and slow to advance. They can also be seen to call for new and different forms of governance compared to past practice for more local and regional environmental problems. They are:

- a global problem that requires significant cooperation amongst diverse (nation-state) actors with vastly different geo-political interests;
- a problem inter-linked with a wide range of other policy issues, making it difficult to govern, to coordinate across different interest groups or governmental agencies and to speak with "one voice";
- most often seen as a distant and abstract problem with uncertain physical and socio-economic impacts, which are expected to be lagged in time and space compared to causes of impacts – further the ambiguity of the meaning of climate change in local contexts makes it difficult to prioritise policy action and incites delay;
- a problem where political understanding and responses depend upon scientific advice; the broad uncertainty surrounding the science of climate change makes this dimension particularly challenging and calls for an active science-policy exchange.

The chapter has reviewed a variety of different strands of the social research literature, organising it along these four dimensions of the problem. The discussion will return to some of these themes to support the empirical analysis of the California case. In particular, the challenge of speaking with "one voice" on climate change, even in a more narrow sub-national context, remains as

climate change can implicitly be framed in many different ways to different audiences. The issue of multilevel governance, including issue-linkage, underscores the analysis of California's regulatory history (Chapter 5).

The conceptual literature on the science-policy interface has highlighted the importance of both cognitive and cultural theories to understanding risk problems such as climate change. This dimension of the climate problem raises procedural equity questions – i.e. how decisions get made and who gets to decide how to proceed. The conceptual literature on these will be further explored in the next chapter on decision-making.

Finally the chapter has also reviewed the origins of risk-governance in the climate change mitigation discourse at different scales of the policy process – internationally within the IPCC assessment process and within the political negotiations of the UN FCCC, particularly with respect to efforts to interpret the Article 2 objective of the Convention. Understanding climate change as a risk governance problem also extends to national and sub-national decision-making as is shown by recent developments taken by some national governments to independently set long-term goals for emission reductions and similar actions within the US at state and local levels. In parallel, there is a growing capacity to develop an use regional impact assessment as a tool to support communication and decision-making.

On the science-policy dimensions it is important to note that sub-national decision-making and governance requires a change in the way that science is brought into policy discussion, forcing it to come in more scale-relevant ways. The chapter points to some evidence of this change. Through the use of regional climate impact assessments -- in regionalisation of the issues, in possibly more explicitly deliberative practice, and in the specific policy-driven context – there may be an opportunity to influence the politics of climate change to shift the debate from the global to the more local scales (Harris 2001; Shackley and Deanwood 2002). This shift may help make the climate problem more tractable to advance action. The science-policy interface is further explored in the empirical analysis (Chapter 7).

The next chapter completes the review of the conceptual literature by focusing on the process of environmental decision- and policy-making.

3. SOCIETY, SCIENCE & GLOBAL ENVIRONMENTAL DECISION-MAKING

3.1. Introduction

This chapter traces various strands of the conceptual social science literature as they relate to our questions about global environmental change decision-making. The chapter is organised in three parts starting with broad theoretical background on society, science and nature relationships. The second section focuses in on the policy process to address decision-making and global environmental governance with an emphasis on who is engaged and why. The final section is on interpreting knowledge, constructing argument and social learning in global environmental decisions – or the "how" of the globalisation policy process. The chapter closes with concluding remarks that move this conceptual framework towards a more structured analytical framework to guide the empirical analysis and discussion that follows.

3.2. Science, society and nature: theoretical background[22]

Theory regarding interactions between science, environment and society is messy at best, and conflicting at worst. The conflict stems in part from the 19th century origins of social and political theory, which aimed to distance its interests and central tenets from the positivism that had dominated social thought during the Enlightenment. At this time, contemporary social and political theory placed culture and society in opposition with biological thinking and nature (Benton and Redclift 1994; Goldblatt 1996). Humanist, social thought emerged in part as a reaction to positivism, as part of a conscious an effort to counter pervasive biological thinking, which was dominant at the time. This derived from philosophers including Schopenhauer and Nietzsche, where Nietzschean "negativism" challenged positivist rational knowledge and its role in matters of social concern and politics (Agrawala 1999b; Barry 1999). In parallel, classical social theorists – Durkheim and Weber -- tried to functionally separate society and social functions from nature and biology in order to distinguish it as a separate and worthy field of study (Goldblatt 1996). Recognising the material, natural basis for production, Marx was also

[22] This sub-section is adapted from a recently published article – see Corfee-Morlot *et al.* 2007.

concerned that society was constrained by nature. The primary ecological concern in this classical social theory was to understand how nature constrains society and, more particularly, how to separate society from and transcend the constraints of nature (Goldblatt 1996).

3.2.1. Reductionism meets constructivism: towards co-construction

Co-constructionist perspectives can be traced to the interface between reductionism and constructivism. The reductionist or positivist perspective on society's interactions with the environment identifies the main problem as a lack of scientific and technical understanding amongst experts and decision-makers (Irwin and Wynne 1996; Owens 2005). This view is also referred to as a "deficit", "knowledge-gap", or techno-rational model of decision-making. The notion can be traced from Enlightenment and pre-Enlightenment thinking, when natural science first began to replace metaphysical religious thought as an input for governance, to the modern tradition of positivism (Agrawala 1999b). In this modern tradition, science provides a unique knowledge basis for social decisions and scientific knowledge creates an unproblematic base of scientific "facts" or "truths" and is given a special status to help resolve social problems.

The "knowledge gap" model also suggests a deficit and gap of knowledge between the "experts" and the "lay public." Since the public is seen as lacking scientific knowledge, they may not have the potential to usefully engage in decision-making concerning scientific issues (Irwin and Wynne 1996; Wynne 1992a). This perceived knowledge gap necessarily extends to a large number of environmental issues since understanding, or at least the initial discovery and framing of environmental problems, is usually science-based. Understanding in this model is largely seen as a process of individual cognition and perception (e.g. Slovic 2000), while ignorance is due to a lack of scientific literacy and competence (Wynne 1992a).

Modern criticism of the reductionist model of nature-society relationships emerged in the 20th century, when a number of sociologists and philosophers suggested the need for a more nuanced understanding of how humanity interacts with science and nature (Brulle 2000; Goldblatt 1996; Redclift and Benton 1994; Skinner 1985a). The vision associated with this perspective is referred to as critical social theory and can also be characterised as largely optimistic about the future (Skinner 1985a). By comparison to environmental sociology or even ecological modernisation, critical theory places more emphasis on the role of civil society and social movement organisations (from environmental justice proponents to environmental advocacy organisations) to also affect change in advanced capitalist society. Drawing on Habermas' work (Habermas 1979; Habermas 1998) among others, some policy analysts suggest there is a possibility for more deliberative and open democracy to influence environment politics and policy reforms in favour

of environmental protection (Brulle 2000; Dryzek 1990; Fischer and Forester 1993). This is often referred to as reflexive modernisation or post-materialism (e.g. see Beck 1992 and discussion below). In the policy sciences research literature, this is more popularly known as the "argumentative turn" in policy analysis (Fischer 1998; Fischer and Forester 1993), where the distinction between "fact" and "value" is blurred (Hawkesworth 1988).

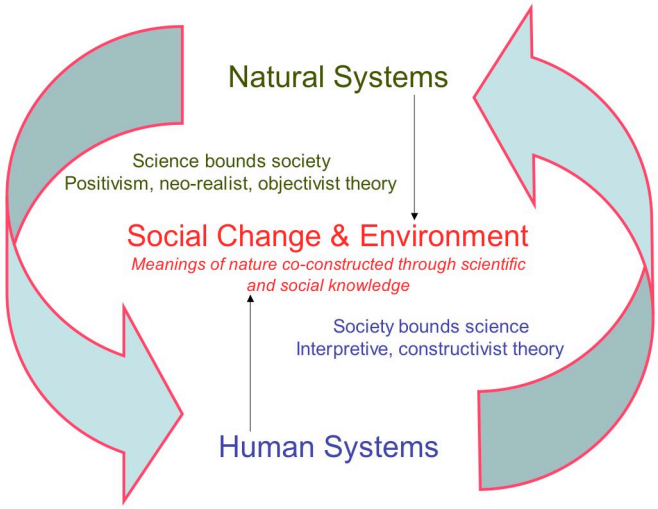
The emergence of critical social theory also led to scholarly social research investigating questions such as whether greater public knowledge of science will lead to a more favourable environment for science and technology and more favourable social outcomes in the use of that knowledge (Beck 1992a; Giddens 1990). Reductionist perspectives suggest that the content of science is separate from the institutions that create it, yet social science research has shown that they are intimately intertwined (Jasanoff and Wynne 1998; Kuhn 1962; Latour 1987; Shackley and Wynne 1995; Wynne 2002). The reductionist perspective also presupposes that people have the capacity and are interested to "learn" about science and technology through an expert lens (Ungar 2000). Yet research has shown that people make sense of science in complex and culturally diverse ways, for example, through metaphors that translate complex issues to everyday life and experience (Harrison and Burgess 1994; Leiserowitz 2006; Ungar 2000). Overall this strand of social theory is known today as contextual or constructivist as it places instrumental knowledge of nature in a societal context, where interpretation is required to bring meaning to such knowledge.

Contextual or constructivist models of environmental science start from interpretive assumptions that nature, science and observed human behaviour must be understood in its social, cultural and historical context. Emphasis is on the diversity of meanings, texts and local frames of reference in knowledge creation (Jasanoff and Wynne 1998). Constructivist models are also reflexive as they focus on the uniquely human role of reflection and ideas to create institutions that guide social interactions (Jasanoff and Wynne 1998). At one extreme, they deny that objective reality or "truth" exists, rather that reality is constructed by the norms, values and practices of the scientific community that produces it (Jasanoff 1998; Jasanoff and Wynne 1998; Latour 1987). Constructivist approaches emphasise the role of "trust" in expert-generated knowledge and institutions mediating between knowledge and policy. Trust, access and influence within institutions that guide decision-makers are of over-riding concern in this view, as are institutions that facilitate interaction between science and local environmental knowledge. These institutions can help to construct networks that allow these different sources of knowledge to interact and inform each other on complex science and environmental issues (Carolan and Bell 2003; Irwin and Wynne 1996; Jasanoff and Wynne 1998; Wynne 1992a).

In parallel, Foucault's study of social institutions and their influence on society and individual behaviour, centres on notions of power and knowledge (pouvoir/savoir) and the ways in which institutions, through legal and administrative means, take on power to control social behaviour and direct change (Fairhead and Leach 2003; Foucault 2004; Hajer 1995; Rydin 2003). Although Foucault's extensive field work and writing does not address environmental issues specifically, he establishes an understanding and approach to the study of discourse – the use of language to express thought, intentions, values, and courses of action – as a key notion that has been adapted to guide interpretive social research on the interactions between environmental politics (power) and science (knowledge) (Fairhead and Leach 2003; Hajer 1995; Rydin 2003; Weingart *et al.* 2000).

In practice the emphasis in the constructivist model is on the two-way process of communication from scientific and expert communities to concerned publics and back again in a circular model of ongoing exchange and influence that passes through the public and the private sphere of influence (Betsill and Bulkeley 2004; Carvalho and Burgess 2005). Thus, constructivist social theory suggests that science and other expert knowledge is only one type of knowledge relevant to environmental problem-solving. Other types of knowledge that can be brought to bear on environmental problem solving include local, lay-knowledge – also referred to here as "experiential knowledge."

Figure 3.1: Conceptual context for understanding social change and the environment



A hybrid between reductionist and constructivist perspectives is the co-constructionist view, which combines the undeniable strengths of realist, scientific discovery with contextual insights and lay knowledge (including experiential knowledge). In this view, both contextual and realist perspectives have influence as society and science co-construct meanings of global warming (Benton and Redclift 1994; Jasanoff and Wynne 1998; Latour 1987; Lorenzoni *et al.* 2000; Stern and Fineberg 1996; Woodgate and Redclift 1998; Wynne 2002). This theoretical approach acknowledges the power and influence of scientific discovery as an input to social processes that mediate understanding in a political context for decision-making (Jasanoff 1990; see Figure 3.1).

Expert knowledge however is mediated through social perceptions and cultural processes (rather than through individual or psychological perception) to shape understandings of environmental risk as they play out in the policy process (Douglas and Wildavsky 1982).

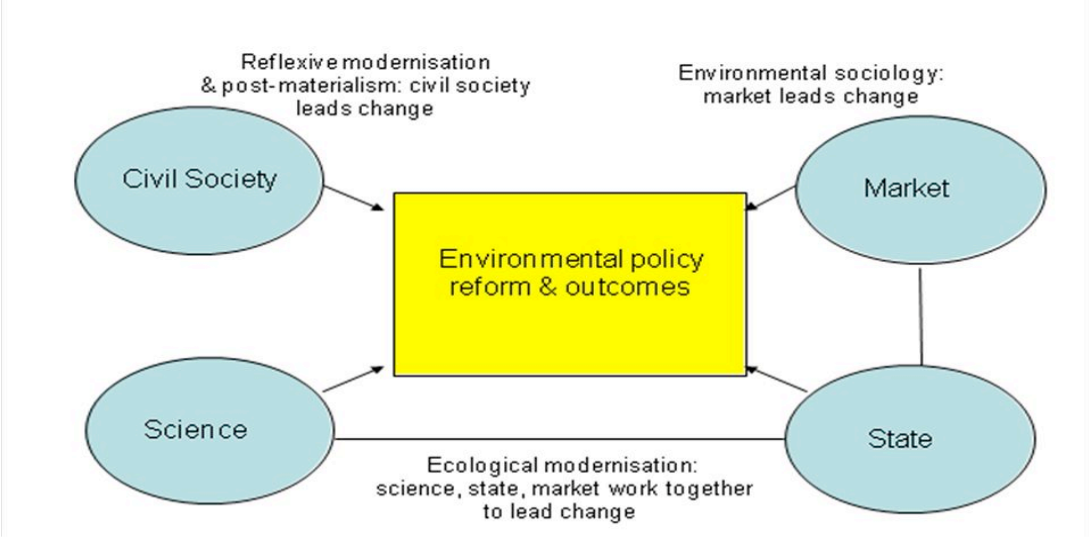
This conceptual model of co-construction suggests that the recognition of climate change in the public sphere provides opportunities to promote social learning and adaptive responses to climate change over time as knowledge, preferences and social norms shift (Corfee-Morlot *et al.* 2007). A key question for policy is whether co-constructionist perspectives have potential to help improve decision-making. In this context it may be particularly interesting to look at the formation of networks of influence and power across different types of actors, sub-politics and the possibility for meaningful action to emerge from the " bottom up" on the basis of co-constructed meanings of climate change. The decision-making frameworks in which such meanings are used are also a central part of the policy process.

3.3. Decision-making and global environmental risk governance

A range of social theoretical perspectives exists to explain the rise of environmental problems and how society deals with them or approaches to environmental governance (Fisher 2004; Paterson 2008). Environmental sociology focuses on the crisis of modern society, and locates the origin of environmental problems in the political economy of the advanced capitalist state (O'Connor 1998; Schnaiberg 1980). Theories of the environmental state on the other hand are more optimistic and place more emphasis on the interactions between state and non-state actors to identify and address environmental problems (Fisher 2004; Figure 3.2).

The most prominent strand of environmental state theories is known as "ecological modernisation" describing a situation where the nation-state goes green and there is "unproblematic use of science and technology" to advance environmental protection (Mol and Spaargaren 1993): 12, as cited in Fisher 2004; see also (Hajer 1995; Matthews and Paterson 2005). In this worldview, market, science and the state work together to determine political outcomes. In the practical manifestations of ecological modernisation, market actors play the greatest role to bring about change but their action is facilitated by policy and institutional change that is driven by the state (Paterson 2001). In an ecological modernisation worldview, the political process looks to modern institutions, including science and technology to lead the way to better environmental outcomes (Fisher 2004; Spaargaren and Mol 1992).

Figure 3.2: Social actors, social theories and the environment



Source: adapted from Dana Fisher, National Governance and the Global Climate Change Regime, 1994.

Another strand of social theory focuses on the strengths of civil society to lead in decision-making, for human agency to interact with expert knowledge through civil society to shape "reflexive" outcomes (Beck 1992a; Giddens 1991). With respect to global environmental change, Anthony Giddens and Ulrich Beck figure prominently among contemporary social theorists explicitly drawing attention to these in a risk context. Giddens (1991) refers to climate change as a high-consequence risk. He notes that global environment consequences and risk culture are part of a broader set of societal problems related to modernity and globalisation trends, suggesting that climate change is but one example of the consequences of shifts in time and space relationships between people and places, of rapid technological and of rapid social change (Barry 1999; Giddens 1991; Goldblatt 2000). Barry (1999: 95) sees global environmental change as "one of the most tangible problems" stemming from Giddens' theory of globalisation.

Similarly Beck advances the notion of a "risk society" to underscore the difficulties for society to address complex industrial (and post-industrial) hazards and the inevitable questions of social accountability and responsibility (1992a; 1996). Beck suggests that we are in an age of global pollution where an individual or group of individuals can no longer escape the hazards of such pollution, thus there is little distinction between socio-economic differences "eliminating the protective zone and social differentiations within and between nation-states" (1992b: 110). Nevertheless, in the case of climate change there will be an asymmetry between the sectors and the regions that cause the pollution and those that are hardest hit (IPCC 2001), splitting the world into the "risk winners" and the "risk losers" (Beck 1992b).

Indeed high consequence risks, such as climate change, are seen to establish an inescapable dependence on abstract expert systems and experts to mediate meaning and understanding for society (Beck 1992a; Giddens 1991). Giddens (1991: 128-129) builds this argument in part from Goffman's (1972) ethnographic work and his notion of "Umwelt" — a " 'moving' world of normalcy" — where individuals have a general awareness of high-consequence risk from which no one can ever escape fully. High-consequence risks of climate change constitute a part of what McKibben calls "socialised nature," where the climate is no longer part of 'old nature' as understood through history and historical observation but is now less predictable and extends beyond observed experience (Giddens 1991; McKibben 2003). McKibben identifies climate change as a clear example of a shift in the human relationship with nature: "We are no longer able to think of ourselves as a species tossed about by larger forces - now we are those larger forces" (McKibben 2003:xiv).

Global environmental risk problems present a challenge to conventional models of policy assessment and decision-making, where rational actor theory and techno-rational approaches dominate and aim to develop recommendations that optimise outcomes or maximise social welfare based on quantitative (scientific and economic) assumptions of the impacts or risks (Owens 2005). Increasingly social research, both within and outside of the field of economics, has raised questions about the validity of such models on questions of risk and the environment. First is a criticism that techno-rational models ignore questions of social justice and fairness (Jaeger 1998; Rawls 1972; Ryan 1985). As Jaeger (1998) and Azar point (1998) out, non-optimising behaviour is commonplace in public decisions on issues of social justice, such as in the decision to establish child labour laws to protect the health and well-being of children. Do the social justice aspects of climate change warrant the same type of reasoned and moral approach to decision-making? Second, techno-rational models overlook the strengths of human intelligence, that is, the ability to reason, reflect and collaborate for the collective good (Dietz 2003b; Ostrom 1998; Ostrom 2000a; Sagoff 1988). They assume that individuals are able to do the mental calculus to weight the costs and benefits of alternatives and to identify and select optimal outcomes for themselves (Dietz 2003b). A related criticism is that they ignore the complexity and contribution of institutions as they shape individual behaviour as well as create opportunities and outcomes for collective decision-making (Jacobs 1994; North 1990; North 2005; Ostrom 1990).

Ostrom (1990) and Ostrom *et al.* (2000) report on extensive empirical research to document the extent and nature of collective action taken to successfully govern common environmental resources, and the institutional and social conditions that lead to such cooperative behaviour.

These examples expand the rational actor model to include a more complex structure of collective reasoning in an institutional context. The model that emerges is one where "deliberative spaces" can be created to raise stakeholder awareness, build trust and understanding and ultimately facilitate collection decision-making and collaboration to protect common environmental resources (Ostrom 1990; Ostrom 2000a; Ostrom *et al.* 2002). This socio-institutional perspective reinforces the importance of dialogic processes – of dialogue and of the notion of trust - by offering opportunities for meaningful exchange among affected stakeholders, including experts, and in so doing building human and social capital that contributes to problem solving over time (Bohman 1996; Dietz 2003b; Healy 1997; Rydin 2003).

This strand of social research on environmental decision-making suggests the need for new institutions that embody principles of governance through democracy, competence and fairness to guide any policy or decision process on risk (Bohman 1996; Jasanoff and Martello 2004a; Rydin 2003; Stern and Fineberg 1996). In this decision-making model, key questions for policy include:

- Who is to make critical judgements to regulate or not, in what manner and on what basis?
- What conditions for decision-making and/or knowledge creation (and uptake processes) will ensure political legitimacy for global environmental policy decisions?

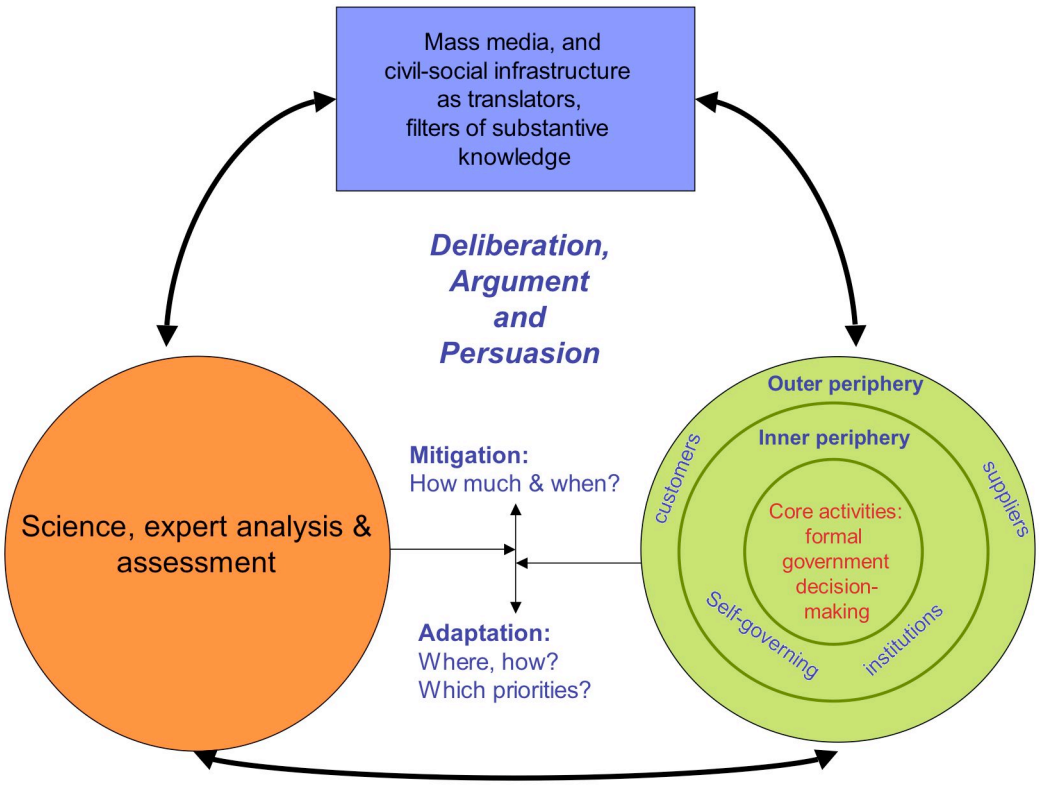
Communication issues become important in risk governance as any assessment or management decision requires significant understanding and judgement about technical and scientific issues. Judgements in particular are needed about what aspects of global environmental risk are potentially most harmful in different contexts. While only science and knowledge about nature can help to highlight systematic linkages between society and natural systems, non-expert viewpoints from the community of affected stakeholders can provide unique and invaluable insight to understanding risk in a local context, framing it as a locally meaningful policy problem and responding to it (Stern and Fineberg 1996; Wynne 1992a).

Policymaking on risk issues will necessarily embrace a range of normative choices about the "framing" of the risk problem, for example, to identify what dimensions of risk are most salient in the policy process (Kingdon 1984; Majone 1989; Schön and Rein 1994) (see below). How risk assessment is framed will determine the range and nature of management responses. Making such choices can only legitimately occur by seeking inputs from a wide range of experts and non-expert stakeholders to ensure that the framing used represents key interests of those most affected by decisions.

Stern and Fineberg (1996) advance a risk characterisation model of decision-making where risk assessment and risk management are inseparable. At the core of this model of decision-making is the creation of new deliberative policy spaces to facilitate the exchange of ideas and reason, and "back and forth movement" in a general process of interpretation, reflection and revision of understanding in the public sphere (Bohman 1996: 58). Conflict is seen as central and unavoidable in this process (Bohman 1996) and working as a means of enhancing solidarity and eventually collective action, by stimulating learning about the conflicting issues in a community context (Rydin 2003: 63). Exploring these concepts in an environmental planning context, Rydin (2003: 65) sees collaboration and deliberation as a distinctive form of environmental governance involving experiment, where "new outcomes are posited, based on new knowledge, joint thinking and previously unconsidered possibilities." In this risk characterisation model, dialogue and reflection move centre stage to interpret scientific information in ways that are meaningful to local contexts and decision-makers.

The role of different types of agents and institutions is central in Habermas' work on deliberative democracy and public decision-making. Focusing on institutional design and the cultural and societal dimensions of decision-making, it is possible to extend a Habermasian model of circuits of power (1998: 354) to highlight how deliberation and persuasion interact to mediate expert and other knowledge to inform decision-making (Figure 3.3). First is the "core area" of public decision-making, which includes formal governmental decision-bodies. Second is an "inner periphery" that operates close to the core and includes a range of institutions that have a degree of autonomy and self-governance functions. Third is the "outer periphery" of policy action, which encompasses a wider variety of "suppliers" of information and ideas for policy decisions and "customers" who are the target audience of decisions. To be legitimate, binding decisions "must be steered by communication flows that start at the periphery and pass through sluices of democratic and constitutional procedures…" at the (Habermas 1998: 356). This model emphasises the social integration function of public discourse and decisions, where the true outer periphery is part of the civil-social infrastructure of the public sphere, dominated by the mass media (see Table 3.1; Figure 3.3).

Figure 3.3: Circulation of Power for Public Decision-making on Climate Change



Source: author, based on Habermas, 1998.

Table 3.1: Habermas: Circulation of Power for Public Decision-making

Centre-Periphery Axis	Actors and circulation of power
Core area	Government administration, judicial system, parliamentary bodies: formal decision-making powers. Capacity to act varies with organisational complexity.
Inner-periphery	Various institutions equipped with rights and self-governance delegated by the state (i.e. universities, public insurance systems, professional agencies and associations, charitable organisations and foundations): informal decision-making powers, significant autonomy
Outer-periphery	Suppliers of ideas and customers and decisions: this includes experts, businesses, and consumers as well as the media; it is the civil-social infrastructure of the public sphere.

When applied to problems of global environmental risk, these strands of social research and theory point to new models of governance and *the* need for new institutions to facilitate the co-production of knowledge about global environmental risk (De Marchi 2003; Renn 2001). These models can also usefully focus on the global-local connections to underscore the centrality of "both the normative and the organizational structure of institutions" (Jasanoff and Martello 2004b). Jasanoff and Martello (2004b) call for improved transparency and self-awareness in institutional process and practices with attention to the "why" of problem framings; and how they capture local knowledges and practices. This model embraces expert knowledge as essential but moves beyond it, especially where risk and uncertainty prevail to underscore issues of social justice, social preferences and values in any policy choice. On questions such as climate change, opening up decision-making encourages public sphere activity through which the media, non-governmental organisations and other institutions interact with the core political process to "frame" the policy questions.

3.3.1. The role of the mass media in shaping understanding of climate change[23]

Related to the issue of policy discourse, and the Habermasian theory of deliberative democracy is the role of media to shape discourse, public perception and the call for social change (Habermas 1998). Media coverage does not tell people what to think however it is able to direct public attention toward specific policy concerns and in this way to influence agenda setting for social concerns and policy issues (Mazur and Lee 1993). Mazur and Lee (1993: 682) note that agenda setting by media players is not powerful per se, rather it is "limited to raising an issue to salience." Most viewers and readers will carry away simple images, thus it is also important to distinguish in media coverage between the "substantive" content and a "simple image", which is conveyed from visuals and from lead text in reporting (Mazur and Lee: 683). Cognitive psychology tells us that simple images repeated often become "availability heuristics" of real and potent danger (Mazur and Lee 1993; Tversky and Kahneman 1973). A similar notion is that of "affect heuristics" where affect refers to a person's feelings about a particular risk; when combined with images, this notion describes how a person may draw on experience and feelings to quickly bring meaning to an image (Leiserowitz 2006). Further, the "quantity of coverage theory" says that increased coverage turns public opinion in a negative direction – increasing the fear of environmental hazards or technology – whether the reporting of an environmental or technology issue is positive or negative (Mazur and Lee 1993). This implies, for example, that even when media coverage of

[23] This sub-section is adapted from a recently published article – see Corfee-Morlot *et al.* 2007.

global warming may report on the potential benefits of global warming in certain regions for agricultural crops or for people's lifestyles (i.e. fewer cold days), there is a tendency for lay publics to interpret this negatively.

A range of social research has shown that media coverage tracks key events on climate change and shapes discourse, understanding and action in the public sphere. (Hart and Victor 1993; Mazur 1988; Mazur and Lee 1993). Despite ongoing scientific and political debate, media attention to global warming has served to legitimize it as a public issue and to establish it as a mainstream concern within society. Certain actors, such as the scientific elite, have been adept in using the media to achieve desired ends (Hart and Victor 1993). Yet how issues are presented varies by the institutional position and biases of the particular media player(s) in question (Carvalho and Burgess 2005), and by disciplinary biases, such as the notion of "balanced" reporting (Boykoff and Boykoff 2004). The media operate through formal social and institutional means but they affect individual consumption and re-production of knowledge in the private sphere. Carvalho and Burgess (Carvalho and Burgess 2005) highlight the media's capacity to reflect social learning on climate change issues.

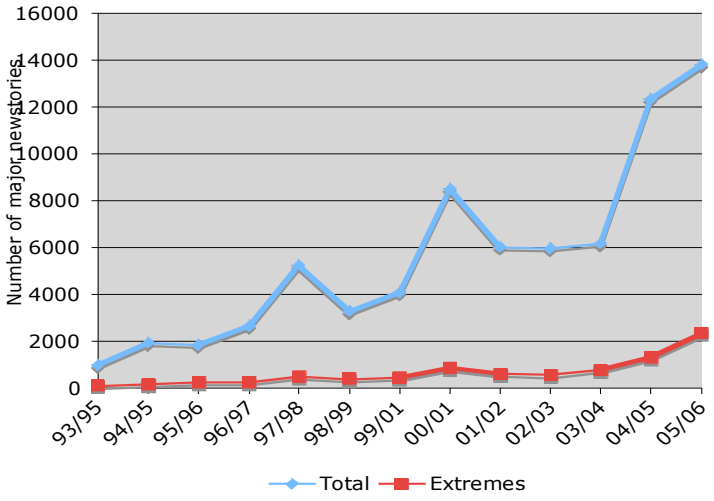
Figure 3.4 shows that worldwide major newspaper coverage of global warming has risen rapidly in the last decade. These data show that the quantity of media coverage tracks well with major international climate change developments such as in the international negotiations (e.g. 1997 Kyoto Protocol signature; 2001 US pulls out of Kyoto) and the release of major IPCC reports (e.g. 1996 and 2001). They also show the influence of major weather-related extreme events, such as the Hurricane Katrina late in 2005. Yet reporting that links climate change with shifts in patterns of extreme events has risen only slightly in recent years as a share of total global news coverage of climate change, suggesting that reporting of major world new services has followed the lead of the scientific community to be cautious about making these links.

Perhaps more powerful than newspaper coverage, are other forms of media that rely on visual information, such as film, television and the internet. Recently researchers have studied the effects of the Hollywood blockbuster 2004 film The Day After Tomorrow. With a huge viewing public (estimated at 21 million people in the U.S. alone), The Day After Tomorrow was a commercial success and also appears to have helped to promote climate change from an obscure scientific issue to one of popular public concern (Leiserowitz 2004; Reusswig and Leiserowitz 2005). Leiserowitz, Reusswig and others surveyed public opinion in several different western countries and concluded that the film shifted public risk perceptions on climate change amongst the viewing public. In addition, in 2006 media coverage in glossy magazines began to

convey a sense of urgency about climate change (e.g. Vanity Fair, May 2006, and Time magazine, April 2006).[24]

Ungar (1992) and others have shown how public awareness on climate change is enhanced through chance events or "scares", such as experience of extreme weather events of droughts or heat-waves or, alternatively, independent events in linked areas (Mazur and Lee 1993; Ungar 1995; Ungar 2000; Ungar 1992). Examples include the energy crises in 1973 and 1979, which heightened attention to energy-climate linkages, and the discovery of the ozone hole in the mid-1980s, generally raising awareness about the potentially destructive nature of human activities for the global atmosphere (Corfee-Morlot *et al.* 2007). The occurrence of events such as the European heat wave in 2003, and Hurricane Katrina in 2005, may have contributed in recent years to the growth in media attention by the popular press to climate change.

Figure 3.4: Worldwide newspaper coverage of climate change and extreme events linked to climate change, 1993 to 2006, number of major newstories



Source: author from data in Lexis-Nexis 2006.

Finally, widespread media coverage of climate change has also been stimulated by the international release of the documentary film An Inconvenient Truth by Al Gore[25] and by a growing number of television documentaries on climate change (e.g. "60 Minutes", ABC News and HBO documentaries in 2006).[26] This rise in "visual" media coverage in the last decade –

[24] Time magazine of 3 April 2006, where the cover page headline read: "Special Report: Climate Change - Be Worried, Be Very Worried".

[25] In 2007 both Al Gore and the Intergovernmental Panel on Climate Change won the Nobel Prize for Peace due to their contributions on climate change. This award attests to the general recognition of climate change as a social priority and to the links between climate change and long-term social stability of civilisation.

[26] For details and internet resources on each of these, see www.net.org/warming/earthday.vtml [accessed 6 June 2006].

including images of melting mountain glaciers and Arctic ice sheets, stranded polar bears and flooded river basins and coastal zones -- suggests a dramatic rise in the "availability heuristics" for promoting public understanding of climate change.

These examples illustrate the influence of the media as part of the civil-social infrastructure to act as translators or filters of substantive expert knowledge. One important dimension of a global environmental risk governance model is the access and engagement of the media on different dimensions of the policy problem and its possible solutions. Non-governmental and governmental actors may also influence the media's uptake of global environmental issues by cultivating their engagement.

3.3.2. Agency, networks, sub-politics and scales in governance

Emergence of climate change in the public sphere to date has been shown to depend on the interaction between science, the media and other social processes, including filtering through various networks of elite actors and institutions across the political system (e.g. Corfee-Morlot *et al.* 2007; see also Liverman and O'Brien 2001). Epistemic communities of experts have been influential in the emergence of climate change as a policy issue in different contexts (Agrawala 1998; Hart and Victor 1993; Mazur and Lee 1993). Such a review also highlights the influence of sub-politics in global environmental decisions and its interaction with mainstream politics, as well as more generally the interaction between politics, expert knowledge and different actors of influence across different scales of governance. This influence is labelled "sub-political" (Beck 1992a) because it is not necessarily formally operating in the public sphere but may be weaving back and forth between the public and the private sphere. Cities are one prominent example where networks of non-state actors and sub-politics are playing an influential role.[27] These patterns put emphasis on "governance" rather than on "governments" as a centre for social research on global environmental change and decision-making.

As noted above, actors influencing the climate policy process can be identified in at least four key areas: state (government), market (business and business institutions), science (or other expert actors, including research institutions), and civil society, which encompasses the media as well as social movement organisations. In the environmental policy area non-state actors and institutions have played an increasingly large role in shaping practices and outcomes, most notably in the

[27] For cities it is useful to look at the ICLEI – International Council for Local Environmental Initiatives – climate protection campaign as an example of environmental networks at this scale (Betsill and Bulkeley 2004; Bulkeley and Betsill 2005; Lindseth 2004).

form of environmental social movement organisations, by championing ideas and providing platforms for dialogue and debate (Bramwell 1989; Brulle 2000; Carpenter 2001; Gough and Shackley 2001; Yearley 1994). Aside from scientists and expert communities, other examples of powerful non-state actors include those from the business community (Falkner 2003; Levy and Newell 2005; Newell 2000). In the expert area, science and economics have typically played a dominant role in environmental policy processes (Layzer 2006) and this has also been true on the issue of climate change (Hart and Victor 1993; Kwa 2001; Miller and Edwards 2001a).[28]

More specifically, within the realm of science actors, Haas (1990) developed the notion of epistemic communities to include authoritative experts, collaborating on a transnational basis, from both within and outside of government and international organizations of influence, to affect policy change. He defines an epistemic community as:

> *...a professional group that believes in the same cause-and-effect relationships, truth tests to assess them and shares common values. As well as sharing an acceptance of a common body of facts, its members share a common interpretive framework, or "consensual knowledge," from which they convert such facts, or observations, to the policy-relevant conclusions.* (Haas, 1990: 55).

Epistemic communities on global and regional environmental issues have been shown to operate across national boundaries to frame and establish cooperative responses to international environmental problems, most notably climate change (Agrawala 1998; Haas 2004). Although it is well established that epistemic communities are an important part of international climate policy processes, less well explored are how such communities interface with national or regional policy processes.

Overall many have argued that the authority of state actors is considerably weaker today than it has been in the past on issues of public concern (Sathaye *et al.* 2007). On climate change, non-state actors have been increasingly influential and part of the transnational epistemic networks that convey understanding and connect actions on these issues across scales of governance (Betsill and Bulkeley 2004; Blowers 1997; Levy and Newell 2005; Paterson *et al.* 2003). Both Hajer (1995) and Fairhead and Leach (2003) also point to the formation of coalitions of actors that cut across these conventional groupings to work towards common

[28] In a separate article, developed in the course of this research, I trace the role of these different networks of actors over time in the movement of the issue of climate change from an obscure scientific issue to a priority policy issue in the United States. See Corfee-Morlot et al. 2007.

endpoints on environmental issues based on common discourses or framings and interpretations of the problem at hand. These networks of largely non-state social and corporate actors point to the emergence of a sub-politics of climate change that works across scales of governance, wielding power to influence policy and decision-making in the political system (Bulkeley 2001; Bulkeley and Betsill 2005; Lindseth 2004).

In climate change, a key governance challenge is how to create and extend networks to support the wide range of actions needed. Lindseth (2004) suggests that there is value in leaving a "margin of negotiation" for individual actors to engage with and help spread an idea, statement or understanding on an issue like climate change (citing Latour 1987). Thus the ability to link climate change to different sectoral issues allows climate change issues to be taken up and transformed by different individuals or groups with different purposes, each looking through their preferred lens. However, Lindseth notes the ultimate challenge in the words of Latour is to establish wider networks to "make many act as one" and to keep "informants on your side while they are far away" (Lindseth 2004, citing Latour 1987:234).

The physical, transboundary nature of global environmental change establishes an unspoken imperative for collaborative, multilevel governance in modern society, where nation-states are increasingly required to act in collaboration with other nation-states, with sub-national or local governments and with non-state partners to influence the course of climate change and other global environmental problems (Biermann and Dingwerth 2004; Vogler 2003). A growing number of studies show how global environmental governance is operating across multiple scales of decision-making (Betsill and Bulkeley 2004; Levy and Newell 2005; Vogler 2003). Some indicate the natural formation of epistemic communities that operate across national boundaries from local to international scales (Fairhead and Leach 2003; Haas 2004).

Although not specific to climate change, David Vogel has documented examples of coalitions of non-governmental actors working from national and sub-national positions of power to strengthen environmental and consumer regulation through nation-state influence in multilateral trade relations. A central force is what Yandle (Yandle 1982) has called “Baptist-bootlegger coalitions,” where different types of actors join together to strengthen regulations to deliver public goods for different reasons. The original reference describes the Prohibition era coalition between the Baptists on the one hand opposing sale of alcoholic beverages for religious and moral reasons, and the bootleggers on the other hand, opposing sale so as to maintain market position and high prices for bootleg alcoholic beverages. Looking across multiple modern examples of such coalitions, Vogel highlights at least three different scales and institutional avenues of action in the context of increasingly global product markets (Vogel 1995; Vogel 2003). First, at national or

sub-national scale, political interests combine to enact strict regulatory standards to create new markets where local firms profit. Second, where export-oriented businesses work through national authorities to influence broader domestic and supra-national regional regulations and markets for their "superior" products (e.g. from a state to multi-state level in the US; from national to EU-wide regulations in Europe). Third, working through national authorities to influence international agreements that recognise and endorse stricter regulatory standards (e.g. as in the case of US support for the Montreal Protocol). Vogel (1995) uses California vehicle regulations as a specific example where the Baptist-bootlegger coalition drove changes in the vehicle market, which eventually had international market influence, referring to this as a "California effect."

This raises the issue of multilevel governance as a central part of the policy approach that has arisen in the public and private sphere on climate change and other issues. As noted in Chapter 2, questions arise about where best to situate public authority and responsibility for climate policy decision-making (i.e. at what tier of government? National, sub-national, community level?) as well as to what extent specific aspects of the climate problem can be best managed through issue-based mechanisms (e.g. through water districts or energy associations that work across multiple local jurisdictions) (Foster 1973; Hooghe and Marks 2003). An important question is what drives action and innovation at sub-national levels and to what extent this action is anchored in federal authority or support (Gray 1973).

Multilevel governance on climate change must also be seen in the broader context of globalisation of economic, political and social relations and increasingly complex, overlapping and nested institutions for the oversight of these relations (Biermann and Dingwerth 2004; Dietz *et al*. 2003; Powell 2007). Governance practices inevitably must embrace a range of different types of state and non-state actors and work across scales of action. Particularly in the context of an increasingly globalised world, it is possible to imagine the results of regional policies and decisions to "filter up" to affect national or international deliberations and decisions, as well as to "filter down" or "filter over" to influence local level or other local level deliberations on climate change (Bulkeley and Betsill 2005; Harris 2001; Shackley and Deanwood 2002).

3.3.3. Social practice model of governance

The foregoing suggests the power of a social-practice model of governance over environmental problems, which sees "culture, norms and habits as sources of behaviour" (Young 2002:29; see also North 1990; North 2005; Ostrom 1990; Powell and DiMaggio 1991). This model is anchored in historical and "new" institutionalism, which sees institutional theory as a theory of change as well as of stability, and one that aims to understand how outcomes occur, who and what affects

outcomes and why? Steinmo (2001) highlights that in their simplest form, institutions are rules. Powell and Scott bring attention to the social and political environments that shape organisations and decision-making through rules, beliefs and conventions (Powell 2007; Scott 2007).

This social-practice model can be contrasted with rational actor or techno-rational models of decision-making – or those referred to by Young as "collective action" models – that treat decision-makers as "utilitarian" and economically rational thinkers, seeking to maximize individual utility (Dietz 2003b; Sagoff 1988; Young 2002). Utilitarian models focus on stability of systems, are more deductive and aim to predict outcomes or change, rather than attempting to understand change (Steinmo 2001). A social-practice model also recognizes a causal role for institutions to shape behaviour of actors and organisations with respect to any particular field or sector of action – or the endogenous nature of norms, beliefs and rules (Powell 2007; Powell and DiMaggio 1991; Young 2002). In this conceptual framework, climate change can be seen as an emerging field of action where such debate is occurring and institutions are rapidly developing to shape, knowledge production and consumption, decision-making and outcomes. Such institutions are not fixed over time, but rather evolving along with the ongoing competition of ideas to find consensual framing of the problem and its solutions.

Regarding global environmental problems, a social-practice model highlights the role of institutions to facilitate the development of "common discourse" about issues, and help to create social practices and routines that direct behaviour in ways that lead to collective well-being. Repeated interaction and building of trust and reciprocity, as observed in environmental planning processes, can both change incentive structures as well as how actors respond to these (Rydin 2003). Institutions can help to build social capital and transform strategies into norms and routines (Rydin 2003; Ostrom 1990). Moreover, institutions that ensure deliberative practices can contribute to the shaping of pro-environmental behaviour (Dietz 2003a; Dietz 2003b). Institutions, in this way, can be a source of change and lead to a form of "communicative rationality" in decision-making (Healy 1997; Rydin 2003), helping to build trust and social capital over time to create new social norms and values with respect to contested environmental issues (Ostrom 1990; Ostrom 2000a; Rydin 2003).

New institutional research has also pointed to "contested, multilevel aspects" and to "critical junctures" of institutional change as a means to study and to understand how broader social reform occurs (Powell, 2007; see also Dietz *et al.* 2000). For example on climate change, Miller (2000) argues that the primary input from the scientific community to policy discussions since the 1990s are derived from international research and IPCC's scientific assessments, which focused on prediction of the global climate and centred on GCM modelling results. In this context

understanding of – or ability to predict - regional climate change and its impacts is limited. However, through a variety of other disciplines and institutions, such as meteorology and climatology, there is significant institutional capacity and understanding of how human systems interact with the climate over time. With adaptation emerging as a central policy priority at different scales of governance, this interest may call for a different more local policy framing and hence type of knowledge network to inform decision-making than that found in the global modelling community (Miller 2000). Dealing with mitigation at regional scales may also challenge the usefulness of a focus of global predictions alone and require a meaningful framing of mitigation issues in national or sub-national decision contexts.

Given the multilevel governance dimensions of climate change as a policy problem, a central research challenge in this area is to understand how tension is resolved over contested meanings and frames for interpretation in any decision-making context (within and across scales) across a wide range of relevant actors and organisations.

3.4. Interpreting knowledge, constructing argument and social learning

Consistent with the social-practice model, Rosa and Dietz (Rosa and Dietz 1998) highlight that one major strand of social research on climate change emphasises historical, political, cultural and social context as a means in itself to bring public recognition and scientific prominence to an issue (Carvalho and Burgess 2005; Hajer 1995; Hart and Victor 1993; Mazur and Lee 1993; Miller and Edwards 2001a). With respect to scientific knowledge and information, this strand is not concerned with the relevance of scientific discovery but with how substantive endpoints come about and with what influence science, amongst other information and factors, has on these. This research project is situated within this conceptual context, focusing in particular on climate change decision-making and policy at the regional scale. Interpretation and argumentation is central to any policy process on the global environment. This section explores social research on how different types of information and knowledge are used in decision-making processes to frame the problem and its solutions, and when and how information and knowledge have influence.

3.4.1. Frames, storylines and narratives in the policy process

Storylines and narratives in policy analysis underscore contextual understanding of physical and social phenomena that are being addressed through policy (Hajer 1985: pp.70-72). Policy narratives or storylines have beginnings, middles and ends and are especially relevant where the policy issue is characterised by uncertainty, complexity and polarised viewpoints (Roe 1994:2). In the area of environmental policy, Hajer highlights the use of storylines as well as metaphors or

metonyms in discursive strategies to mobilise actors and policy discourse around these.[29] Metaphors and metonyms are commonly used in language to convey understanding of our experience (Lakoff and Johnson 1980).[30]

The notion of "policy frames" relates to narratives but goes further to suggest that there is a base of evidence that transforms the story from a simple storyline to a belief structure or worldview (Miller 2000; Schön and Rein 1994). Schön and Rein (1994) define the notion of frames to refer to differences in underlying belief structures, whereas Miller (2000) broadens the term to refer to different "world views" amongst communities of people (see also Box 3.1). Roe (1994: 3) also notes that if a policy narrative is in the form of arguments, they will "have premises and conclusions". Further, the existence of competing narratives or policy frames suggests that there is no single, correct interpretation of the "facts" – rather there are facts upon which policy decisions will ultimately be constructed through careful argument and reasoning that, in the case of environmental policy, draws upon but is not limited to scientific assessment (Herrick 2004; Majone 1989). While Hajer's focus is on the argumentative approach and on the use of language and discourse in that process to shape interests over time, Schön and Rein's use policy frames to suggest that they reflect a deeper meaning and belief structure (see Box 3.1).

Box 3.1: Frames and Framing

Frames: Schön and Rein (1994: 23) define frames as: "*Underlying structures of belief, perception and appreciation"; "policy positions rest upon these frames.*"

Miller (2000: 211) develops a slightly different definition of frames defining them as: "Perceptual lenses, worldviews or underlying assumptions that guide communal interpretation and definition of particular issues."

Framing: A means to stabilise "*frames of meaning*" around otherwise uncertain, complex and polarised science-policy issues (Roe 1994; Miller 2000).

In particular, Schön and Rein (1994) use the notion of "frames" and "frame reflection" to highlight the ability to shift and change frames over time in the policy process, such that intractable policy controversies can be resolved. They demonstrate how policy problems become intractable not only when there are varied or conflicting interests of different actors but when

[29] For example, Hajer (1985) outlines emblems in environmental discourse over the last 150 yrs ranging from deforestation, destruction of wilderness (in the US) or of the countryside (in the UK) at the end of the 19th century to the emergence of global environmental issues such as climate change and ozone in the 1980s.

[30] Lakoff and Johnson (1980: 36) define a metaphor as "principally a means of understanding one thing in terms of another where its primary function is understanding", whereas metonym serves a referential and understanding function, noting "it allows us to use one entity to stand in for another."

actors in the policy process have different frames. They see: "….policy controversies as disputes in which the contending parties hold conflicting frames. Such disputes are resistant to resolution by appeal to facts or reasoned argumentation because the parties' conflicting frames determine what counts as a fact and what arguments are taken to be relevant and compelling. … the frames that shape policy positions and underlie controversy are usually tacit, which means they are exempt from conscious attention and reasoning" (Schön and Rein 1994: 23). They argue that frame reflection is a means to break open deadlocked negotiations; it is a means for people "to reflect on and learn about the game of policymaking even as they play it" (Schön and Rein 1994:37).

In Schön and Rein's view (1994) active frame reflection can lead to a reframing of the policy debate and argument so as to permit resolution of conflict. In the area of climate change, a variety of different frames exist ranging from a frame that presents climate change as a problem of global environmental degradation, where the world is broadly at risk from human activities, to one of local disaster management where there is increasing ecological risk to human society to be managed over time (Miller 2000). Another possible frame is the definition of climate change as an energy problem where technological management is a key to resolving it (Miller 2000; Lindseth 2004). Schön and Rein have shown that changes in the framing of seemingly intractable and contested policy problems can enable policy solutions to be found, despite initial disagreement and controversy. Miller (2000) and Schön and Rein (1994) show that the use of policy frames is a dynamic process that both interacts with and affects the interests of different stakeholder groups over time.

While different in their emphases, Hajer (1995) and Schön and Rein's (1994) approaches both aim to understand how and why change occurs in the policy process. Both consider that shifts in argumentation about a policy issue interact with agency (i.e. different actors and organisations), with structure (i.e. what is "fixed" and what is not in an argument) and with interests to influence change over time (Hajer 1995; Schön and Rein 1994). Also in each approach, interest or belief structures are not immutable but can change over time, in part influenced by shifts in the argumentation that accompanies an issue.

Majone's (1989) work, though earlier, supports the view that the discursive process can influence beliefs and norms over time. He highlights the central role of interpretation, argumentation and persuasion in "good" policy analysis. Majone compares argument in policy process to the Greek concept of dialectic, stating that good policy analysis should provide the basis for public discourse and debate to arrive at good or acceptable policy outcomes as well as outcomes that will be implemented. Using the notion of "evidence" Majone notes that rules for what constitutes

allowable evidence will depend upon the audience and the policy context and that quantitative analysis must be complemented with persuasion and argument. In this view, "decisionism" or formal quantitative policy analysis, is of little use in the policy process on its own. Policy analysts use rhetorical and dialectical skills "to define a problem according to various points of view, to draw argument from many different sources, to adapt the argument to the audience and to educate public opinion" (Majone 1989: 13). Focusing on the policy process rather than on outcomes, it is possible to see the function of argument in the policy process as shifting the boundaries of what is possible, shaping values and attitudes about what is fair and acceptable (Majone 1989). Further, what is fair or acceptable is shaped by people's attitudes and these attitudes are likely to shift based on dialogue, policy analysis and evidence over time.

3.4.2. How and why does change in policy occur?

In addition, to argumentation and frame interpretation in the policy discourse, a number of other concepts are also useful to study how and why change occurs in the policy process. Hall (1993) and Kingdon (1984) highlight the role of ideas and the generation of policy alternatives, problem definition or agenda setting, identification of key agents of change such as "policy entrepreneurs" and "visible participants" and "policy windows", each of which are briefly outlined here. Importantly, Hall (1993) shows that ideas are central to policymaking and to underlying policy paradigms thus debunking political theories that focus uniquely on political interests and their relationship to the state. He notes that new ideas are developed and promoted through deliberation (Hall 1993; also citing Anderson 1978). Anderson relates discourse and deliberation to the evolution of ideas when he said: "deliberation takes place within the realm of discourse"; he also said that policies must be based on a "system of ideas and standards which is plausible and comprehensible to the actors involved" (Anderson 1978).

Kingdon (1984) highlights the importance of two different yet parallel and intertwining parts of the policy process: agenda setting and the definition of policy alternatives.[31] As noted in Chapter 1, problem definition, politics, and participants in the policy process are shown to be the most significant determinants of "agenda-setting", which refers to why a particular problem is added to the agenda or not (Kingdon 1984). Difficulties are only defined as a policy problem if something can be done about it, and as such there is a direct link to policy alternatives (Kingdon 1984; Wildavsky 1987). More specifically Wildavsky states (1987: 42) that analysts "… understand

[31] This is an expansion of the Cohen, March and Olsen "garbage can model" of organisational choice and decision-making (Cohen *et al.* 1972; March and Olsen 1984; Olsen 2001).

problems only through tentative solutions that take on the character of programs linking governmental resources with social objectives."

Yet there remains the question of why and how some problems are identified, advanced and dealt with in the policy process over others? Research suggests that reasons vary for the rise and fall of problems on the public agenda. These include changes in the conditions that define the problem itself or in the way people respond to the condition (Kingdon 1984). For example, people may become accustomed or accepting of the conditions, for example, if government fails in its attempt to deal with the problem. Also attention to any issue is likely to be cyclical and either wane or rise depending upon a range of confluent factors (Downs 1972; Kingdon 1984). In the case of climate change, social and political processes have interacted with treatment in the media and a growing and increasingly consensual body of scientific evidence to mediate understanding, concern and the level of attention to climate change in the public sphere (Corfee-Morlot *et al.* 2007).

Both politics and participants have been shown to interact with problem definition to determine when and in what way a particular problem is advanced as part of the policy agenda (Kingdon 1984; Grindle and Thomas 1991). "Policy entrepreneurs" play a special role in bringing public attention to new issues (Kingdon 1984: 198; Hart and Victor, 1993). Kingdon states that policy entrepreneurs "…invest considerable resources bringing their conception of problems to officials' attention, and trying to convince them to see problems their way." While Grindle and Thomas (1991) highlight the role of policy elites to frame issues, shape policy processes and guide policy change, Kingdon's work also highlights that "visible participants" may be either political leaders in government or in influential non-governmental roles. These conclusion is consistent with reviews that focus on how climate change emerged as a policy issue, where the promotion of climate change in the public sphere is shown to be closely linked to policy or issue entrepreneurs (Corfee-Morlot *et al.*, 2007; Hart and Victor, 1993). Perhaps a main difference in the climate change arena is that entrepreneurs have been drawn not only from the political arena but also from the scientific elite and shown to work closely with the mass media to generate political attention to the issue (e.g. see [Hart and Victor 1993; Mazur and Lee 1993]).

After Kingdon (1984), "policy windows" also allow the unique coupling of problems with solutions to events either related to the problem or to the political stream. On the problem side, there may be crisis or a media-worthy event that brings the problem to the centre of public attention. An example on climate change is media attention to extreme weather events; for example, the 2003 heat wave or Hurricane Katrina in 2005, raised media, public and political attention to links between a changing climate and the frequency and intensity of such events in the

future. On the political or solutions side, a change in administration may bring about a shift in philosophy and a call for change from previous status quo policies. Thus another example of this type of policy window is the next President of the United States, who -- joined by the US Congress – is expected to take an international and national leadership position on climate change.

3.4.3. Social learning in context: argument, interpretation and policy paradigm shifts

Beyond understanding how argumentation is constructed and triggers of change occur, another important question in the study of the policy process is whether learning occurs and if so how? Some research highlights that in any environmental policy process, discourse, storylines or "narratives" are part of a larger dynamic process of social learning (e.g. Hajer 1995; Rydin 2003). Peter Hall developed the notion of policy paradigms in the context of political science assessment of policy change (Hall 1993) and integrated it with an understanding of policymaking as part of a process of social learning.[32] Hall also investigates concepts of learning and social learning as a situation where change is a function of past experience; he defines social learning as experience-based learning in the local context for policy (Hall 1993) (see Box 3.2).

Hall's work identifies three types of policy changes as relevant to understanding social learning, but only the third type is transformative. First order changes or adjustments are applied to existing policies; second order changes represent a shift in implementation strategy; and third order changes are characterised as a full shift in the policy paradigm (Hall 1993). The shift in policy paradigm change described by Hall is relevant to Schön and Rein's (1994) frame analysis where they show that shifting frames can lead to resolution of otherwise intractable policy controversies. Table 3.2 relates Hall's notion of change in policy paradigms to other literature reviewed here.

The notion of policy paradigms can be used as an interpretive framework for understanding policy change (see Box 3.2; Hall 1993). Hall compares policy paradigms with Kuhn's notion of scientific paradigms (Kuhn 1962), where a particular narrative becomes dominant (as opposed to a particular set of scientific practices based in a particular discipline). Policy paradigms are never fully commensurable, as Hall states: "Because each contains its own account of how the world facing policymakers operates and each account is different, it is often impossible for the advocates

[32] The origin of policy as social learning is found in Heclo's political science work on theories of the state as well as Argyris & Schön, and Nye's work on organizational behaviour. See: (Argyris and Schön 1978; Heclo 1974; Nye 1987).

of different paradigms to agree on a common body of data against which a technical judgement in favour of one paradigm over another might be made" (Hall 1993:280). In this way policy paradigms are similar to the frames that are described in the work of Schön and Rein as well as Miller (see above).

Table 3.2: Shifts in the policy paradigm (adapted from Hall 1993 and other authors as cited)

Description	Principal agents / means of change	Relevant conceptual background
Shifts in underlying goals and hierarchy of goals for policy – these are shifts in the fundamental policy paradigm, which is driven by: 1) a sociological process of shifting balance of political interests; 2) shift in locus of authority; 3) necessarily entails changes across all dimensions of policy (goals, instrument choice, level and scope of application in instrument)	Anomalies in the policy experience compared to reigning paradigm; policy failures or external events presenting unforeseen challenges Power of new ideas, wide range of political and social forces & actors (state and non-state) influence outcomes, including the media. Socio-political system is a directly central force in mediating outcomes	Hall, 1993: policy paradigm shifts and social learning as fundamentally different from state-centric models; emergence of new "issue network" or "policy network" to advocate new ideas (after Heclo 1974; Smith 1987). Hall, 1993; Kingdon, 1984: Puzzling & powering combine - state-structural approaches where politics and social forces combine – non-state actors are important. Schön & Rein, 1994; Majone, 1989: discourse/narratives, argument, interpretation and persuasion as powerful forces. Majone, 1989: policy change occurs through persuasion and argument; interacts with ideas, shifts in public opinion

Social learning is defined here as part of a dynamic process, involving an exchange between knowledge, discourse, goals and purposes where there is a deliberative attempt to adjust goals or techniques of a policy process to reflect past experiences (Jasanoff and Wynne 1998). This moves beyond Hall's more narrow definition (see Box 3.2) (Hall 1993). Further as Rydin states (Rydin 2003): "Social learning does not necessarily mean consensus about framing the issues or about policy responses, but rather conscious effort to understand conflicting points of view and interest, to build trust and social capital to continue to work among participants towards improved outcomes."

Given the complexity and the scientific uncertainty surrounding the issue of climate change, improved institutions to facilitate social learning might establish stronger co-constructions of the

problem, greater trust and understanding about it amongst a wider community of people, encompassing both scientists and lay-public groups (Jasanoff and Martello 2004a; Jasanoff and Wynne 1998). Jasanoff and Martello (2004b) argue that national or sub-national action on climate change offer the potential to create a dynamic process of social learning and increase "local" knowledge about the nature of the climate problem and how to deal with it in a variety of different contexts.

Box 3.2: Learning, social learning and policy paradigms in policy processes

Learning: "*Learning is conventionally said to occur when individuals assimilate new information, including that based on past experience, and apply it to their subsequent action.*" (Hall 1993: 278).

Social learning: **"***a deliberate attempt to adjust the goals or techniques of policy in response to past experience and new information. Learning is indicated when policy changes as a result of such a process*" (Hall 1993: 278).

Policy paradigms: "*…policymakers customarily work within a framework of ideas and standards that specifies not only the goals of policy and the kind of instruments that can be used to attain them, but also the very nature of the problems they are meant to be addressing*" (Hall 1993: 279).

3.5. Concluding remarks: an analytical framework

This research is situated within a broad conceptual framework that is anchored on the co-construction of knowledge and understanding that is encouraged through dialogue and open debate among a range of actors including the media and other non-governmental, lay actors. Further, argumentation and framing of expert information in combination with local insights and knowledge helps to establish meaningful interpretations of science at more local scales of decision-making. It suggests that the active co-construction of common interpretive frameworks can guide decision-making on global environmental policies and social learning. Another strand of research addresses questions about how and why decisions are made. This points to a "social-practice model" of global environmental governance, where culture, norms and habits are understood to be sources of behaviour (Young 2002). In this model, institutions are also central to channel interactions amongst diverse actors to ensure that democracy, competence and fairness prevail in policy decisions. A starting point is recognition that the emergence of climate change in the public sphere confirms the intimate relationship between science and society and the role of socially-mediated pathways to understand and use science in decision-making (Corfee-Morlot *et al.* 2007; Jasanoff and Wynne 1998; Redclift and Benton 1994).

Chapter 1 highlighted the four drivers of change that were used to structure the interpretive analysis of interview data. These are summarised in Table 3.3 and further developed here based on the foregoing conceptual literature. Table 3.3 also identifies a range of research questions

associated with each of these drivers of change, highlighting issues of regional context and more generally issues of scale so as to flesh out relevant findings from the research.

These drivers for policy change encompass the use of storylines, narratives or policy frames, the role of science and other expert knowledge, institutions and agency, and turning points in the policy process as parallel means of shaping change. The drivers are "tested" in the research to assess if indeed they are important to understanding climate policy change as it has occurred in California. Assessment of these drivers should also help to inform answers to the main research questions that are raised in Chapter 1: What triggers policy action on global climate change at regional scale? What arguments and lines of evidence underlie the policy discourse at regional scale? How do "winning" arguments gain salience? does regional action make a difference to broader scale climate policy?

Table 3.3: Analytical framework for research on regional climate policy processes

Drivers of change	Supplementary research questions
i) Frames and agenda-setting to define problems	What are the frames in use in regional climate policy processes to define the climate change problem and possible solutions, and how do these differ from those in use at larger scale (*i.e.* internationally and nationally)? How do these frames represent different interests or objectives, how do they relate to each other and what do they imply for progress in policy implementation on climate change more generally?
ii) Argument and evidence, the role of interpretation of knowledge, ideas in the policy-process to propose alternative solutions	What role of argument and evidence and how does understanding of these circulate through governments, elite actors and the policymaking process? Particularly important is the "system of ideas" that support change in policy paradigms; these are inevitably accompanied by different sets of evidence, shifting argumentation, and eventually different set of policy alternatives. What are they and are they context specific (i.e. local) or more generic in origin?
iii) Focusing events or policy windows	What focusing events or policy windows have influenced the policy process or outcomes at regional scale? Who capitalises on these and how is this done to influence the policy process and outcomes? How do these policy windows connect to national and international scale policy developments?
iv) Agency, structure and institutional design, and interests	What role and influence of different social actors and institutions (*e.g.* in practice of law, politics, science and social movement organisations or structure of formal decision-making processes) in establishing stable framings for climate change policy in regional context? How do these agents of change and their interests at regional scale interact with and influence similar processes at other scales of governance?

Part II: California - Context & Empirical Analysis

4. CALIFORNIA CONTEXT FOR CLIMATE POLICY

4.1. Introduction

In late 2003, Governor Schwarzenegger's won an extraordinary recall election over incumbent Gray Davis. A key election issue was California's poor state of fiscal affairs, a situation that had been brought on in part by the electricity crisis a few years earlier. Energy, environment, and climate change in particular, were an important part of Arnold Schwarzenegger's campaign platform. Once elected, many expected the Governor to announce targets for greenhouse gas emission reductions within his first year in office (Alvord 2006i). He did eventually announce greenhouse gas emission targets but only on 1 June 2005 (California 2005a) and this was the beginning of a broad-based initiative to establish comprehensive state-wide policy.

Shortly after the Governor's Executive Order in 2005, the California legislature began work in earnest on the Global Warming Solutions Act (also known as Assembly Bill 32 or AB 32), which would codify the 2020 target to return greenhouse gas emissions to 1990 levels by 2020. The Global Warming Solutions Act passed in September 2006, establishing the basis for a broad and long-term framework for climate policy in California.

Key questions for this research are: Why did California take these extraordinary measures? Why would a state or other sub-national authority see it in their interest to move policy forward on a global environmental issue?

This chapter provides the backdrop for the California climate policy case study. It lays out the empirical context for California's emergent climate change policy, starting with the state's geography and its economic backdrop for policy as well as the general political context for public policy decision-making. It moves on to review the principal sources and trends of California's greenhouse gas emissions and the likely effects or impacts of climate change in California. The latter part of the chapter briefly summarises recent developments, which mark the emergence of a clear, broad-based state-wide framework to address climate change.

4.2. Economic and geographic context

California's diverse large area, population and economy and its diverse geography, make the state somewhat unique in the United States. Its large economy and diverse population is founded upon a physically large and diverse land area with large discrepancies in access to freshwater. Built

infrastructure has been essential to the development of the West. California in particular has benefited from large public (Federal and state) investments in water supply and transportation infrastructure from the time of its statehood to today.

4.2.1. The people and the economy

California was a frontier economy until 1848 when John Marshall accidentally discovered gold on the South fork of the American River (Bean 1968, p. 108). The "Gold Rush" era marked the beginning of large movements of people and of economic development from the East to the West in the United States. By 1870, California's population is estimated to have more than tripled compared to several decades earlier (Bean, 1968: 197). This demographic and economic expansion was accompanied by a successful push toward statehood when California became the 31st state in the Union in 1850. The state's economy and population has continued to boom since this time, with the economy quickly diversifying away from gold to become the largest agricultural economy in the US as well as the home of a vibrant "high-technology" industry, among other activities. California has the largest population and economy of any US state[33,34] and its economy ranks among the top 10 of the largest nation-states of the world (see Figure 4.1).

Key historical events that led to this phenomenal growth include the opening of the West by the Federally subsidised transcontinental railway, a project that was completed in 1869. This connected California to the rest of the nation, but in particular to profitable markets in the then more heavily populated eastern U.S. (Bean 1968; Starr 2005). The following several decades saw the rapid growth of the economy, urban populations in the northern part of the state, as well as of excessive political power and corruption yielded by "railroads, corporations and large land owners" (Starr 2005: 129). The 1870s was the gilded era of ultra-capitalist expansion in California, facilitated by Federally subsidised growth as well as graft.

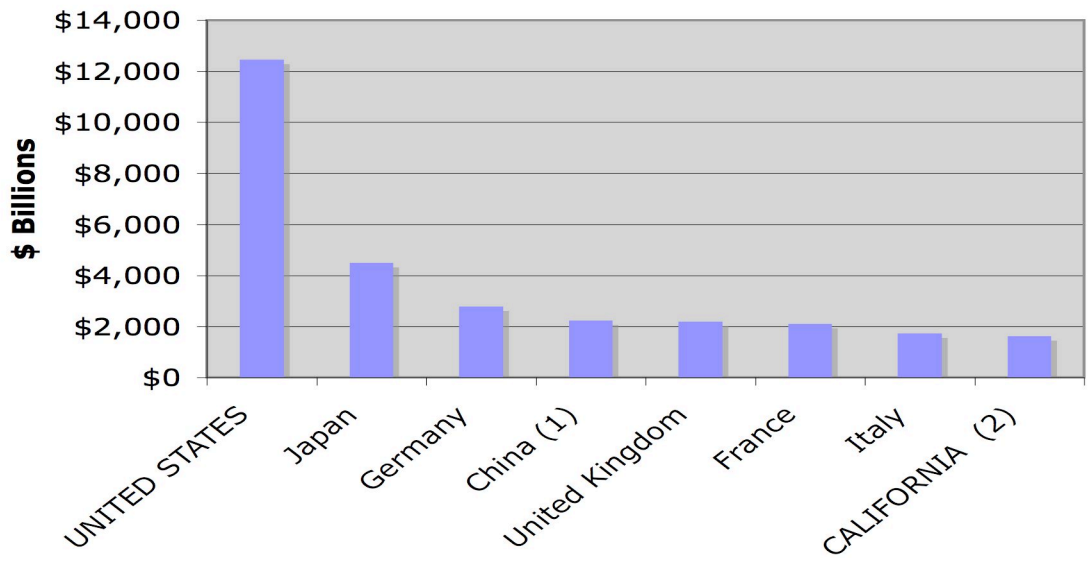
Eventually progressive reforms broke the power of the rail company and of large corporations in the early 1900s and established greater transparency and the rule of law. Starting in the 1920s and throughout the 1930s, such reforms led to the development of large physical infrastructure projects – including highways, bridges and major water projects (Starr 2005; Bean 1968). New institutions also emerged in the early part of the 20th century to guide progressive era of politics

[33] U.S. Bureau of the Census, 2006. Web: www.census.gov [accessed 15 May 2007].

[34] U.S. Bureau of Economic Analysis, News Release: Gross Domestic Product (GDP) by State, 2005 (dated 26 October 2006); Table 3. GDP by State in Current Dollars, 2005 http://www.bea.gov/newsreleases/regional/gdp_state/gsp_newsrelease.htm [accessed 12 May 2007].

across a wide range of social issues, ranging from worker's rights and civil liberties, to natural resource management.

Figure 4.1: California's World Economic Ranking



Source: Author from: World Bank: World Development Indicators database, July 2006; 1) Excluding Hong Kong; 2) California Gross State Product: US Bureau of Economic Analysis (BEA), June 6, 2006.

In the 1930s, California experienced another wave of population growth as agricultural workers arrived from the Dustbowl states (such as Oklahoma - hence the term "Okies") to compete for work in the still expanding California agricultural sector. In the 1940s, California became the home base for manufacturing industries related to the defence sector, notably shipbuilding and the aerospace industries along with various associated high-tech industries. These fuelled its economic growth through the 1960s, (Didion 2003; Starr 2005). After World War II, another population surge occurred, comprising veterans and their families settling into civilian life (Starr 2005). Aerospace industries settled into southern California, transforming the landscape to decentralised middle-class suburban communities, where affordable tract housing became the model of development. The social fabric of the region was inextricably linked to the local identity of these industries (Didion 2003). By the 1950s, California's economy had a fundamentally new form, dominated by technology and entertainment industries. Once dominant, the agriculture share of the economy shrank in the face of this "new economy", amounting to only about 1% of the California economy today (see Figure 4.2). In the 1970s, Silicon Valley emerged as a centre

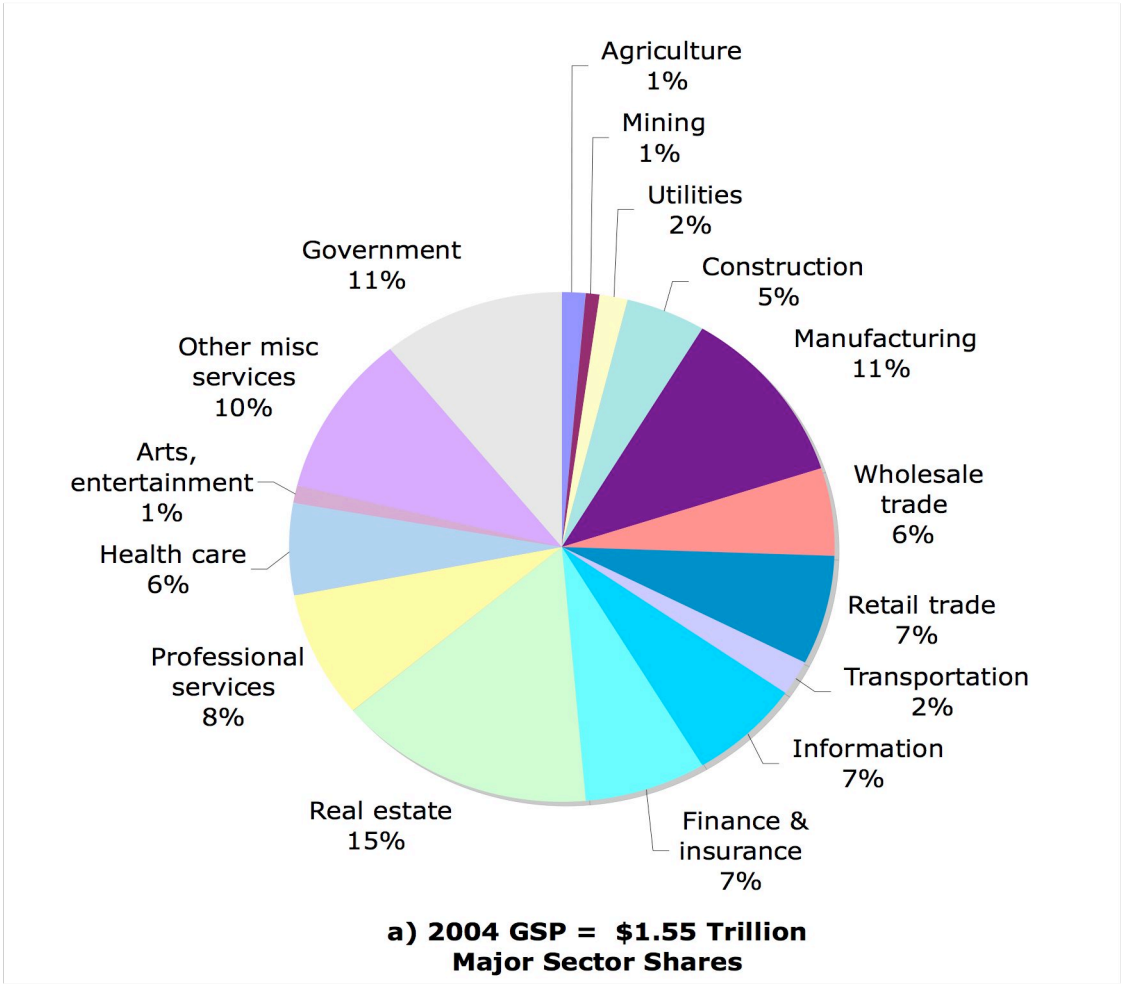
of technical innovation for the electronics, telecom and computing industries. Referred to as a modern "gold rush," these industries continue as an engine of economic growth today (CDOF 2005a; Figure 4.2).

Over the last four decades, the California service and technology economy has remained solid, even in the face of economic troubles. The robust nature of economic growth in California is evident from developments in the 1990s. Economic slumps, for example in the mid-1990s, marked the economic profile of the state as cut-backs in Federal military spending and personnel closed several large military bases as well as many manufacturing facilities throughout California. This came on top of a series of natural disasters, from earthquakes to fires to floods that occurred from 1989 to 1999 (CDOF, 2005a; Starr 2005). Nevertheless, in 1999, California's high technology companies alone received over $16 Billion in venture capital demonstrating their resilience in spite of difficulty elsewhere, and by 2000 venture capital had roughly doubled to $31 Billion. About 80% of this went to Silicon Valley, making it one of the largest destinations for venture capital in the US (CDOF, 2005a; Wilkinson *et al.* 2002). Temporary slumps aside, California's economic growth has outpaced the nation since the end of the 1990s with the state's economy growing about 4.5% per year since 1997 (CDOF 2005a).

California is a world-scale economy. In 2005, gross state product topped $1.6 trillion, representing more than one-eighth of the US economy. Since 2001, California has ranked between 5th and 8th among other world economies ranking 8th in 2005, just behind Italy, France and China, but ahead of Spain, Canada and Brazil (CDOF 2006) (Figure 4.1). California's wealth is, however, unevenly distributed and in recent years the number of people living in poverty increased rather than decreased. In 1999, roughly 14% of the population lived in poverty, up from 11% three decades earlier (i.e. in 1969) (CDOF 2005b).

California's ethnically diverse population today is a reflection of its past. Of the approximately 36 million inhabitants, about 26% are foreign-born and 40% speak a language other than English at home (USCB 2006). Historian Kevin Starr (2005) traces this ethnic diversity to the state's historic tendency to bring in immigrant labour when needed, in part to support the huge infrastructure projects built over the last century and a half, but also as labourers in the agricultural sector. Today only about 40% of the population is Anglo-Saxon, whereas one-third is of Hispanic or Latino origin and another twelve percent Asian. People of race are thus a majority in California, making it one of the most culturally and ethnically diverse states in the United States.

Figure 4.2: California's Economic Profile – Gross State Product by Sector



Source: California Statistical Abstract - Release January 2006.

4.2.2. The land and its climate – the physical context

California is large and geographically diverse. Comprising 158,693 square miles (411 012 km^2), it is roughly equivalent in area to the UK, the Netherlands and Denmark combined. Its population of 36 million, represents more than 10% of the US population, nevertheless the population density remains relatively low at less than 227 persons per square mile (or about 90 persons per km^2; by comparison the UK has 244 persons per km^2) (USCB 2006). California's geographic diversity combines with patterns of water and climate to create a unique combination of eco-regions co-existing side by side, from the coastal sage and chaparral region in the Southwest to the Sierra Nevada forests found in the interior of the state (Olson *et al.* 2001).[35] The earliest Spanish explorers characterised California in maps as an island, and in many ways it remains a terrestrial island of sorts, as mountains establish its boundaries to the North and East and desert to the South and East, and of course to the West its dramatic coastline opens to the Pacific Ocean (Starr, 2005).

California's 1264-mile shoreline is more than half of that of the western continental United States, and is accompanied by a dramatic interplay of mountains and valleys. The Sierra Nevada Mountain Range stretches 400 miles along the North-South axis. Labelled by John Muir as the "Range of Light", the Sierra Nevada feature some of the highest peaks in North America. The Sierra Nevada rise from grassy and then wooded foothills in the West, while in the East they drop dramatically off into the planes of the Great Basin (USCB 2006; Starr 2005).

Historian Kevin Starr (2005) outlines four distinct geographic regions that shape California's history and still define its character today. These are: the Bay Area and the original mining districts in the Sierra foothills; the far North, which includes the Mount Shasta region and sparsely populated areas on the northern coast and inland; the Central Valley, stretching South of Sacramento to Bakersfield; and southern California, which was originally known for its Mexican influence, large ranches and other agricultural activity. At the time of its proposal for statehood, in 1849-50, California's large size raised questions about whether it should be divided politically in two, especially given the strong Mexican and Spanish influences that distinguished southern parts of the state from the North.[36]

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[35] See also WWF definitions and descriptions of ecoregions in the Nearctic zone: http://www.worldwildlife.org/wildworld/profiles/ [accessed 6 June 2007].

[36] There was also debate about whether California should be a free or a slave state. It had applied to be a free state, but this would alter the overall balance in the number of free to slave states. Ultimately California was granted statehood as a free state.

Much of California has a distinctly Mediterranean climate since large areas of the state are semi-arid desert, where the climate is generally dry and often hot. Mountain regions are more humid and temperate in climate over summer months. Two-thirds of the state's precipitation falls in the northern third of the state, which is the least populated. In a typical year, precipitation falls in the November to March winter months only, while May to September months are dry.

4.2.3. Water, agriculture and urban development

Some of the state's first entrepreneurs recognized water availability as a factor that would constrain or enable the state's economic development (Starr 2005; Bean 1968; Reisner 1986). Today the state is characterised by a large imbalance between the distribution of demand for water and its sources.[37] California's water resources in the form of precipitation and run-off are concentrated in the northern half of the state while roughly 80% of the demand for water is located South of Sacramento, corresponding to the larger share of population located in the South (Chung 2006i; Roos 2003).

From the end of the 19th century to this day, massive infrastructure projects move water from one basin to another, within and across state boundaries, so as to support agriculture, economic development and the growing urban populations. Much of today's basic infrastructure dates from the end of the 19th to the beginning of the 20th century, representing Billions of dollars of investment. This infrastructure investment has fundamentally shaped the state's economy, including agricultural and urban development over time (Bean 1968; Reisner 1986; Starr 2005). Since the late 1800s, massive irrigation projects combined with water storage and aqueduct projects to "green" entire valley regions that were previously known as desert land (e.g. the Imperial Valley in southern California). In the northern and Central Valley regions, the principal agricultural crop was wheat to the end of the 19th century, whereas the southern regions have been known largely for their citrus groves, as well as olive groves, vineyards and other specialty crops.

Partly because of the early and large investment in water infrastructure, agriculture dominated California's economy from the end of the 19th to the middle of the 20th century. As Steve Shaffer, Director of the Office of Agriculture and Environmental Strategies of the California Department of Agriculture, put it California's agriculture sector is large, both in national and international terms: "California the 'number one' farm state since World War II – and it's fifty percent above

[37] Frances Chung referred to this as the "80-20 rule" for water in California (Chung 2006i).

Texas, which is 'number two.' California agriculture produces about 50% of the nation's fresh fruits and vegetables, nuts – nearly 25% of the dairy..."

California is also a major exporter of fruits and vegetables and other farm products outside of the U.S. and the importance of the export market is growing rapidly. In 2004, exports accounted for 22% of its production, representing roughly a 50% increase since 1999 (CDFA 2005). Of course, as Steve Shaffer notes, the significance of this sector depends "upon how you measure economic significance. Farm gate value is what the farmer receives at the edge of the field for their crop -- it's about 32 Billion a year [in California], but then if you look at the trucking, the processing, you're talking about a 100 Billion $ industry, and still, California is a trillion dollar economy… As a whole California agriculture is the 5th most valuable agriculture in the world. Behind the U.S. as a whole, the EU, Brazil and China – we're number five - and it's because California has the high value specialty crops. We are the 2nd largest rice producer in the country –and we're probably about the 5th largest in cotton"(see also CDFA 2005). Despite its size, the agricultural sector today is small relative to other economic activities in the state. In 2004, with sector earnings of about $32 Billion, it represented only about 2% of gross state product (CDFA 2005); the relative share of the sector appears to have declined further to represent only 1% of the gross state product in 2006 (Figure 4.2).

In the US, California remains the number one agricultural producer and is the unique producer of specialty products such as almonds and walnuts, raisins and artichokes, among other items. Today California boasts a broad diversity of different types of agricultural activities, with about two hundred different types of crops in any one year (CDFA 2005). The agro-business sector is also notable in terms of its political influence as it encompasses an influential set of political actors, comprised of large landowners or corporations, with interests in a wide variety of policy decisions ranging from immigration law to water infrastructure investment (see below – [EWG 2004]). Despite the relatively small share of value added of agriculture, for historical reasons actors linked to the agricultural sector are a disproportionately influential and active part of the political fabric in California today.

Agriculture in California is also characterised by two potentially problematic economic inputs, which have influenced the political agenda of the state over time. The first is water that is heavily subsidised by the federal (and state) government. The second is cheap seasonal labour, largely supplied by (sometimes illegal) immigrants. Redressing the economic problems with either of these would be costly to California's agricultural sector. For example, the migrant worker population continues to challenge the political and social institutions of California to provide affordable housing and health services, among other services, to people who are often

impoverished (Starr 2005). Federally subsidised water has received perhaps less political attention in California than have the social problems of migrant workers. However both issues are economically central to the vitality of the agricultural sector in California.

Since the turn of the century, water and (hydro-) electricity infrastructure has been instrumental in California to support growing urban populations in major metropolitan regions. By the 1920s, the Los Angeles Aqueduct was draining the Owens River and the Hetch-Hetchy reservoir on the Tuolumne River to support urban growth in the Los Angeles and San Francisco regions respectively (Starr 2005). This, in turn allowed growth in urban areas to continue. Population in Los Angeles area exploded in the first part of the 20th century, with more than a ten-fold increase rising from only 100,000 people in 1900 to 1.2 million by 1930 (Starr 2005).

The federal government financed and still operates two other major water projects that have subsidised growth in California (Figure 4.3). First is the Hoover Dam (and other more minor dams) along the Colorado River, which feed water into the Colorado River Aqueduct, and since the 1940s has supplied water to southern California. Second, in the North there is the Central Valley Project (CVP), consisting of a series of dams, reservoirs, canals, pumping and power stations, which began operation as an integrated system by the Federal Bureau of Reclamation in the 1950s. The CVP supplies water to users in the Bay Area, the Sacramento Delta and the Central Valley areas of California. Aside from regulating river flows and providing for flood control, these massive projects provide large amounts of low-priced (Federally-subsidised) water to agricultural users as well as urban water districts (Bean 1968; Starr 2005). Combined these projects have reshaped the water and power sector infrastructure of the state and have continued to stimulate rapid population and economic growth. The three largest urban areas -- San Francisco/Oakland (and surroundings, known as the Bay Area), and Los Angeles/Long Beach as well as San Diego (also known as southern California) -- all depend upon water supplies that come from distant locations by artificial means (Bean 1968; Figure 4.3).

Figure 4.3: Major Federal, State and Local Water Infrastructure in California

Source: California Department of Water Resources [CDWR], 2006

Shortly after completion of these federal projects, the state of California also became an active partner in managing and developing large-scale infrastructure to serve growing demand for water and power. The State Water Project (SWP) was initially drawn up and approved in the 1950s, however the Feather River facility, completed in 1973, was the first major infrastructure project completed under the SWP. More than half of the water supplied from this project serves urban users in southern California (Corfee 1981). The SWP also grew up in response to large agricultural interests in California. Since Federal law restricts the amounts of water to be sold from its projects to large landowners from the federal Central Valley project (i.e. there is a 160 acre lot limit), the state's engagement was in part to assuage large agricultural land-owners that they would have access to low-priced water. Historically and still today there is a large price differential between the water from state and from Federal projects. Federal water is more heavily subsidised and lower priced with (CVP) prices roughly a quarter to a third of SWP prices (Bean 1968; Corfee 1981; EWG 2004). A recent report estimates that rice and wheat farmers in California's Central Valley use a fifth of the state's water from the CVP and pay prices so low for the water that there is an implicit subsidy worth up to $416 million each year (EWG 2004). Neither Federal nor state funded water projects price their water at "full" cost, nor do they use competitive markets to allocate water. Thus both sources remain heavily subsidized by the taxpaying public and lead to significant economic inefficiencies as well as environmental harm, especially in California's water scarce climate (EWG 2004).

4.5. Political context: some contradictions and explanations

Irrespective of its well-earned reputation for eccentric individualism and dissent, since the beginning of this century the mainstream political current in California has been more conservative and anti-government, than it has been tree-hugging liberal. Although the State is typically classified as a "blue-state" – that is voting Democratic rather than Republican in Federal and state elections – it is also the state that has delivered several prominent Republicans to Federal government in recent decades. Notably, Presidents Richard Nixon and Ronald Reagan, as well as former Supreme Court Justice Earl Warren began their political careers in California. Of course California is also the state that elected Governor Jerry Brown, also known as "Governor Moonbeam" for his visionary, or radical, policies depending on your political point of view. And we cannot forget Republican Governor Arnold Schwarzenegger, also an immigrant, who is becoming known as both a social conservative and an environmental activist.

Despite the generally positive economic outlook for the Golden State, an increasing number of Californians today express concern about the ability to maintain a high quality of life in the face

of rapid population growth and unfettered suburban sprawl (Diamond 2005). This growth is accompanied by worsening traffic conditions, and until very recently no attention to possible long-term solutions such as public transit. In this regard, Starr (2005) notes that Californians have begun to recognise their environmental limits and, increasingly, vote for environmental protection. This view is supported by public opinion research documenting a Californian preference for environmental protection (Baldassare 2000; Baldassare 2006) (see also Chapter 6). Compared to social issues, for example, environmental issues have been understood to be largely bipartisan and therefore perhaps less vulnerable to California's past tendencies towards taxpayer revolt. This is not to say that solutions for major environmental problems are imminent, only that California has begun to actively seek such solutions and is learning as it acts.

Despite strong policies to favour clean technology development, contradictions remain between the environmental preferences, on the one hand, and lifestyle choices and patterns of investment in infrastructure on the other, such as high investment in highways and parking lots versus public transportation systems throughout the state. The Governor's endorsement of a large government bond to support infrastructure development and maintenance is a good example of this type of contradiction (Russo 2006). As Adrienne Alvord, legislative analyst, said: "…how can you have a climate policy if you're laying down all this cement and encouraging all this vehicle traffic? …lets just say, [it's] not coordinated as part of a climate policy." In other words, public infrastructure and climate change policy, for the moment have not been conceived of together and are not necessarily going in compatible directions to reduce future greenhouse gas emissions. In an encouraging development, in 2007 the Attorney General's Office, led by none other than former Governor Jerry Brown, has begun to use its authority over environmental impact assessment of new development to require local authorities and private entities to consider greenhouse gas emission implications of development plans.[38] To date a number of settlement agreements have been reached requiring the integration of greenhouse gas mitigation into development plans (California 2007a; California 2007b; California 2007c).

With respect to policy and the power to drive change, Starr (2005: 332) points out that much of the political power of state-centric government was moved over the last century to local and regional government, and to boards and districts that are "anonymous in composition". He credits

[38] This authority exists under the California Environmental Quality Act, a law that was signed by former Governor Reagan in 1970. Although the law does not explicitly address global warming or greenhouse gas emissions, it provides broad authority to ensure environmental impacts of new projects are identified and mitigated. For more information, see California Office of Attorney General, California Environmental Quality Act, http://www.ag.ca.gov/globalwarming/ceqa.php [last accessed 14 June 2008].

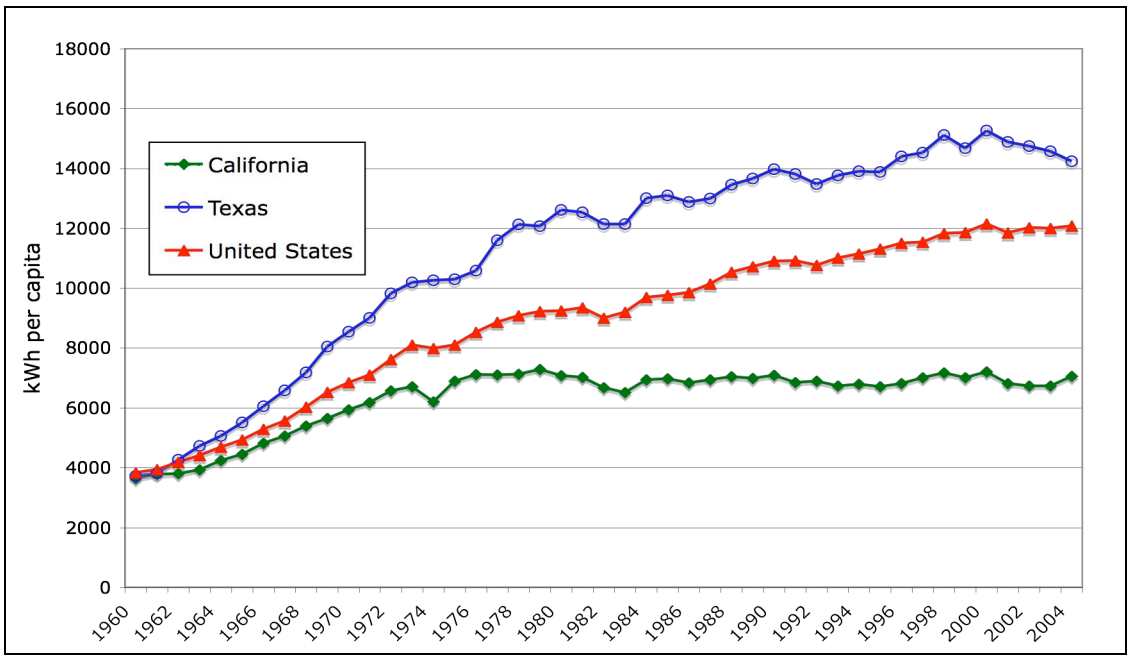
this devolved institutional structure to a relatively immature, state-level political infrastructure and a general lack of interest by the citizens in the process of government, other than at local level. Beyond the weak state role in public transportation planning, another case in point is the difficulty of recent past that California has encountered at state-level to support its education system. Joan Didion joins Kevin Starr to lament failings of public education for California's young-people (K-12 and below), and the stark contrast with its sustained ability to create economic wealth. As Starr (2005: 335) points out, by 1990 California was among the lowest of the nation in spending and performance of primary and secondary education. In 1993 California fourth graders were competing with Mississippi students for last place across the nation on basic reading skills. By 1996, voters had reauthorized more than $1 Billion in new spending and in 2006 California will be spending 40% of its state budget in its continuing effort to "catch up" on education (California 2006c). This strange and relatively recent disengagement of California taxpayers from support for education at lower levels is due in part to "taxpayer revolt." This stands in stark contrast to progressive reforms of the past. Indeed in the 1950-60s progressive reforms created a world-class state university system in California, which is the backbone of the research community and continues to be an engine for economic growth today (Starr 2005; CDOF 2005a).

The next sections highlight some of the essential background for understanding how and why climate policy has developed as it has in California starting with the GHG emission profile today, moving on to impacts and to recent legislation.

4.6. Greenhouse gas emissions profile

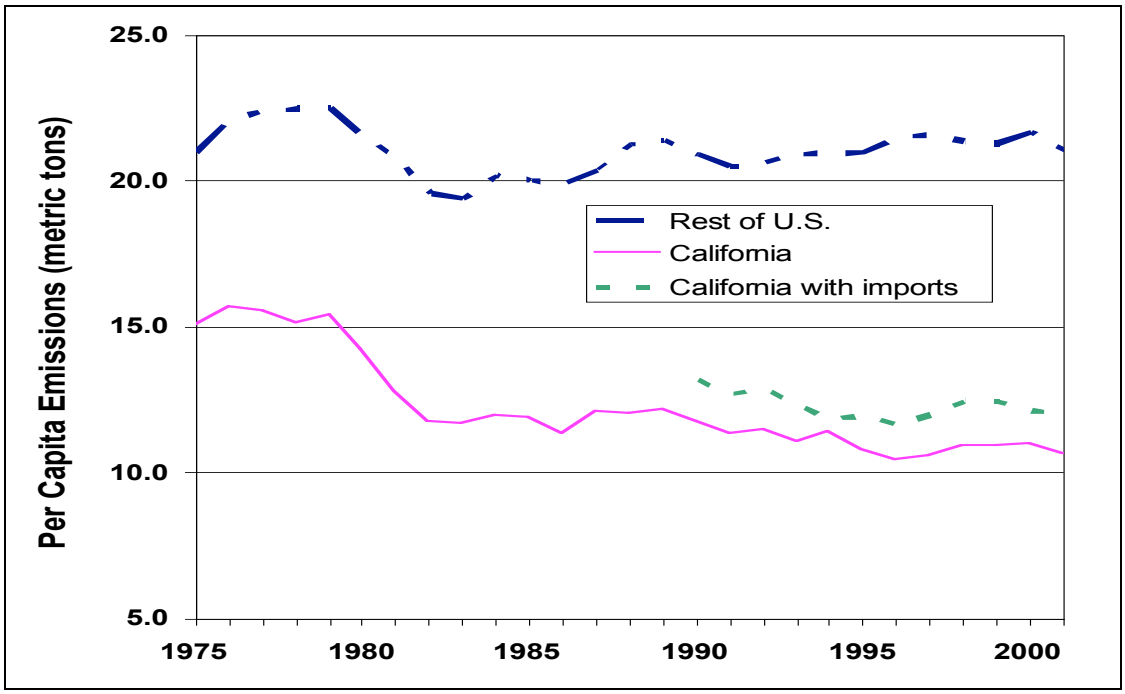
Emissions in California are relatively high as it is the second largest emitting state within the US, accounting for about 7% of total US emissions in 2003 and following only Texas (12%) (WRI 2008, presented in multigas, $CO_{2\text{-eq}}$ unless otherwise noted). Emission trends in California reflect its economic profile, which is dominated by service sectors (including government, these represent roughly 45% of its GSP in 2004; Figure 4.2). These sectors have low direct emissions, though they may have large indirect emissions stemming from emissions associated with electric power production or from transportation of employees to and from the workplace. Residential and commercial buildings, office energy and home energy end-uses thus comprise a significant source of GHG emissions (9% without including emissions related to electricity use). However, contrary to national trends and those in many other states, these sources have been on the decline since the 1990s in California, in large part due to heavy investment in energy efficiency in these sectors.

Figure 4.4: Per capita Electricity Consumption



Source: Energy Information Agency, http://www.eia.doe.gov/emeu/states/_seds.html (accessed 11 November 2007).

Figure 4.5: Per Capita CO2 Emissions



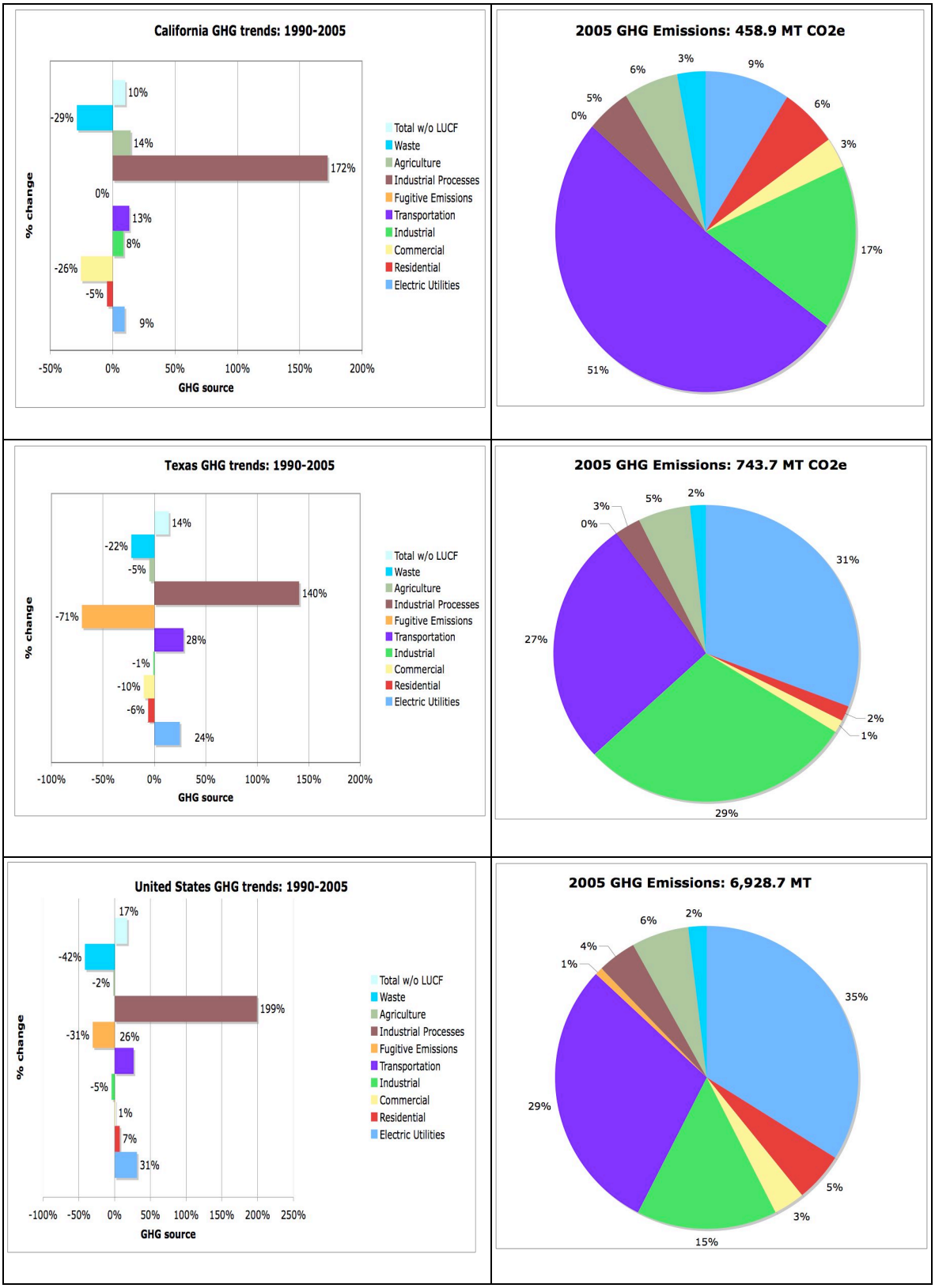
Source: Chang 2006; citing data compiled from Blasing, Broniak & Marland 2004 and CEC 2005a.

In large part due to past policy efforts in the area of energy efficiency (Ch. 5 & 6), California's per capita electricity consumption is comparatively low and relatively stable (see comparison to average US and Texas trends in Figure 4.4).[39] This in turn has helped to drive moderate per capita CO_2 emissions (Figure 4.5).

Of course the trends towards low per capita emissions in California are driven in part by regional characteristics e.g. its mild climate, the relatively high share of hydropower and natural gas (as compared to coal or oil) in the power sector, and the absence of coal in its energy sector. Also energy use per unit of gross state product is relatively low in California compared to other states (and regions of the world) as is the per capita energy use, reflecting the large share of the service economy of the state and the low share of economic activity from heavy industry. On top of these factors, however, aggressive energy efficiency policies have played a role in moderating these trends (CEC 2005a; Chang 2006b; see Chapters 5 & 6). Figure 4.6 presents California emissions by sector and shows for comparison purposes the state of Texas and the United States as a whole. This shows that in California transportation remains the largest source of emissions, accounting for more than half of emissions in 2005, followed by the industrial sector (17%) and the power sector (9%). Since 1990, the power sector shows high growth (44%) while both the transport and industrial sectors grew only marginally. Depending on the year, imported power accounts for one-quarter to one-third of the total power consumed in the state, however it accounts for over 50% of the emissions from this sector (CARB 2008). Including GHG emissions from imported power raises the share of emissions from this sector to nearly 20% of emissions (CEC 2005).

[39] Texas (1) and California (2) are the two biggest state emitters in the United States. Combined they represent nearly one-fifth of total emissions in the United States in 2003. Source: Climate Analysis Indicators Tool (CAIT US) Version 2.0. (Washington, DC: World Resources Institute, 2007). In this chapter, Texas is used as a point of comparison with California since it is comparable in terms of annual emissions of GHG. Note the official California state data may vary slightly and are available from the state website: http://www.arb.ca.gov/cc/inventory/inventory.htm [last accessed 15 Decmeber 2008]. WRI-CAIT data were selected for presentation here for comparability purposes.

Figure 4.6: California, Texas, and the US: greenhouse gas trends – by sector, 1990-2005, CO_{2eq}

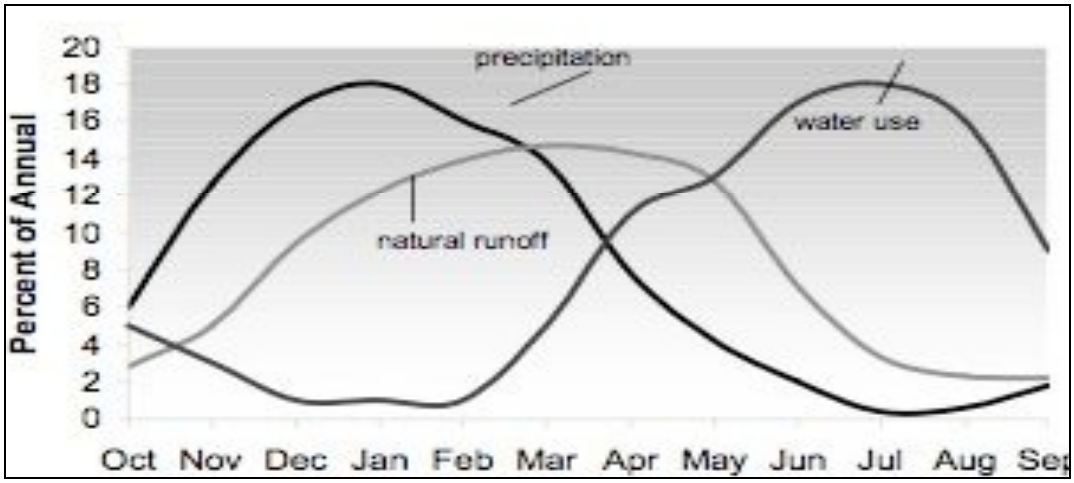


Source: Author using Climate Analysis Indicators Tool (CAIT US) Version 3.0. (Washington, DC: World Resources Institute, 2008).

4.7. Projected climate change impacts in California[40]

California's geography and its economic profile make it particularly sensitive and vulnerable to climate change across a broad range of future emission and climate scenarios (Luers *et al.* 2006; Schneider 2007).

Figure 4.7: Water Supply and Demand Pattern in Northern California



Source: CA Department of Water Resources as cited in (Roos 2003).

The water sector in California has long been identified as particularly vulnerable to climate change since the late 1980s (Smith & Tirpak 1989; Gleick 1987a & b). Although difficult to predict, hydrological effects of climate change have implications for both the availability and quality of water for agricultural, urban and in-stream uses. With the onset of climate change more precipitation falls as rain rather than as snow. Recent projections suggest that by the 2080s, snow pack in the Sierra Nevada will decline by about 60% (or 70-90% at higher emission levels) (Luers et al. 2006). Roughly half of the storage of water in California is in the natural "reservoir" provided by this snow pack, and this loss will lead to a decline in stream flow, especially during summer months; by contrast warmer temperatures are likely to increase the agricultural and urban demand for water in the spring and summer (Roos 2006i; Luers *et al.* 2006) (Figure 4.7). In the water scarce regions of California, such as southern California, water becomes an even scarcer

[40] As outlined in Chapter 6, the literature on climate change impacts in California is large and growing quickly. Interested readers should visit the California Climate Change Portal website, "climate research" page, see: http://www.climatechange.ca.gov/research/climate.html [last accessed 14 June 2008]. This section is based on recent overviews of this large body of work, such as Luers *et al.* 2006, California 2006 and Schneider 2007. This section is intended to give only a brief overview of key climate change impacts and vulnerabilities in California.

and more precious resource in the face of climate change, which increases the risk of water shortages and competition between urban and agricultural users, especially during the dry summer months, and these users will also compete with in-river ecosystem water needs (see Table 4.1 for an overview of effects in the water sector (CDWR 2006; Luers *et al.* 2006).[41]

Table 4.1: Potential Effects of Climate Change on California's Water Resources and Expected Consequences

Potential Water Resource Impact	Expected Consequence
Reduction of the state's average annual snowpack	• Potential loss of 5 million acre-feet or more of average annual water storage in the State's snowpack • Increased challenges for reservoir management and balancing the competing concerns of flood protection and water supply
Changes in the timing, intensity, location, amount, and variability of precipitation	• Potential increased storm intensity and increased potential for flooding • Possible increased potential for droughts
Long-term changes in watershed vegetation and increased incidence of wildfires	• Changes in the intensity and timing of runoff • Possible increased incidence of flooding and increased sedimentation
Sea level rise	• Inundation of coastal marshes and estuaries • Increased salinity intrusion into the Sacramento-San Joaquin River Delta • Increased potential for Delta levee failure • Increased potential for salinity intrusion into coastal aquifers (groundwater) • Increased potential for flooding near the mouths of rivers due to backwater effects
Increased water temperatures	• Possible critical effects on listed and endangered aquatic species • Increased environmental water demand for temperature control • Possible increased problems with foreign invasive species in aquatic ecosystems • Potential adverse changes in water quality, including the reduction of dissolved oxygen levels
Changes in urban and agricultural water demand	• Changes in demand patterns and evapotranspiration rates

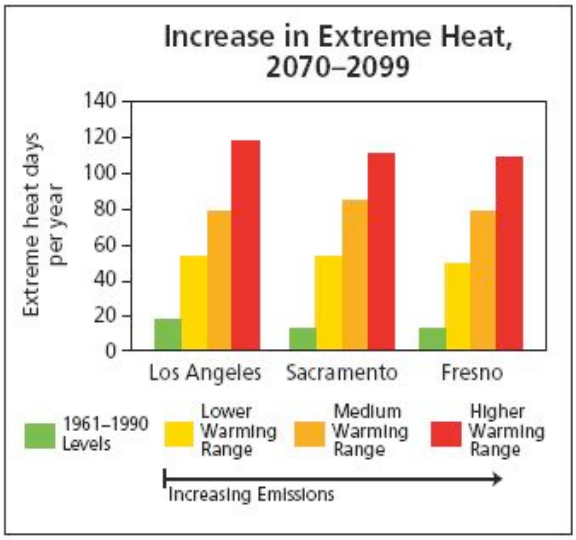
Source: CDWR, 2006.

[41] A recent Owens River basin restoration project is an example here of that competition – see (Sahagun 2006).

Increasing sea-levels and storm surge will increase the risk of coastal flooding which in turn will increase saltwater intrusion to further exacerbate diminishing freshwater supplies in California (CDWR 2006; Luers *et al.* 2006). Because some of California's largest and wealthiest urban areas are located in coastal zones, large amounts of infrastructure and people will also be particularly vulnerable to coastal flooding and growing erosion due to climate change.

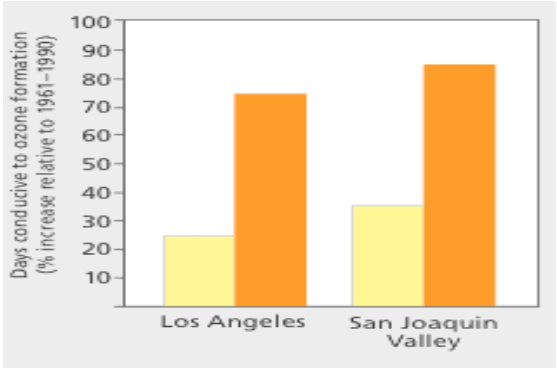
The virtual certitude of higher temperatures in coming decades – even with aggressive mitigation efforts – will exacerbate an already warm and dry climate in California (Figure 4.8). Even low to moderate temperature increases will increase the risk to human health and settlements due to higher incidence of heat waves and air pollution events (Drechsler *et al.* 2006; Kleeman and Cayan 2005). Widespread effects from a 12-day heat wave in July of 2006 – ranging from 130 human deaths to the loss of thousands of dairy cows and skyrocketing demand for electricity – raised the awareness of residents, businesses and state officials alike about the risks of future climate change that will increase the incidence of such events (see Figures 4.8 and 4.9) (Bernstein and Covarrubias 2006; California 2006; Pomfret 2006; Williams 2006).

Figure 4.8: Incidence of Extreme Heat Days by Major City, 2070-2099



Source: Chart from Luers *et al.* 2006; data from Drechsler *et al.* 2006. The lower warming range corresponds to 3-5.5 °F; medium range 5.5-8 °F; higher range to 8-10.5 °F.

Figure 4.9: Increased risk of days conducive to ozone formation in California regions, 2070-2099



Source: Chart from Luers *et al.* 2006; data from Kleeman and Cayan 2005.

There is some evidence that California is both more exposed (IPCC 2007a) and more sensitive to temperature change from global warming compared to other regions in the US (Basu and Ostro

2008; Zanobetti and Schwartz 2008). Health risks associated with rising temperatures may also fall disproportionately on the poor (California 2006; RP 2006).

Aside from direct health risks, rising temperatures (and lower precipitation) from climate change will have other impacts, notably in the energy sector and on fire risk. Rising temperatures will stretch hydropower capacity and lead to increasing electricity with demand for air conditioning, requiring costly additions to power generation capabilities (Franco and Sanstad 2006; Miller *et al.* 2007; Smith and Mendelsohn 2007). Fire risk in the western US has already seen a four-fold increase over the last thirty years (Westerling *et al.* 2006) and is expected to continue to increase as temperatures rise, to a great extent varying with somewhat uncertain changes in precipitation (Easterling *et al.* 2007; Luers *et al.* 2006). Multiple and interacting stresses from changes in temperature, water supply and pests will also negatively affect the California agricultural sector, including the wine-grape industry (Luers *et al.* 2006).

California is also the home to a large number of natural reserves, national and state parklands with unique "natural" ecosystems that are especially at risk of disruption from climate change. This includes shifting forest and grassland areas, and local insect and animal populations, as well as changes in the California Sacramento San Joaquin River Delta fly-ways and deterioration of habitats for cold water fish such as trout and salmon (California 2006). Marine habitats are also changing rapidly due to warmer and more acidic ocean waters (Caldeira and Wickett 2003; Feely *et al.* 2006), threatening to alter the basic food chain as well as the distribution of marine fauna and flora in California (California 2006).

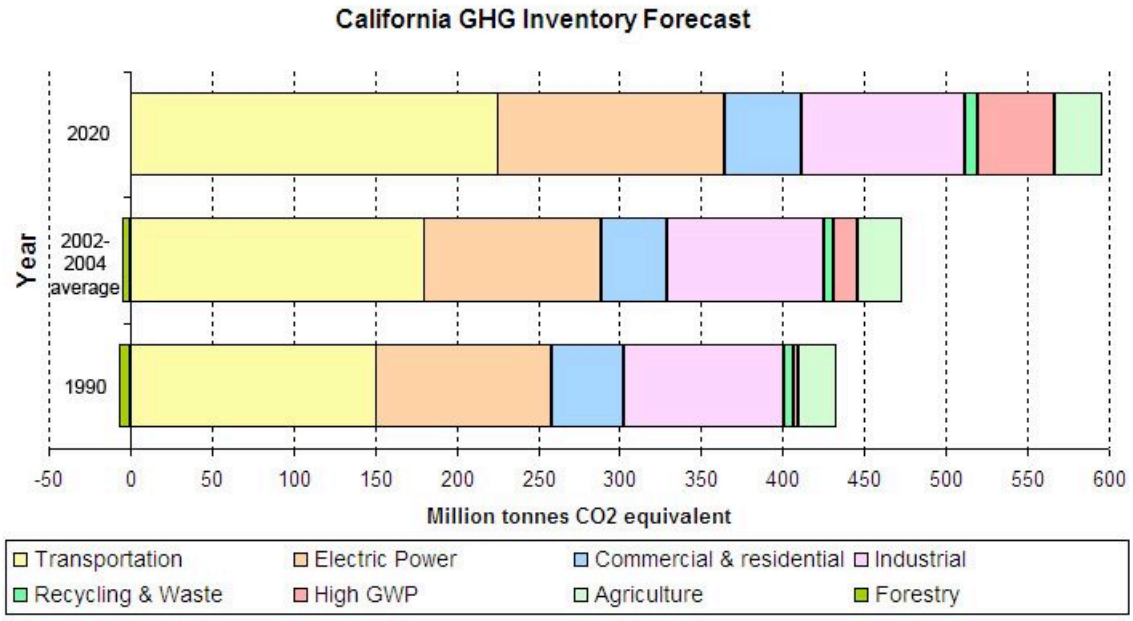
4.8. Overarching climate policy framework: 2005-2006

On June 1, 2005, California's Governor Schwarzenegger made headlines around the world when he announced state-wide GHG reduction targets for the medium and long-term. Set out in an Executive Order (California 2005a), these targets aim to reduce GHG emissions to 2000 emissions levels by 2010, to 1990 levels by 2020, and to 80% below 1990 levels by 2050. In 2006, California legislated the medium term (2020) goal for GHG reduction with the passage of Assembly Bill 32 (AB 32), entitled California Global Warming Solutions Act (CA-Code 2006a). The law codified, and thus makes legally binding, the Governor's 2020 target, which is to return emissions to 1990 levels.

The Global Warming Solutions Act (AB32) is significant in that it is the first broad based legislative effort to set out medium term reduction targets at a state-wide scale in the United States. It followed the landmark California legislation of 2002, known as the Pavley Bill, which

regulated CO_2 from passenger vehicles (see Chapter 6). By comparison with other near- or medium term targets at state or international scale,[42] California near-term targets may appear relatively modest, however, the long-term 2050 target is clearly aggressive (see Table 4.2 and Figure 4.10; also Chapter 2). Expected growth in emissions in California is relatively low compared to other states that are setting similar or more stringent 2020 targets (e.g. Arizona) (ACCAG 2006). Whatever one considers to be the nominal strength of these targets, it is important to consider both the size of the California economy (which is ranked amongst the top ten of the world's economies), its rapid economic growth and the high levels of past emission reductions achieved through aggressive investment in energy efficiency over the past 20 years.

Figure 4.10: California GHG emission by sector, 1990-2004 and forecast 2020[43]



Source: CARB 2008d, GHG Inventory Data Draft Forecast, [last accessed 15 December 2008] http://www.arb.ca.gov/cc/inventory/data/forecast.htm

The existence of pre-existing energy efficiency policies, and significant past achievements in this area at the time of taking on GHG targets, implies that the marginal costs of GHG abatement in California could be high relative to other states or nations. This is precisely because energy efficiency policies target the achievement of "no regret" or "win-win" multiple environmental and

[42] For example, the European Union has agreed to GHG emission reductions of -20% by 2020 compared to 1990 levels, and -30% should other comparable international efforts be forthcoming. See Table 2.1.

[43] These data are from the State's official GHG inventory and may not be directly comparable to the data presented from CAIT-WRI in Figure 4.6

economic benefits and thus may have already exploited a significant share of the lowest cost (or most economically beneficial) mitigation options. Of course, the legally-binding nature of the goals in California is a also a significant departure from what were to this point largely hortatory actions in California and in other states.

In 2006, a number of companion Bills also passed along with AB32 to extend the coverage of some of the CPUC climate change policies to all energy entities in the state – both regulated and un-regulated under the CPUC. The Perata Bill (CA-Code 2006b) codifies a CPUC ruling to establish a GHG standard for all baseload power procurement (or for any baseload power plants that might be built in California). Assemblyman Levine's Bill, AB 2021 extends the CPUC's aggressive approach to energy efficiency to also cover municipal utilities (CA-Code 2006c).[44]

The 2006 passage of these three laws – AB32, the Perata Bill and the Levine Bill -- combined with the earlier Pavley legislation, marks the establishment of a clear legal framework to begin to comprehensively address climate change in the State of California.

California has a large and vibrant economy that is anchored in a culturally and politically diverse context. Landowners and agricultural interests wield disproportionate influence in state politics, especially given the declining share of the state's economy generated by this sector. But to ignore that influence would be to ignore California's past, which is intimately linked to the power of large landowners and agri-business interests. In part due to this history, where the politics in California is intimately connected to people's relationship to the land, there is much attention to the environment and a strong environmental conservation ethic that tends to support pro-environmental action. Yet the inevitable clash between high growth and environmental preservation is increasingly apparent.

[44] AB 32 also covers the municipal utilities. Municipal utilities are required to do a comparable RPS and invest in energy efficiency, following the CPUC policy for loading order preference towards clean energy sources, but are not required to use the GHG adder in procurement planning.

Table 4.2: States with GHG reduction targets: selected policies (updated 21 December 2006)

State	GHG reduction target	Type of target	Transport	Power Sector
AZ	2020 target: 2000 levels 2040 target: 50 % below 2000 levels	Not legislated – through Executive Order (EO 2006-13)	Pavley standards (Executive order for 2007)	
CA	2010: 2000 levels *2020: 1990 levels 2050: 80 % below 1990 levels	All GHG. *2020 target legislated (2006); other targets thru EO S-3-05	Pavley Bill regulations, effective from 2009 model	Loading order GHG adder GHG perf std (regulations & state law)
CT	NEG/ECP[45] as follows: 2010: 1990 levels; 2020: 10 % below 1990 levels; long-term: 75-85% below 2001 levels	Regional goal; Connecticut state action plan (SAP) 2005	Pavley standards	RGGI (cap & trade) from 01/09[46]
MA	NEG/ECP (see above, except 75-85% below 1990 long-term)	State Action Plan 2004	Pavley standards	Emissions cap w/ offsets - (statute & regulations); To join RGGI[47]
ME	NEG/ECP, (see above, except 75-85% below 1990 long-term)	2003 state law requires NEG/ECP targets	Pavley standards	RGGI
NH	NEG/ECP	NEG/ECP – recommendations 2001		Cap & trade from '07; RGGI from 01/09
NJ	3.5 % below 1990 levels by 2005	Administrative order 2002 SAP	Pavley standards	RGGI
NM	2012: 2000 levels 2020: 10% below 2000 2050: 75% below 2000	EO – 05-033		
NY	2010: 5 % below 1990 levels 2020: 10 % below 1990	State Energy Plan 2002	Pavley standards	RGGI
OR	2010: 1990 levels 2020: 10 % below 1990 2050: 75 % below 1990	Oregon state strategy 2002 - recommendations	Pavley standards	GHG perf std new facilities – w/ offsets; legislated power plant cap since 1997
RI	2010: 1990 levels 2020: 10 % below 1990	State Action Plan 2002	Pavley standards	RGGI

Source: author, based on Pew-Center 2006; Royden-Blum 2006 and source documents cited within these.

[45] New England Governors/Eastern Canadian Premiers – these are not legally binding unless covered in legal statutes in individual states or provinces.

[46] RGGI is the Northeast Regional Greenhouse Gas initiative - it agrees to cap CO2 emissions in the power sector annually at 2009 levels until 2015 and to reduce emissions from this sector to 10% below 2009 levels by 2019 (RGGI 2006a).

[47] Litz (2006) reported that MA and MD agreed to join RGGI in 2006.

4.8 Conclusion

Evidence from past actions suggest that Californians are at once both politically and socially conservative as well as environmentally pro-active. The political and economic contradictions are clear: fiercely independent and anti-government (and anti-tax) political sentiment has been coupled with a historic dependence on large amounts of Federal funding, whether it be for large-scale infrastructure projects or through the national military investments. There is also at least a perception of a strong, socially-liberal contingent in California, but an uneven record with respect to funding for various initiatives, ranging from education to social protection for immigrant labourers. Overall such contradictions appear to go unnoticed in today's economic and political environment, where the mood is optimistic about the future of California's economy and society (e.g. see Schwarzenegger 2006). By comparison with many of these apparent contradictions in the area of social policy, environmental issues appear to have remained "above the fray". Public and political support for environmental action is consistently high and bipartisan.

California's GHG emission profile and its vulnerability to climate change may be somewhat unique within the US. Emissions in California are relatively high as it is the second largest emitting state accounting for about 7% of total US emissions in 2005 (WRI 2008). However on a per capita basis emissions are relatively low, and they are declining, in part due to strong investment in clean and efficient energy systems (see Chapter 5). Emissions in California are growing slowly at about 0.6% per year since 1990. The main source of GHG emissions in 2005 was transportation, followed by industry and the power sector. This emissions profile reflects the high share of the service sector in the economy, a lack of coal in the power sector (and an important share of imported power) and limited alternatives to gasoline-powered motor vehicles as a means of transport.

In terms of vulnerability to climate change and impacts, there has long been an awareness within the US that California may be particularly exposed to climate change. This is due to its dry and already warm climate and its long, heavily populated coastline, which heightens risks from inevitable sea level rise and possible increases in storm surge. The impacts of climate change are already evident on the state's snow pack and the availability of freshwater supply in dry summer periods. Also apparent today is an increase in the incidence of heat waves, higher incidence of forest fires and worsening air pollution, with consequent impacts on human health and property. As noted in Chapter 7, the growing risks of climate change to human and economic development in California are increasingly used in arguments intended to motivate action to protect the climate.

The passage of Assembly Bill 32 placed California at the forefront of both US and international climate policy. This sends a clear signal to international energy and technology markets that greenhouse gas constraints will be part of the state's environmental regulatory framework of the future. Parallel California legislation also codified regulatory rules in the power sector to be extended not just to investor-owned utilities but to also include municipal and other operators in the power sector thus extending their scope and significance. By comparison with other states or even at the national level, California's legal framework to regulate GHG emissions is significant in its scope, which is economy-wide, and its legally-binding character. Taken as a whole, the 2006 legislation secured a basis for broad state-wide climate policy action. The next chapters in this section explore the reasons why the State of California moved ahead when it did to tackle climate change.

5. AIR POLLUTION & ENERGY EFFICIENCY POLICY: FOUNDATION FOR CLIMATE ACTION

5.1 Introduction

This chapter recounts key events in the history of air pollution and energy efficiency policy development, as both areas appear to provide an important source of experience and knowledge for climate policy in California. Many of the elite policy actors interviewed noted that this past experience establishes a foundation upon which climate policy is being built today. Per the "thick description" approach outlined in Chapter 1, the chapter focuses on several different dimensions of key events: the context for past policy actions in these areas; the intentions and meanings that organise the actions; the evolution of these actions; and an interpretation of their significance with respect to national policy developments as well as later in California with respect to climate change policy.

Multilevel governance and the social-practice model of environmental governance are two key conceptual themes that run through this short historical account. Multilevel governance exists where authority to legislate and regulate at regional scale is nested and hierarchical as well as polycentric in nature (increasingly organised around issues). Air pollution and energy efficiency policy is also shown to be driven by "grassroots" action or from the "bottom up," in both instances instigated by non-state actors. In the social practice model of governance, social and political environments shape organisations and decision-making through institutions in the form of rules, beliefs and conventions. These institutions are not fixed in time but rapidly evolving as the discourse that they help to shape evolves (see further discussion of these conceptual themes in Chapter 3.) In the case of California, it appears that climate change policy has been shaped by these past developments, which in turn sheds light on possibilities for future change.

The chapter begins with a review of statements by some of the policy elites in California about how and why climate policy in the state today is linked to past actions in other areas. It then traces developments in air pollution and energy policy (focusing on energy efficiency) in California. Finally, it offers some preliminary conclusions, looking across these contextual and conceptual issues.

5.2 Energy and air pollution policy as a bridge to climate policy?

Many of the elite participants in the California climate policy process pointed to air pollution and energy efficiency policies as historical anchors for California's emerging climate policy framework. For example, a champion for clean air in the nation and in the State of California, senior regulator Mary Nichols[48] said: "In the whole period from 1970 to the present, there's a history of California's regulatory programs having led the way in pushing or pulling new technologies into the market that then became nationwide in their application, but were pioneered first in California. So it makes it much more comfortable for the legislature and administration to envision taking on that type of role."

A lobbyist for clean energy companies, John White, had a similar view. He said: "It's important to understand how far back our work in this area goes. California was the first governmental body in the world, certainly the first in the United States, to regulate tailpipe emissions. We adopted standards and began regulating the emission levels from new cars before anybody else." He added that in the State of California: "…climate policy is part and parcel of work to advance specific clean energy goals." Environmental and clean energy activist, Devra Bachrach Wang of NRDC, also pointed to the synergies between policies to address climate change and other key environmental issues when she said: "Many of the solutions to global warming have been adopted and in place for many years because they also are solutions to other significant problems that California faces…"

Anne Baker, the Deputy Secretary in charge of the Governor's Climate Action Team, highlighted this: "When I came in everybody here talked about climate like it was the mobile source reg. I'd go to Europe and it would all be about energy efficiency. I came back and [thought]: 'So why aren't we talking about what we've done, you know, what we've done as opposed to this next phase?' ...so part of what I've gotten to do in the last year is to begin to say, 'We have … some rather significant building blocks in place and we need to start talking about this issue the same way the rest of the world does.'"

[48] Mary Nichols is the former Secretary of the California Resources Agency and was the head of the Environment Institute at the University of California at Los Angeles at the time she was interviewed. In 2007 she has been appointed as the Chairman of the California Air Resources Board which is the state agency mandated in the 2006 Assembly Bill 32 to design and implement the plan to achieve 2020 greenhouse gas emission targets.

Table 5.1: California & US Air Pollution Control Legislative Actions -- Highlights and Other Key Events

Year	California state action	US federal action & key events elsewhere
1940-1950s	1943: eye-burning smog events begin in Los Angeles, California 1947: California Air Pollution Control Act grants authority for individual counties to regulate air pollution. Los Angeles County – the first county in the state to establish an air quality management district & the first location in the US to regulate air pollution rather than "smoke"; county regulates smokestack emissions. 1955: Legislation requires the state Department of Public Health to establish air quality standards and controls for motor vehicle emissions. California Department of Public Health sets the nation's first state-wide air quality standards for total suspended particulates, photochemical oxidants, sulphur dioxide, nitrogen dioxide, and carbon monoxide.	1948: Donora, Pennsylvania smog event kills 20 people and leaves 6000 people (43% of the local population) suffering from respiratory problems. 1949 US Public Health Service study attributes event to a combination of air pollutants (PM and SO_x) from industrial activity. Both the event and the study make national headlines in the New York Times and bring attention to health risks from air pollution (as distinct from smoke). 1955: Air Pollution Control Act authorises funds for demonstration and for state & local air pollution control agencies & calls for federal research by Department of Health, Education and Welfare
1960s	1961: Vehicle technology standard established by the California Motor Vehicle State Bureau of Air Sanitation to control hydrocarbon emissions. Referred to as "Positive Crankcase Ventilation", this was the first such control technology in the nation. 1963: Original effective date for the crankcase technology standard – legislation rescinded (reinstated in 1966). 1966: California Motor Vehicle Control Board adopts vehicle tailpipe emission standards adopted for HC and CO, the first of their kind in the nation. 1967: Mulford-Carrell Act creates the California Air Resources Board (CARB) by merging the California Motor Vehicle Control Board and the Bureau of Air Sanitation and its Laboratory. 1969: CARB set nation's first ambient Air Quality Standards for TSP, photochemical oxidants, SO_2, NO_2, and CO.	1963: First federal legislation on air pollution, the Federal Clean Air Act (CAA) of 1963. Provision of grants-in-aid to states for the implementation of air pollution controls. 1965: Motor Vehicle Air Pollution Control Act amends the CAA to establish air pollution regulatory authority at federal level and directs Department of Health, Education and Welfare to establish vehicle emission standards

1970s	1971: CARB adopts first in the nation vehicle NO_x standards 1972: California submits state implementation plan to US EPA for "criteria pollutants" as regulated under the 1970 Clean Air Act. Federal authorities reject submission. 1975: the first two-way catalytic converters came into use as part of the CARB's Motor Vehicle Emission Control Program 1976: CARB limits lead in gasoline Concerns over southern California air quality dominate state regulatory action through the 1980.	1970: Clean Air Act Amendments of 1970 strengthen federal authority to control air pollution & grant California the right to waive "pre-emption" requirement (see below). 1971: US Environmental Protection Agency issues National Ambient Air Quality Standards for PM, photochemical oxidants (including O_3), HC, SO_2, NO_2, and CO and new source performance standards (NSPS) for stationary facilities. 1977: Clean Air Act Amendments strengthen federal emission standards for stationary and mobile sources; California waiver for pre-emption stands. Also require strengthening of National Ambient Air Quality Standards by 1980. 1979: Federal NSPS ratcheted down for new plants
1980-1990s	1980: CARB adopts stringent NO_x emission standard for power plants requiring all facilities to reduce emissions by 90% between 1988 and 1990, effectively requiring selective catalytic reduction technology. 1988: California passes its own Clean Air Act requiring regional attainment plans strengthening control of pollution sources 1989: SCAQMD sets stringent emission standards for power stations requiring post-combustion technologies 1990: California adopts Low and Zero Emission Vehicle standard which jumpstarted the electric vehicle, and for cleaner burning gasoline; other states follow 1998: CARB identifies diesel as a toxic air contaminant; in 2000 launch requirement for low-sulphur diesel fuel and particulate standards for diesel engines.	Scientists bring attention to acid rain effects of NO_x and SO_x. 1990: CAA Amendments require EPA to issue federal regulations; establish national SO_2 emission trading programme to apply to new and existing facilities effective from 1995

Source: Based on Bachman 2007; CARB 2008b; Taylor 2006; Taylor et al 2005; Vogel 1995.

Eric Heitz of the Energy Foundation also pointed to past achievements as the "building blocks" for climate policy to give California policymakers a sense of what can be accomplished through policy. Consistent with the above discussion, Eric Heitz identified institutional capacity in the power sector as a key platform for future climate action: "… both energy efficiency and renewable energy were pulled into kind of the sights if you will of some of the leaders. The institutional strength that was set up at the California Energy Commission had a lot to do with it. …there were serious senior people thinking about that… analysts and others thinking about how to make that happen. Then, at the same time, in the late '80s and early '90s in California and also in the East coast, you had the rise of the utility energy efficiency programs. So at the same time as you had the CEC beginning to… institutionalize this." A range of important institutional changes that reinforce the ability of the state government agencies to address climate related issues, such as energy efficiency, accompanied this leadership in the energy and power sector.

Industry analysts also appear to recognise the influence of this history in the emergence of California leadership on climate change. In a recent report on energy security and climate change focusing on the implications for the vehicle industry, Merrill Lynch (2006) reported: "California has a long history of setting national trends on environmental legislation, and politicians, including Governor Schwarzenegger, appear to have taken on climate change as the next iteration of this leadership." As a whole such statements imply that the California policy community has made a direct link between climate policy on the one hand, and energy and air pollution policies on the other, with a common solution being clean and reliable energy supply and clean technology.

The remaining sections of this chapter trace historical developments of this base of experience in the climate related regulatory areas of air pollution and energy efficiency policy. Table 5.1 highlights major developments both in California and at the federal level.

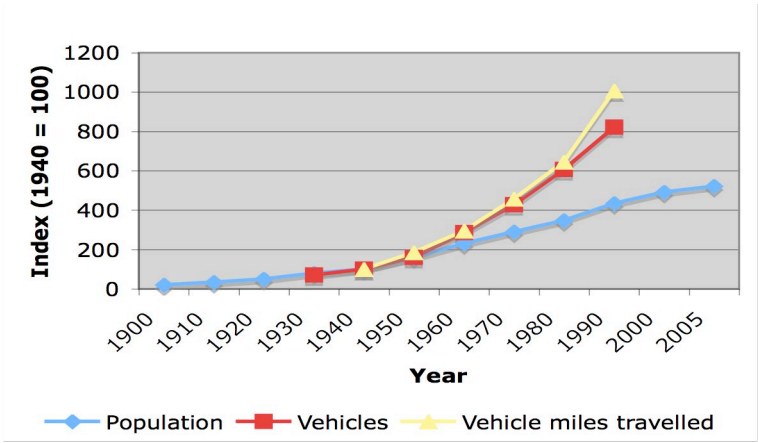
5.3. Urban air pollution and the motor vehicle

Urbanisation across the United States and many other parts of the Western world grew up after the First World War, along with rapid industrialisation of economic activity. Urban populations expanded rapidly in California towards the end of the 19th and into the 20th century. Economic development in California was largely facilitated by huge water infrastructure projects, which were planned and implemented during this period. In the first decade of the 20th century most of the California population of about 2.3 million, was based in the northern half of the state. Los Angeles was the home to only 102,000 at the start of the 20th century, however its urban population had grown ten-fold by 1930 to total roughly 1,238,000 (Figure 5.1; see also

Starr 2005). This explosive growth exceeded even that of San Francisco and Sacramento at the time of the 19th century Gold Rush and established southern California as a geo-political and economic force within the state (Starr 2005).

Since the beginning of the 19th century, transportation systems have shaped California's development. Electric rail soon became an important feature of urban living, one that was more accessible to the ordinary person than was the personal automobile. By the 1920s, virtually every American city had an electric rail system with 1200 inter-urban rail systems throughout the U.S. (Davis 2002; Snell 1974). In the 1920s, Los Angeles had one of the largest electric rail systems in the US; owned by the world's largest rail company, Southern Pacific. Known for its Red Car trolleys, the Los Angeles metropolitan area had 1500 miles of track, connecting major cities in the larger metropolitan area. Los Angeles also had more than 1000 yellow streetcars (Davis 2002: 59).

Figure 5.1: Population, vehicles and VMT in California



Source: author; data from CARB 2006. Starr 2005 and US Census 2006.

Also at this time the U.S. auto industry was suffering financial losses and feared a saturated market for private vehicles. This led to an organised effort to rid cities in the United States of their electric rail systems, including in Los Angeles, orchestrated through collusion between GM, parts of the oil industry and other corporations.[49] By the 1950s this strategic effort had largely succeeded with 900 out of 1200 electric railway systems either converted to bus systems or simply sold and dismantled. By 1953 the public transport system in Los Angeles had been destroyed. A front company for General Motors – American City Lines – had acquired and

[49] This is described in some depth in a 1974 report to the US Senate by Bradford Snell – main elements of which is online at: http://www.tompaine.com/Archive/scontent/4518.html; original material in "American Ground Transport," which is to be found in Part 4A of Hearings in S. 1167, The Industrial Reorganization Act, before the Subcommittee on Antitrust and Monopoly of the Committee of the Judiciary, U.S. Senate, 93rd Congress, 2nd Session (Washington, D.C.: 1974). See also discussion in Davis (2002).

destroyed many of the street cars and destroyed much of the heavy metal track that had facilitated rail travel but hindered vehicle traffic in the city area (Davis 2002).

Devra Davis (2002: 59-60) notes: "the history of southern California cannot be separated from the history of the car. … southern California grew as the promised land, where everyone had a right and a need for a car. Roads were built at a dizzying pace. In 1947, nearly two out of every five workers used public transportation. Two decades later, fewer than one in ten did. Today the number is fewer than one in twenty nationwide. From 1950 to 1970, the number of vehicles in southern California tripled, the population doubled, and the miles of road built grew more than fifty percent." Heavy dependence on the personal vehicle was not unique to southern California but widespread throughout the state. Kevin Starr (2005) notes rapid development in California from about 1910 on of large highway and bridge infrastructure projects of the 1930s that facilitated movement of people and vehicles across waterways and up and down the state. Urban electric rail was a historical artefact and inter-city rail service was increasingly abandoned, or dedicated to transporting freight rather than people. From the 1930s on, California's urban landscape and its economic development, as well as its cultural identity, was to be inextricably linked with the personal automobile.

5.4 Air pollution regulatory law is born: Los Angeles versus Detroit

Interestingly the earliest efforts to curb air pollution in California provide a perfect example of grassroots environmental activism taking hold in the state (SCAQMD 1997). Its first actions on air pollution control were taken at the scale of county and city authority, through the County and City of Los Angeles. As early as 1943, Los Angeles had experienced eye-burning smog events, which were unusual in that there was virtually no coal burning in the area (Bachman 2007).[50] In 1945, following similar action in other localities across the nation (Bachman 2007), the County of Los Angeles banned the emission of "dense smoke" and the City of LA followed suit with a similar ban. In 1946, an expert from St. Louis named Raymond Tucker was commissioned by the Los Angeles Times newspaper to report on the causes of air pollution. The results pointed to a wide range of sources, from industry to backyard burning of debris, and recommendations called

[50] Bachman (2007) reports on many more early local efforts to control smoke across the US between 1880 and 1930 mainly as a response to the aesthetic nuisance of smoke. Importantly the City of St. Louis commissioned Washington University Professor Raymond Tucker's pioneering work on cleaner combustion of coal in the 1930s. Despite even earlier work in 1914 by the Mellon Institute in Pennsylvania on the health effects of smoke, a link in public policy between industrial air pollution and human health was not made definitively until the 1940s with the regulations in Los Angeles, CA.

for a comprehensive approach to controlling the full range of pollution sources including from motor vehicles. He also recommended centralizing authority for air pollution control at county level, in an agency that would design and enforce regulatory approaches.

Tucker's advice was heeded when, in 1947, California passed the nation's first air pollution legislation, the Air Pollution Control Act (CARB 2003; Table 5.1). Its passage was in direct response to the problem of air pollution in southern California. This law established the authority to create an Air Pollution Control District in every county of the state but the County of Los Angeles was the first to exercise that right. In a review of the evidence and history of air pollution and health regulation of the United States, Devra Davis (2002:88) highlights the significance of the California's early action to limit air pollution from vehicles noting: "Driven by the political demands, California became the first state on many fronts. It was the first to have an air pollution control agency; the first to set up some form of program to test car engines on a regular basis; the first to impose automotive emissions standards…; the first to set up a process for setting and changing the standards for key air pollutants."[51]

Figure 5.2: First recorded photo of smog, Los Angeles, 1943

Source: SCAQMD 1997. Photo courtesy of Los Angeles Times Collection, Department of Special Collections, UCLA Library

The unique geography of Los Angeles basin is central to understanding the demand for air pollution control in the region. Mountains surround the basin and sometimes-stagnant sea air combined with sunlight and warmth, create an air inversion, which traps warm polluted air close to the ground by layers of colder air above it. The first major episodes of smog in the LA basin occurred in 1943, during World War II, and at the time of extraordinary industrialisation and population growth in the region. The 1943 smog events, referred to as a "gas attack", were initially (and wrongly) attributed to a butadiene plant in the region (SCAQMD

[51] Note that Revesz (2001: 580) identifies Oregon in 1951as the first state in the nation to establish broad air pollution control authority, with California following in 1957.

1997). When closure of the plant did not have a positive effect on smog, it was clear that the origin of the smog was elsewhere.

Discoveries by a southern California scientist in the late 1940s and 1950s, Dr. Arie Haagen-Smit, eventually led to the understanding that the smog episodes were caused by ozone pollution, which was not emitted directly but rather formed in the lower atmosphere by other precursor pollutants combining with sunlight and warm air (CARB 2006). Eventually ozone pollution was linked directly to risks to human health and ecosystems (e.g. eye irritation, respiratory problems, heart disease and damage to materials and plants) (Davis 2002).

Under the 1947 state legislation, Los Angeles (LA) County was the first in the state and in the nation to establish such an air pollution control district with health as a central objective of policy. Strongly supported in the California legislature, Governor Earl Warren signed the groundbreaking law "in spite of stiff opposition from oil companies and the Chamber of Commerce" (SCAQMD 1997). Shortly after this in 1948, a deadly air pollution episode in Donora, Pennsylvania, left 20 people dead and about half the residents ill, while also killing a plethora of local animals (CARB 2003; Davis 2002; Bachman 2007). In 1952-53 another deadly pollution event struck, this time in London. In 1955 residents of downtown LA suffered the highest exposure to ozone pollution ever recorded in LA at levels more than three times what it is today (Davis 2002; see Figure 5.4).

Thus by the late 1940s, California had broken new ground within the U.S. and also worldwide, by placing air pollution on the public policy agenda and initiating efforts to monitor and control it (Table 5.1). Beyond the unique geography of the LA basin, political attention on the problem of air pollution in California was also driven by a number of factors: its rapid economic growth; growth in population and number of vehicles; the lack of public transit options and long distances between communities – when combined with a large freeway network led to large increases in traffic and congestion (SCAQMB 1997; Melosi 2004; see also Figures 5.1 & 5.3).

Early in the history of California air pollution regulation, politicians had made the link between environmental protection and economic performance. Governor Goodwin "Goodie" Knight led the initial fight against air pollution in the 1950s. Devra Davis says of Governor Knight: "…his overriding goal was to keep California's booming economy moving and thus ensure his re-election in 1954… Knight and his minions understood that the famous California lifestyle could fast become unattractive if people became fearful about the state's air" (Davis 2002:79-80). The problem originated in Los Angeles (LA) and in some ways public understanding of the air pollution problem was propagated by LA's dirty air image. John White recounted: "In the 50s and early 60s …this plague …seemed to be uniquely Los Angeles. The political leaders, …the board of supervisors, …were instrumental in raising the issue of air pollution as a political priority."

Figure 5.3: Los Angeles traffic, 1950s

Source: SCAQMD 1977; photo courtesy of CARB.

Some of the earliest action against air pollution in California was led by local politician and LA County Supervisor Kenny Hahn,[52] much to the dismay of the auto and oil industry, when it became clear that neither the automakers nor federal regulation would move ahead quickly to control emissions (Melosi 2004). There was widespread recognition across the nation of LA's dirty air – for example, through popular television. John White said: "If you go back on the early days of the Tonight Show with Johnny Carson... they were making jokes about the smog in LA as if it was unique to LA." Meanwhile southern California's affluence and power within the state increased, with the growth in both manufacturing and the entertainment industries in this post-War period (Starr 2005).

Perhaps more importantly, the political power of wealthy southern California residents, who were directly affected by the pollution, helped to promote solutions. John White underscored this: "Who's downwind often has the most to do with the actual solutions. In southern California in the 70s ...you had the eastern part of Los Angeles, Uplands, Redlands, Riverside, Palm Springs.

[52] Kenny Hahn served on the Los Angeles County Board of Supervisors from 1952 to 1991(Los-Angeles-Almanac 2008). Although he was white, he was known as a champion for the black community and for his many initiatives to bring local development and amenities to the impoverished area of South Los Angeles (CE 2008; CLA 2008).

...those areas of the basin became more smoggy with higher levels of ozone, higher levels of particulates than any other part of the LA basin and ..." From a political and economic perspective this was important: "their whole image was affected, their self-image and their economic image. [LA was] the smoggiest part of California... so that community, even though very conservative compared to say the West side of Los Angeles or the Bay Area, was a source of political support for strong actions on air pollution" (White 2006i).[53] These upwind suburban communities were among the wealthiest residents in the Los Angeles air basin and their political influence contributed to the state's resolve to tackle the air quality problem.

Smog does not respect political boundaries. While Los Angeles County had been the first to establish an air quality management district to manage air pollution in 1947, by 1957 three more counties had followed suit to establish individual countywide districts within southern California (Orange, Riverside and San Bernadino Counties) (SCAQMD 1997). The westerly sea breezes of the Los Angeles coast concentrated the smog and the worst of its effects in some of the wealthiest inland areas in the metropolitan region. Yet it is difficult to bring together decision-makers across county lines to tackle the problem of air pollution, in part because at the time links to human health were still only tentative (Davis 2002).

Following the state's initial decentralization of air pollution control authority to counties, the period from 1960-1977 was a critical moment that solidified knowledge and institutional capacity to combat air pollution. According to John White: "This [was a] unique political environment that was bipartisan, that was not liberal or conservative but southern California against Detroit…" Although the County of Los Angeles began controlling industrial smokestack emissions as early as 1947, California's first pollution control standards for [add-on control technology for] vehicles came into force on 1963 models. When unfounded rumours of motor damage circulated, the regulations were temporarily rescinded by the legislature (SCAQMD 1997).

Under the unwavering leadership of Governor Pat Brown (Jerry Brown's father), the regulations were reinstated for 1966 models as California regulators persisted in implementing the nations' first tailpipe standards (Davis 2002).[54] Institutional capacity in southern California was finally consolidated in 1976, after a five-year political battle and two vetoes under Governor Reagan, when Governor Jerry Brown signed a controversial yet powerful law that joined the four

[53] This notation (name – year i) is used to indicate information is derived directly from an interview.

[54] Note there is some disagreement in the literature about the date of initial entry into force of these regulations. Some authors place the start date in 1965 (Percival *et al.* 2003; Revesz 2001).

individual county districts into one, more powerful agency -- The South Coast Air Quality Management District – effective 1 January 1977 (SCAQMD 1997).

A more centralised institution, the California Air Resources Board, was created in 1967 with the passage of the Mulford-Carrell Act, provides overarching regulatory authority across the state (Table 5.1). This linked across the activities of individual air quality management districts to control mobile and stationary sources (CARB 2006; Hershman 1970).[55] The CARB has as an overall mandate to protect human health, plant and animal life, and ecosystems from the harmful effects of air pollution and shortly began to issue state-wide standards (CARB 2006; see also Table 5.1).

The Board of Supervisors in Los Angeles County played a large role in the early political fight against air pollution. By the end of the 1960s, the Board included key personalities and people of influence in the region to lead the fight against air pollution to favour cleaner and healthier cities. This included Gladys Meade, the esteemed Dr. Haagen-Smit of the California Institute of Technology and well-known local politician Kenny Hahn[56] (White 2006i). For example, John White said: "Kenny Hahn personally wrote these letters to the Detroit executives saying you have got to clean up your cars, you're causing all this smog and they just sort of laughed. Then he made a campaign with the LA board of supervisors and the community of LA backing him."

Several years later in 1970, the US Congress revised the Clean Air Act (CAA)[57] to provide the statutory basis for controlling air pollution across the U.S. The passage of this legislation was accompanied by a fierce battle between federal and California lawmakers. California wanted to

[55] The Act combined the Motor Vehicle Pollution Control Board with the Bureau of Air Sanitation – both of which were under the Department of Health at the time. The CARB is comprised of an eleven-member board that is appointed by the governor.

[56] This includes the "legendary" Los Angeles County Supervisor Kenneth Hahn (see above) as well as to Gladys Meade and Dr. Arie Haagen-Smit, whom are known for their political leadership in the local fight against air pollution. Gladys Meade was a leader in the American Lung Association and the Women's League of Voters; she also served on the Boards of the South Coast Air Quality Management District and the California Air Resources Board; she remains active today, see: (Rose-Foundation 2008). Dr. Haagen-Smit was a California professor who discovered the atmospheric photochemical conversion of air pollutants that leads to smog; ozone was later shown to be a significant health hazard (Davis, 2002). Haagen-Smit became a champion of air pollution control policy in California.

[57] This act replaced the considerably weaker Clean Air Act of 1963. It followed earlier, more partial efforts to regulate air pollution. Significantly the 1963 Act provided grants-in-aid to states that implemented air pollution controls; by 1969 the number of states with such regulations had risen from 11 to 50. Federal legislation in 1967 (the 1967 Air Quality Act) was the first to recognise and provide an exceptional exemption for California's pre-existing and more stringent state-wide regulations. Although opposed by the auto industry from the start, this exemption survived the more comprehensive 1970 legislation and was later extended to cover additional source categories in the 1977 Amendments (Revesz 2001: 585).

maintain its authority to manage air quality locally. John White recounts: "The Clean Air Act [Amendments] didn't pass till 1970 and the whole reason that we are even around to do this is that we fought in the Congress with none other than George Murphy[58] leading the fight, the Senator from Hollywood, the song and dance man, a friend of [Governor] Ronald Reagan[59] who was a one-term Senator. He led the fight against [Congressman] John Dingle[60] of Michigan to try to protect California's authority when the Clean Air Act was passed." Joined by the California House Delegation, Murphy fought the federal attempt to take away California's authority.

California won the battle over federal authority with the passage of the 1970 Amendments, gaining specific exemptions from the law to provide it with authority to regulate air pollution in California. The Clean Air Act (section 209[b]) gives the EPA administrator authority to waive pre-emption for states that controlled auto emissions "prior to March 30, 1966", making only California eligible to receive a waiver.[61] Other states also eventually gained the option to adopt the stricter California standards in lieu of the (weaker) federal standards (Carlson 2003; Revesz 2001).[62]

California's aggressive regulatory efforts to control air pollution continue to this day with striking results (see Figure 5.4). Gladys Meade said (SCAQMD 1997): "Air quality has improved because of government regulation pushing a reluctant industry to comply with each issue." Jim Boyd, who served as chief executive officer of California Air Resources Board from 1981 to 1996 and who is now an Energy Commissioner in California, said: "In the beginning, they said it could not be done. They said the technology was impossible. That it was incredibly expensive" (SCAQMD 1997). Yet this was shown not to be the case.

California's results to improve air quality are unequivocal showing a reduction in peak ozone concentrations between 1955 and 1970 in downtown Los Angeles from 0.68 to 0.58 parts per

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[58] George Murphy was a Republican US Senator from California from 1965 to 1971. He was also an accomplished actor having made numerous motion pictures (US-Congress 2008).

[59] Ronald Reagan was Governor of California at the time that this federal legislation was passed; however he was known in California more for his vetoes of legislation to combat air pollution than for his support.

[60] Congressman John Dingell is in the US House of Representatives from the State of Michigan, home to the city of Detroit and seat of much of the US automobile industry. He is a Democrat and is currently the longest serving member of the House.

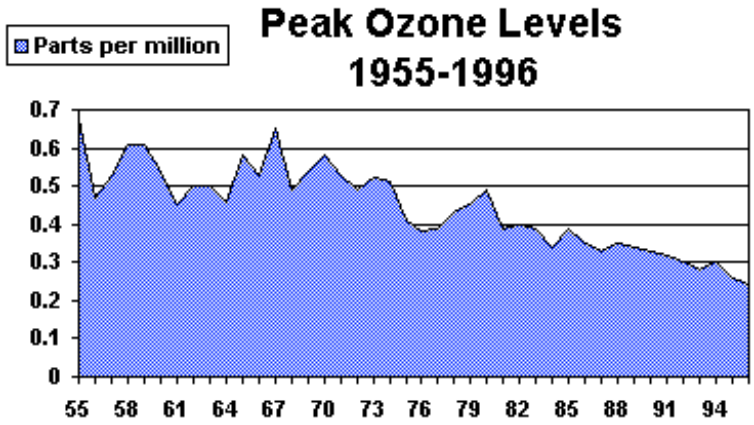
[61] CAA 42 U.S.C. §§7543(a), 7543(b)(1) as cited in (Carlson 2003).

[62] The authority to extend California standards to other states was initially done through the 1977 CAA Amendments and then reconfirmed in the 1990 Amendments. The caveat is that this can be done only in the event that the states have local areas that do not achieve federal air quality standards, *i.e.* they have "non-attainment" areas.

million (ppm) (see Figure 5.4). Concentrations continued to fall in the 1990s due to pollution control efforts, with 1996 figures for downtown LA standing at 0.24 ppm and for 2006 the 8-hour average peak estimate is less than 0.10 ppm (SCAQMD 2007). Unfortunately the air pollution problem in California and in particular in the South coast air basin remains. In spite of remarkable improvements in the last decades, air quality in the South coast metropolitan region is still among the worst in the nation today (SCAQMD 2008).

Perhaps because of the ongoing challenge of local air pollution, the institutional and technical competence in California is recognised by experts to be amongst the highest and most respected in the nation (Hanemann 2008; Heitz 2006i). Eric Heitz of the Energy Foundation explained how the opening in the Clean Air Act opened a window of opportunity for California to assert leadership on clean vehicle technologies in the transportation sector. He said: "On the transportation side, California's sense of leadership really grew out of the Clean Air Act and the recognition that Los Angeles was so much worse than anywhere else that… and that fact, … got encoded into the Clean Air Act, allowing California to go beyond what other states were doing." In his view, these circumstances, combined with policy decisions to build a strong "institutional apparatus and centre of excellence in California on air quality and transportation issues." In particular, Eric Heitz said of these years: "…a tremendous apparatus

Figure 5.4: Peak Ozone Levels, Los Angeles Metropolitan Area



Source: SCAQMD 1997.

Figure 5.5: Los Angeles area: "still …the worst air quality in the nation"

Source: SCAQMD 1997; Photo courtesy of California Air Resources Board.

was built beginning with California Resources Board, but also with the South Coast Quality Air Management District. Alan Lloyd was the chief scientist, Jim Lents was the head of it. …you had the worst air in the world by far, and a mandate to push and clean that up and no constraints by the federal government. And you had a popular sentiment that it was very bad…". Thus the regulatory and institutional capacity built by the state government to address air pollution was driven to a great extent by broad popular demand and political support for public interventions to improve California's air quality and local environments.

The California programme for air pollution control, and in particular, particulate and NO_x regulation of the vehicle sector, is widely regarded to have brought major technological breakthroughs to the sector, altering vehicle emission performance worldwide. Making use of the waiver right to exempt it from federal regulations on approximately 50 occasions (California 2008c). Carlson (2002) cites relevant vehicle technology breakthroughs to have included catalytic converters (for control of NO_x), unleaded gasoline and low-emission vehicles among others. These innovations have been broadly diffused in the world today, suggesting what Vogel (1995) has described as a "race to the top" or the "California effect" in the literature on trade and environmental policy interfaces. There is also evidence that at least for conventional air pollutants, strong environmental performance in the form of declining emissions can go hand-in-hand with strong economic performance (Bachman 2007).

Mary Nichols noted also the value of the experiential knowledge that grew out of the vehicles programme in California, which in her view had a clear influence on how the state was dealing with global climate change. Pointing to the international and national implications of the 2004 Pavley Law (see Chapter 6), she said: "…the fact that California has its own vehicle program is very central to our sense of our ability to act on an issue of national and international significance at the state level." As noted above, Mary Nichols highlighted that California was in a unique position of influence and latitude to act on CO_2 emissions from vehicles given the provisions of the Clean Air Act to allow California to regulate air pollution from vehicles.[63]

There is some evidence that California's aggressive air pollution regulation has benefited local business. For example, Taylor et al. (2006) show that where California has front-runner policy it has it has captured a significantly higher share of intellectual property rights for relevant

[63] Background for California's 2002 legislation regulating CO_2 from motor vehicles, commonly known as the Pavley Law, makes an explicit link between air pollution, CO_2 and energy. One of the principal legal arguments being used by the State of California to defend the law against various legal challenges is that it is necessary to improve energy efficiency to achieve significant improvements in the CO_2 emission performance of vehicles (see Chapter 5).

technologies than on average across the patent system as a whole in the US. Further Carlson (2003) identifies significant business activity in California in motor vehicle engine innovation. [64] This suggests that California business, including venture capital investors in which Silicon Valley California is an important worldwide centre, stands to profit economically from technology innovations (Mullins 2008) even when the clean technology innovations is manufactured out of state or by foreign companies. Furthermore, even if environmental or clean energy technologies are not "home grown" (i.e. made in China or elsewhere), an important service industry and technical, regulatory know-how has emerged in the state from the air pollution regulatory experience. This would suggest that California's early and aggressive regulatory efforts might have yielded important competitive advantages to local businesses in what are increasingly global markets for these services.

5.5. Energy policy emerges

While past experience with air pollution control policy may be part of the explanation for bold, early action in California to address climate change, many participants also saw action on climate change as linked to California's experience and experimentation with clean energy policies and technologies. The onset of the first oil embargos of the 1970s turned world attention to energy as a new domain of public policy (EPPFF 1974; Lovins 1976; Table 5.2). In the United States and elsewhere this became an important source of environmental policy innovation (see for example Corfee-Morlot et al. 2007; Mazur and Lee 1993).

In the 1970s, developments in California paralleled Federal efforts to move energy to the top of the policy agenda. Two prominent strands of early energy policy emerged: efforts to increase energy efficiency and to boost the supply of renewable energy. These initiatives targeted the same end-point: a clean supply of energy to fuel growth in California's population and its economy. Policies emerged in response to the energy crises of 1973 and 1979 as well as the nuclear crisis of Three Mile Island in 1979 (Lovins 1976; Roe 1984); as such they were not explicitly targeting environmental goals, rather they were aiming to avoid the risks of large-scale investment in nuclear power and of security risks of oil dependence.

[64] In an analysis of the legal history of environmental regulations in the vehicle sector, Carlson attributes important environmental innovations in the vehicle sector, such as the catalytic converter and hybrid vehicles, to California air pollution regulations. She argues that this is a form of "modified federalism" in the environmental arena that encourages experimentation at one level through the unique waiver for California (granted on the basis of its large size and ability to manage the problem), while also maintaining a large amount of federal control for regulatory policy.

By the time of nationwide and California the push for energy policy in the late 1970s, air pollution was already a well-established policy problem and it was not automatically clear that the two agendas were connected. As noted by John White: "…the air pollution fight was ongoing and it was not especially an energy fight although there were energy issues." Energy policy in California was begun as a separate area of policy and on a separate trajectory from air pollution policy. Over time the two agendas became increasingly intertwined.

Clean energy policy in California can be traced to the early 1970s, with the creation of the California Energy Commission. Eric Heitz underscored California's energy policy experience as part of the explanation for why it had chosen to lead early action on climate change (Heitz 2006i). On the origin of the state's energy policy he said: "That largely grew out of the apparatus that was built post-OPEC [embargos], when California built the California Energy Commission, which was a major institution saying that California needs to head in a different direction… That started the process off of California having a set of thinkers and an idea that it could do better on energy across the board."

Energy policy quickly moved to the top of the policy agenda in California in 1975 when Jerry Brown was elected Governor. John White said: "… [In] those years … we launched our solar programs. [The] solar and the wind industry both began in California with tax credits that were passed by the legislature and articulated by his administration. The independent power movement away from central station nuclear and coal plants began during that same time… so that first wave of energy technology of the green sort began during those years." The search for alternatives to petroleum and Jerry Brown's administration in the 1970-1980s may also have been a turning point when air policy began to connect to energy policy in the state.

Table 5.2: Highlights of Key Early Energy Policy Developments: California and United States

Year	California state action	US federal action & key events elsewhere
1970s	1968: PG&E begins construction of Diablo Canyon Nuclear Power Plant (2200 MW) 1973: Warren-Alquist Act passed but Governor Reagan later vetoed it. 1974: Warren-Alquist Act (revised) passes to establish the California Energy Commission (CEC) and regulatory authority over: energy facility siting; energy forecasting, planning and policy; energy efficiency programmes, standards (appliances and buildings), information & education; and technology research and development. 1975: CPUC decision to regulate electric utility investment decisions thus creating policy lever to require investment in energy efficiency. 1977: First California efficiency standards go into effect. 1979: PG&E completes Diablo Canyon Nuclear Power Plant but it is several Billion $ over original budget.	1973:" October – OPEC declares the first world oil embargo following the Yom Kippur War. President Nixon calls for equivalent of a "Manhattan Project" effort to free US of dependence on foreign oil. 1974: Federal Administration Act of 1974 replaces the Federal Energy Office with the Federal Energy Administration. 1975: US Energy Policy and Conservation Act includes extension of oil price controls and mandates automobile fuel economy standards; creates strategic petroleum reserve. 1977: President Carter announces National Energy Plan – calls for establishment of energy department. 1978: National Energy Act, includes: National Energy Conservation Policy Act; the Power Plant and Industrial Fuel Use Act, the Public Utilities Regulatory Policy Act, the Energy Tax Act, and the Natural Gas Policy Act. First CAFE (national vehicle fuel efficiency) standards take effect. 1979: January – 2nd oil crisis occurs when the Shah flees Iran. Three Mile Island nuclear power plant accident (March). President Carter announces programme to increase national use of solar energy.
1980s	1983: Diablo Canyon begins operation 1980 &1981: PG&E and SCE cancel plans to build new power facilities (coal and nuclear) and invest instead in a range of alternatives notably energy efficiency	Mid- to late-1980s: UNEP, WMO and ICSU organise a series of international conferences, first in Villach then in Belagio, to bring policymakers' attention to climate change 1986: Oil prices collapse and accident at Chernobyl nuclear power plant (USSR) 1987: US Energy Appliance Energy Conservation Act mandates federal energy efficiency standards for common appliances. 1988: UNEP & WMO create the IPCC; Toronto conference "The Changing Atmosphere: Implications for Global Security" issues (non-binding) declaration by governments to work towards emission reductions
1990s	1996: Energy Industry Deregulation Law passes. Beyond broad restructuring of CA electricity market, it establishes public goods charge and ability to fund energy-related research under CEC Public Interest Energy Research programme (PIER). 1997: CEC Renewable Energy Programme established through law (Senate Bill 90)	1992: President Bush signs the Energy Policy Act of 1992 to requires integrated resource planning at state level; also providing resources to help states comply. The Act also enables electricity market deregulation by expanding access to transmission through federal regulatory authority. 1992-94: Earth Summit '92 including the UN Framework Convention on Climate Change (UNFCCC) – entry into force in 1994. President Clinton and Vice President Gore unveil the US The Climate Change Action Plan, emphasizing voluntary measures to stabilize greenhouse gas emissions in 1993.

Sources: Various sources: ASE 2008; CEC 2008; Dasovich 1993; Hanemann 2008; USDOE 2008; see also Corfee-Morlot et al. 2007.

Referring to the second oil embargo in 1979, John White remembered that: "The movement towards alternative fuels was launched in that Jerry Brown period. … In '79, we got hit harder than the rest of the country in terms of mobility and gas lines and …so there was an emphasis on alternatives to petroleum. …That emphasis got harmonized with the clean air struggles and we began to look at how to use alternative fuels to get another chunk of air pollution. That debate then begat the electric vehicle, the fuel cell and [eventually] the hybrid. …That [energy] platform …built in the late 70s and early 80s combined with the infrastructure …built for air pollution control -- those two rivers of policy, if you will, both putting us ahead of the nation on the very things that would become important." Thus by the middle of the 1980s the two agendas, air pollution policy and energy policy, had begun to converge, and these agendas have provided a source of knowledge drawn from experience to support the earliest of the state's efforts to shape climate policy. California's climate policy elite has also repeatedly pointed to a strong link between climate change and its experience on energy efficiency if not other areas of energy and environmental policy. As Devra Wang, of NRDC, noted: "On energy efficiency… California has really led the country and led the world for 25 years." Many of those championing climate policies today in California see it through the lens of past experience with energy policy.

5.5.1. The Warren-Alquist Act and the Energy Commission

In 1973, the California legislature passed the Warren-Alquist Act (CA-Code 1973) to establish what was to become a stable, long-term framework to guide energy efficiency investment in California. The legislation was eventually signed into law following the OPEC oil embargo and widespread perception of an "energy crisis". In the face of widespread national attention to the issue of energy security, Governor Reagan reversed his original position to ultimately sign the Warren-Alquist Act in 1973 (Rosenfeld 1999).

The Warren-Alquist Act has a number of features that were extremely innovative at the time. It firmly institutionalised energy efficiency as a policy objective, along side of alternative (renewable) energy objectives and pre-existing air pollution policies. Specifically the law aims: "to improve the environment and to encourage the diversity of energy sources through improvements in energy efficiency and development of renewable energy resources, such as wind, solar, and geothermal energy" (25000.1 [a]). On energy efficiency it establishes: "the policy of the state and the intent of the Legislature to employ a range of measures to reduce wasteful, uneconomical, and unnecessary uses of energy, thereby reducing the rate of growth of energy consumption, prudently conserve energy resources, and assure state-wide environmental, public safety, and land use goals" (25007). Over time the law permitted a new way of

understanding energy supply to also include the notion of "supplying energy through greater efficiency" (Meier 1982; Meier *et al.* 1983).

As one of the primary strategies demonstrating California's leadership in this area, energy efficiency standards were first pioneered by California under the Warren-Alquist Act, leading the way for federal action, which came only later.[65] Dr. Arthur Rosenfeld and the Lawrence Berkeley Laboratory have played a prominent role in shaping the design and implementation of both California and federal policies in this area (Box 5.1).

Box 5.1: Art Rosenfeld and his energy efficiency legacy in California

Part of California's prescient record on energy efficiency may be attributed to institutional legacies established through visionary leadership of a few people. Art Rosenfeld is undoubtedly one of these leaders. An internationally recognized physicist, Art Rosenfeld has dedicated more than thirty years of his life to championing investment in energy efficiency (Roe 1984; Rosenfeld 1999). He has been an effective advocate of policy reforms, both across the nation and within the state of California. Policy attention to energy efficiency grew in part from the recognition by scientists that wasted energy was a valuable and relatively cheap resource, especially when compared to the cost of developing new energy sources. The "energy efficiency movement" in the United States grew out of a 1974 Princeton summer study, organised by the American Physical Society, on energy and environment; this event gathered some of the nation's most innovative and brilliant physicists on energy efficiency issues (Rosenfeld 1999). Rosenfeld was part of the group and remembers the profound conclusion that: "by the end of the first week, we realized that we were discovering (or had blundered into) a huge oil and gas field buried in our cities (buildings), factories, and roads (cars), which could be 'extracted' at pennies per gallon of gasoline equivalent" (Rosenfeld 1999).

Since the 1970s, Art Rosenfeld has provided leadership within the energy and environment group at Lawrence Berkeley Laboratory (LBL) helping it to become a major centre of expertise to support the Californian state government and the federal government to better understand energy efficiency potentials and to develop technical specifications for appliance and building energy efficiency standards. LBL has also partnered with companies and other non-governmental partners, such as Pacific Gas and Electric and the construction industry, to advance policies and practices that promote energy efficiency in the buildings, lighting and appliance sectors (Rosenfeld 1999). LBL and Art Rosenfeld in particular, have championed the role of energy efficiency and challenged conventional wisdom that "more is better" – eventually helping to avoid the cost of new power facilities in the state of California (and more widely in the United States) saving consumers Billions of dollars (Roe 1984). (See also Figures 5.3; Chang 2006; CPUC 2005a).

The Warren-Alquist Act requires an economical approach to rule-making, identifying "lifecycle costs" as one of the criteria for assessing the cost of alternative resources, including investment in energy conservation (25008). Interestingly, it also formally calls for the integration of energy

[65] Known as "Title 24 building standards" and "Title 20 appliance standards" (Public Resources Code 25402), these are revised at the discretion of the Energy Commission, but generally on a three-year cycle. Interim years are used to assess new technologies and develop the next generation of standards in consultation with stakeholders. The next update for building standards will be effective January 2008 and for appliances in January 2009. See CAT 2005, State Agency Work Plans, December 8, 2005.

with air pollution policy objectives: "In calculating the cost effectiveness of energy resources, including conservation and load management options, the commission shall include a value for any costs and benefits to the environment, including air quality" (25000.1.c). Thus formal recognition in California of the need for an integrated approach between energy efficiency and air pollution occurred as early as 1973.

The 1973 Warren-Alquist Act, the first of its type in the nation, had put California on the forefront of energy and environmental policy in the US. It enabled a prioritisation of investment in energy efficiency as well as in renewable sources of energy as alternatives to fossil fuel and nuclear energy supply investments. The Act institutionalised public authority to ensure that energy efficiency is considered an important "source of energy" alongside of other, presumably more expensive and polluting sources such as coal, oil or natural gas. In a landmark move, the Act empowered the state to set minimum energy efficiency standards for buildings and appliances sold in California so as to conserve energy, setting California out as a world leader in this area (Box 5.2). It also established the State Energy Resources Conservation and Development Commission, also known as the California Energy Commission (CEC), as the lead institution to oversee energy policy in the state.

Box 5.2: Federal versus state environmental regulatory authority

Despite the early action of the State of California on these issues, and the potential effectiveness of state action, the extent of state authority to regulate the environment is contentious and remains a complicated area of environmental law (*e.g.* see Revesz 2001; Carlson 2003). There is an ongoing back and forth between state and federal authorities on these issues, with industry often pushing for the federal government to intervene to "level the playing field" among states. The extent to which states have authority to regulate reflect a balance of different interests *i.e. for example the tension between whether* economies of scale of production be harmed by different product standards versus whether different standards promote better outcomes with respect to the goals of the law, such as air quality or energy efficiency. The latest example of this tug-of-war is in the area of motor vehicles where California's request to regulate CO_2 in this sector under the Clean Air Act was denied by US EPA.[66] The basis for the denial was on the grounds that the action regulated energy efficiency of vehicles, which is an area pre-empted by federal law.

…continued on following page

[66] US 2007

Box 5.2 continued…

Another example where California differs from other parts of the US is in the area of water use and its Where the federal government has asserted authority, the state may be required to maintain uniformity with federal standards, and is thus pre-empted from action that is more (or less) stringent than what has been laid down at national level. This is the case for vehicle energy efficiency standards, for example. Revesz (2001) notes that this varies from the more typical approach in US law, which allows states with more stringent standards to exceed federal regulations. The Clean Air Act is an unusual case where a specific exception was made for California alone, to allow it an exemption from the federal standards. Under certain conditions, other states may also choose to adopt the California emission standards. At least for vehicles, this has led to a situation where a dual set of standards is in play in the US, the more stringent California emission standard versus the less stringent federal standard.

The case of federal and state appliance standards differs but also demonstrates the influence of industry calls for uniform standards. Some of the nation's earliest appliance standards were first adopted in California in 1977, with Florida, Massachusetts, Connecticut, New York and other states also adopting these.[67] Federal authority to set appliance efficiency standards became effective in 1987, thus their timing lagged about ten years behind that of California on household appliances. Once adopted, these were implemented uniformly across the US. In this case the California standards became the model for federal standards. Federal authority to regulate buildings was debated but never approved by Congress, leaving states to fend for themselves and firmly establishing California as a leader in this area (Rosenfeld 1999).

Where the law permits the possibility for a waiver, California may request and receive a waiver from the federal government to exceed federal standards and this may also occur for appliance standards. For example, Devra Wang noted a recent exchange concerning air conditioners: "California has a …very hot and dry climate [compared to] the rest of the country and so the types of air conditioners that are efficient here are not necessarily the same [as elsewhere]. So the metric that the federal standard uses does not necessarily denote high efficiency for California's climate." Thus from a technical standpoint it can and has been in some cases successfully argued that California should set its own energy efficiency appliance standards in certain instances.

Another example where California differs from other parts of the US is in the area of water use and its interaction with energy. Taking into account the extensive water storage and transport infrastructure in California, which moves massive amounts of water from the North to the South of the state, as well as heating and wastewater treatment, the use of water is estimated to account for 20% of the state's electricity use and 30% of its natural gas use (Cohen *et al.* 2004a). As a result there is growing interest to save water to save energy. Devra Wang reports: "There are a lot of potential synergies between the energy and water efficiency programs and there are huge potential savings that are both very cost-effective from an energy and greenhouse gas perspective. ...Water is an extremely valuable resource in California." Accordingly the California Energy Commission is also beginning to establish water efficiency standards for household appliances, such as clothes washers, in part because of the embedded energy savings that can be achieved (Wang 2006i). The federal government currently does not regulate water use of equipment or appliances, thus the area is open for state action.

Although it had not used the terminology of "integrated resource planning," the Warren-Alquist Act in California was path breaking in its call for just that. Integrated resource planning requires

[67] More recent examples also exist in the area of lighting – see IEA 2006a.

energy conservation and management to be considered alongside of energy supply investments and this was also to become federal policy, but only two decades later with the passage of the (federal) Energy Policy Act of 1992 (see Table 5.2).

5.5.2. Tapping into the supply curve of energy efficiency

Another innovative idea embodied by the Warren-Alquist Act was to insert regulatory review into a previously un-trodden area for state oversight – that of electricity demand forecasts. The reason to do this was to consider whether all proposed investments in new facilities were warranted, or alternatively, to test whether some might not better be avoided by investment in energy efficiency (Roe 1984). John White said: "One of the controversies at the time was how is the state going to permit and site all the new power facilities? So the idea was that we should have a single permit at the state level - an one-stop shop as they came to call it -- where you would be able to get a state siting certification for new power plants. At the time we were looking at nuclear plants and coal plants and gas plants. All of them big scale, so the idea [was that] in exchange for siting authority, …the state needed to have a forecast of what the energy needs would be."

The CEC was given the authority to generate electricity demand forecasts. In the words of David Roe (1984: 38), the purpose of this new reform was "to cure the overestimates of the utilities." Embedded in an agency with little regulatory authority and without a history of public advocacy, some environmental advocates questioned whether this change would make a difference to investment decisions of the utilities, even though it was one of the principal reforms brought about by the law (Roe 1984). Environmental Defence Fund (EDF) was one of the environmental advocacy groups to participate in California's regulatory processes concerning the electricity sector in the 1970s. In their view, the real action was going to be on the financial issues through the regulatory proceedings of the California Public Utilities Commission (CPUC). The CPUC had authority to set electricity tariffs or rates for electricity, based on their actual and planned investments, or costs of business to be recovered (Roe 1984; Dasovich et al. 1993).

Tom Graff had helped to open the California office of EDF in 1971 (Graff 2006i). He was also one of the lead lawyers in an initial series of regulatory proceedings that opened the way to ensure that energy efficiency was embedded in the investment plans of the electric utilities (Graff 2006i). In the mid-1970s, EDF collaborated with technical experts from Lawrence Berkeley Laboratory (LBL), notably with Art Rosenfeld, to argue in rate cases before the CPUC that it would be possible to meet a given demand at remarkably lower cost. They advanced the argument that required investment costs in new power generating facilities could be less than half of what utility

forecasts suggested. These lower cost energy scenarios could be made possible by aggressive investment in energy efficiency and other alternatives.

An initial breakthrough occurred in 1975 when the CPUC exerted its authority to review utility investment plans (Dasovich et al. 1993; Graff 2006i). Tom Graff remembers: "… it was a proceeding… a standard rate case where the question was: … 'were PG&E's expenditures' you know, 'appropriate' so that they could be approved and then a greater return could be applied to that? And we questioned their expenditures, and we were way the hell out. I mean we were just trying stuff that was just way beyond and [PG&E lawyers] were objecting at every moment. And Lenny Ross who had just been appointed by Jerry Brown as a [C]PUC commissioner a couple months earlier, in early 1975, took that proceeding and wrote… [he] added a page in which he said: 'based on blahblahblahblah… from henceforth utilities projected investment plans should be up for [C]PUC review.'" This meant utility investment plans would be subject to scrutiny by a range of technically savvy environmental and consumer advocacy groups as well as by regulators.

Tom Graff tells the story about how they initially accessed details of utility investments plans, which at this point were not in the public domain: "Zack Willie and I went over to PG&E's document room and asked for the investment plans. And somebody at PG&E… unbeknownst to us who it was, whether it was a mole or it was someone who was not knowing what he or she was doing or it was in fact someone saying: 'well we were asked for this, here it is'… they gave us their investment plans, which were just stunningly outrageous. I mean there was like Billions of dollars of investment in big new plants with no [justification]… Nobody had ever asked for this stuff before. So we just went in there and… we did a fishing expedition and we caught something. … It was interesting because … there was a footnote. You know, why do they have a little footnote on one of those pages that said: '…and this assumes rate increases every year for the next 20 years?' " [68]

The 1975 CPUC decision is considered to have been a turning point in California policy, where utility investment decisions became routinely scrutinized through open, deliberative CPUC regulatory proceedings (Dasovich et al. 1993; Graff 2006i; Roe 1984). Dasovich et al. (2003: 47) report that it was in this (September 19975) decision that the CPUC first articulated its position on energy conservation, in stating:

> "We regard conservation [as] the most important task facing utilities today. Continued growth of energy consumption at the rates we have known in the past

[68] Roe (1984) also recounts this incident.

> would mean even higher rates for customers, multi-Billion dollar capital requirements for utilities, and unchecked proliferation of power plants. Energy growth of these proportions is simply not sustainable. Reducing energy growth in an orderly, intelligent manner is the only long-term solution to the energy crisis."[69]

Institutional capacity thus developed on several fronts to question the authority and assumptions of utilities as they developed investment plans and, eventually, to re-direct these plans towards lowest cost, energy efficiency strategies.

Working alongside of the environmental advocacy community, LBL was a central driving force (see also Box 5.1). As Ralph Cavanagh, Energy Program Co-Director of the Natural Resources Defence Council, said: "…[it was] the place that probably mattered the most in terms of actually doing the groundwork, laying the groundwork for that. Some of it was also done in the environmental community at places like NRDC, but LBL under Rosenfeld is going to figure very prominently in any history of that period". The critical players were of course the utilities, but also the environmental advocacy community including EDF but also NRDC and others, and the regulatory institutions of the state (CPUC and CEC).

At the core of the peripheral non-governmental activity however, there was a small but growing epistemic network centring on the Rosenfeld group on Energy Efficient Buildings at LBL. In 1973, the same year as the passage of the Warren-Alquist Act, University of California at Berkeley established one of the nation's first interdisciplinary graduate programmes on energy, known as the Energy and Resources Group (ERG) (ERG 2008). This university based research group extended the network of policy-relevant scholarly work, which would, over time, support decision-making in California.

In the late 1970s and into the 1980s, EDF actively participated in the CPUC regulatory arena, focusing its expert interventions not on the level of forecasted demand, but on cost of supply. They modelled alternatives for supplying electricity, for a given increase in demand, agreeing with the utilities that there would be growing demand for electricity in California (Roe 1984). EDF's efforts led to landmark victories in 1980 and 1981 in which two of California largest utility companies – PG&E and SCE – shelved plans to build new power facilities (coal and nuclear) and invested instead in a range of alternatives (Emshwiller 1981; Jones 1986). John White underscored this history and the force of the voice of environmental advocacy organisations, such as EDF and NRDC, in shaping of energy efficiency policy of the state: "…[they] have continued

[69] 78 CPUC, page 746 (Decision 84902, September 16, 1975), as cited in Dasovich et al. 1993.

to really articulate that vision and that's part of what the energy efficiency programs are based on. The legacy is still from those rate cases, of creating incentives, getting the utilities some money to try to get them to do the right thing."

5.5.3 Rethinking electricity supply

Although nuclear power and the oil crisis was the initial concern that opened up the debate across the United States the mid- to late-1970s, the innovate regulatory approach taken by the CPUC and other regulatory authorities in the US -- to subject utility investment plans to public scrutiny -- had broad implications for the electricity supply industry generally (Dasovich et al. 1993). John White summarised: "And there became an ethos that the state should make conservation at least part of the consideration when deciding how many new plants to allow you to build." The results were striking; as Art Rosenfeld (1999) pointed out: "it is improved efficiency that has been the largest single generator of new electric services for California's growing economy." Interestingly, the CPUC still monitors its achievements in reducing energy demand in terms of avoided power plants (see section 5.7 below).

By the late 1970s, Federal laws were establishing national policies to limit the vulnerability of the nation to foreign oil supply shortages and price hikes. Two different national laws converged with the state laws in California to shift incentives to favour investment and grow markets for alternative fuels and energy efficiency. First was the Energy Policy and Conservation Act, of 1975, which led eventually to national energy efficiency standards for vehicles (USC 1975) (see Table 5.2). A second wave of legislation was shuttled in by the Carter administration in the late 1970s and focused on energy alternatives, including the Public Utilities Regulatory Policy Act of 1978 (PURPA; USC 1978). Finally in 1986, US Congress passed the Energy Appliance Energy Conservation Act, which mandates federal energy efficiency standards for common appliances (e.g. refrigerator, air conditioners and natural gas furnaces) (Nadel 2002). As shown in Figure 5.6, the combined impact of state and federal standards on average energy efficiency of appliances was striking, leading to significant savings in energy, reductions in air pollution and in GHG (CEC 2005a; see also Chang 2006; Berstein et al. 2000; Rosenfeld 2008 and Sanstad et al. 2006).

The PURPA effectively ended the monopoly that electric utilities exercised over supply and forced them to buy power from third-party power producers at their "avoided cost." In California, the CPUC interpreted avoided costs to be the marginal cost of new power additions for investor-owned utilities, a cost that was based on what could be built economically at the margin at large-scale (e.g. natural gas). Thus a relatively high price was guaranteed for third-party power

producers, which in turn stimulated significant new investment in alternative power sources, such as co-generation and wind, in California. The US Energy Policy Act of 1992 further opened the electricity market (see Table 5.2).

These shifts in federal and state legislation changed energy policy of the nation and in California to favour clean energy alternatives, including energy efficiency among supply options. It also began the change in structure of the industry, a preview of what would be even greater change in the future. In particular it marked the beginning of the power sector's transition from large-scale to small-scale, modular power generating facilities along side of investment in energy efficiency, a change that was driven by both changes in regulatory regimes as well as in technology.

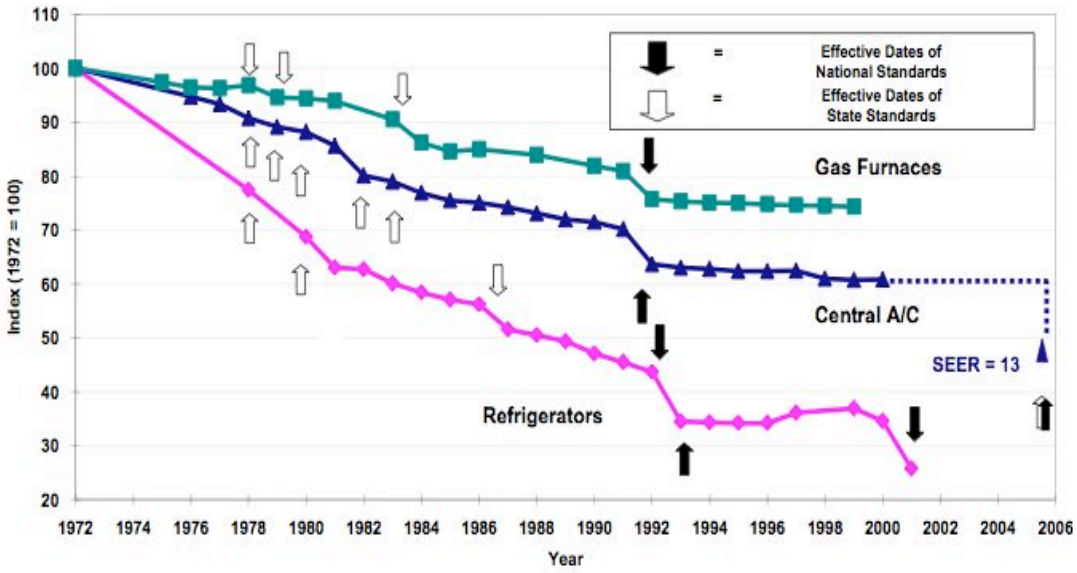
In the past, the large scale of technology had led utilities to build and to own their own facilities. By the early 1990s, there had been significant improvements in natural gas turbine technology, building on military research for aircraft gas turbines, that permitted modular, on-site power generation and co-generation (production of heat and power simultaneously) (Wald 1990; White 2006i). This led to a different scale of investment activity to adapt power investments to smaller increments of demand, and a different ownership structure in the power sector. As John White said: "…the need for the monopoly was diminished in part because the financing of the projects was less burdensome. If you were building a 1500 megawatt coal or nuclear plant then you had all those [risks of] cost overruns".

In the heyday of nuclear power construction, cost overruns could and did occur in California and elsewhere (Dasovich et al. 2003). For example, in the case of Diablo Canyon Nuclear Facility, which was built by PG&E in the 1970s, the facility was several Billion dollars over-budget when finally completed in 1979, in part due to unanticipated engineering challenges.70 However in the new world of small-scale, modular natural gas or other alternative (e.g. co-generating) energy facilities, the financial requirements and risk profile of the sector had significantly shifted. This shift made investments in large-scale nuclear (or coal) facilities increasingly less profitable and less competitive in the new market context.

[70] Based on the author's own experience as a rate analyst at PG&E working on the Diablo Canyon Rate Case. The main challenge included building the facility near an earthquake fault that was discovered after the design and regulatory approval of construction of the facility during the construction process. See also Dasovich et al. 1993.

The changes in market and technical structure of the power industry eventually opened the way to partial deregulation of the U.S. market. An important feature of this new market structure, inspired in part by federal regulations, was the growing presence of independent power producers. However this market development was linked to technology change which meant that there was more system flexibility in building smaller modular units for power production, units which had shorter lead time for investors and less regulatory uncertainty. In turn these developments fostered the idea of deregulation, where, as John White put it: "…the utility wasn't the only

Figure 5.6: Impact of Standards on Three Appliances 1977 to 2001



Source: Nadel 2003 (as cited in Rosenfeld 2008) and Nadel 2002

builder and not even the optimum builder."

The theory behind the deregulatory effort sweeping the US in the late 1980s was that electricity markets would be like the other deregulated monopolies e.g. telecom and natural gas, where markets had been successful deregulation starting. Yet John White pointed out: "It turned out to be different…electricity is a much different commodity to deregulate: unlike natural gas you can't store it, so you have to make it in real-time and use it in real-time. Also the capital requirements of the industry are significant, even with decentralized technology. And then we have market manipulation… and Enron… and a bunch of things that happened… so then we ended up with failed deregulation…."

5.5.4 Energy industry deregulation (1998) and the electricity crisis (2000-2001)

In the late 1990s, many states acted to deregulate their electric power industry. In California, legislation known as the Electric Industry Deregulation Law was signed in 1996 and became effective in 1998.[71] The aim of the legislation was to liberalise the power market in California and restructure the industry such that it was divested of its largest capital assets and leave the selling and the purchase of power to the new "competitive" market. However the law also reorganised the way that environmental policy was to interface with the energy market and private sector players. By March 1998, the California market was open to competition under the new rules set out by the CPUC (USDOE 2003).

Prior to deregulation, three vertically integrated investor-owned utilities dominated the market, each with their own power generation, transmission and distribution facilities. The companies remain today the principal players in the California market: Pacific, Gas and Electric; southern California Edison; and San Diego Gas and Electric (SDG&E). In the restructured market, the companies were allowed to sell off most of their major capital investments, with the exception of nuclear and hydropower capacity. They thus became "load-serving entities" (LSEs), which shifted both the structure of the companies and their management objectives. John White recalled: "…in their mind they weren't going to be in the procurement business [i.e. procuring electricity]. They were going to be in a poles and wires business with the captive distribution customers …everybody originally envisioned that the procurement would be done by individual customers and suppliers in an open market that would be liquid and deep ….it never showed up."

The market operated under the emerging set of rules without major disruptions until the summer of 2000. At this time, California's electricity market experienced a "tight" supply market due to a dry summer, high demand (though not at historically peak levels) and low availability of hydropower in the region. A number of conditions in the newly deregulated market for power led to dramatic hikes in the cost of purchased power and eventually shortages – electricity blackouts – in California. This electricity crisis, which began summer 2000 and lasted through the winter of 2001, raised alarm throughout the West, and indeed the US, about the future of deregulation in the power sector (Peace 2000; USDOE 2003; Wolak 2003).

[71] Electric Industry Deregulation Law – AB 1890 – signed 1996; effective 1998.

Box 5.3: Public Goods Charge Established in the Electricity Sector

In a prescient manner, the law that deregulated the electricity sector in California also established a visionary charge, which aimed to provide "public good" benefits that would not otherwise derive from the market (CA-Code 1996). It established a non-bypassable public goods charge on electricity sales and a mechanism to dedicate revenues from this charge to four key purposes: energy efficiency; renewable energy; research and development; and low-income assistance. The basic tenets of the law remain in place today. It is a small surcharge on electricity (3.5 to 4.7 mills/kwh) collected by investor owned utilities (IOUs). Although the exact amount varies by year, it funds several hundred million USD for energy efficiency per year, and about half this amount for renewable energy, as well as $62.5 million for research, development and demonstration programmes (2002-2011) (CA-Code 2006d).[72] The CEC and the CPUC work together to disburse this funding.

With respect to the funds for energy efficiency, these are returned to IOUs to implement programmes and goals mandated by the CPUC (CEC 2005a; see Figure 5.7 below). The strong environmental and economic performance of this investment in energy efficiency is well documented (CEC 2005; Chang 2006; Berstein et al. 2000 and Roland-Holst 2008).

The research funds are administered by the CEC to support the Public Interest Energy Research (PIER) programme.[73] The mission of PIER, as originally set out in 1997, gives a prominent place to environmental objectives (CEC 1997): "…to conduct public interest energy research that seeks to improve the quality of life for California citizens by providing environmentally sound, safe, reliable and affordable energy services and products. Public Interest Energy Research includes the full range of research, development, and demonstration activities that will advance science or technology not adequately provided by competitive and regulated markets." PIER has six different programme areas and while most of the funding goes to energy efficiency or renewable energy technology (or technical process) research, demonstration and development, since 1999, the programme has supported climate change science and policy research. Funding for this activity began at about $2 million and now fluctuates at about $5 to $6 million per year.[74] There are two main lines of the climate research programme: regional climate change monitoring and modelling and economics of mitigation and adaptation policies (CEC 2003a). A recent independent review of the PIER programme confirmed its role in keeping California in the forefront of energy and environmental RD&D and noted the unique role of PIER to conduct research in the area that is specific to the California context (CCST 2005; see also Chapter 8).

The electricity crisis was also a financial crisis for the State of California and its electricity companies. By early 2001, one of the three large utilities had filed for bankruptcy (PG&E), another was close to bankruptcy (SC&E) and the new power exchange (PX) entity, which had been created to mediate the sales of power from wholesale to the retail companies, also declared bankruptcy (Wolak 2003). All had suffered under state rules that had capped retail prices of electricity, while wholesale power prices had risen astronomically. John White said: "… the irony was we thought we were freezing rates to keep them from falling so we froze the rates in

[72] Funding amounts are adjusted annually to reflect the lesser of electricity annual sales growth or annual inflation.

[73] The original legislation (AB 1890) established this funding for a 4-year period; 2002 legislation later extended these provisions to 2012 (AB 995 and SB 1194).

[74] Personal communication Guido Franco (6 June 2007) and interview Guido Franco (Franco 2006i).

order to guarantee the utilities the revenue to pay off their stranded cost. …Nobody imagined that the rates would need to go up. … The question was how far will they fall and could we freeze them so the utilities could pay off their debts. We froze them and then the generators figured out how to game the market and raise prices. We got a shortage, we had a hot summer, we had a natural gas shortage…. Suddenly the wholesale market is above what the rates were."

Expectations, fed by economic analysis, were for electricity prices to decline due to increased competition in a deregulated market. Thus the intention of the state pricing mechanism was to protect the companies from falling prices. In the end, this problem never arose and the intended solution had become the source of a different, unanticipated problem that would lead to insolvency in the retail business.

Analysts of the electricity crisis point to a number of critical factors that led to these market conditions and the failure of the deregulated market to deliver low cost power to California consumers (O'Donnell 2002; Wolak 2003). Largely divested of power generating facilities, the LSEs (i.e. the utility companies) were focused on retail operations, including the purchase of power to supply retail customers. An important strategic error of the LSEs was failure to forward contract for an important share of their retail area power needs.[75] Instead, over-dependence on the newly established spot market for power, with lower import availability in 2000, combined to make the California retail market particularly vulnerable to a limited number of wholesale energy companies wielding an increasing amount of market power.

Acting more rapidly and comprehensively than many other states in the U.S., California embraced the notion that a liberalised power market could benefit consumers and companies alike. In retrospect, some analysts argue that the attempt at deregulation did not address the right type of details. For example, important issues were the respective roles of federal versus state regulatory authorities to intervene in the case of market power, or other extreme situations, on the use of spot markets as opposed to a more reasoned approach to the use of spot markets as part of a mix of instruments that also includes long-term contracts for power to fulfil demand (Wolak 2003; O'Donnell 2002). These and other conditions and oversight arrangements in California led to market manipulation that resulted in prices that were 10 to 12 times higher than wholesale energy price increases in the rest of the western U.S. in this period (Peace 2000; Wolak 2003).

[75] One could also have expected a requirement for this type of contracting to have been laid out in the restructuring law or the CPUC rules on how to implement that law, as was done in other states. See Wolak 2003.

Most observers agree that a main reason for price hikes and power shortages in California was failure in regulatory oversight at the federal level, operating through the Federal Energy Regulatory Commission (FERC). The FERC has the authority to oversee wholesale power markets, among other inter-state energy transactions, and had led the way towards deregulation across the US (Wolak 2003; Peace 2000). It is responsible for ensuring "just and reasonable" pricing in this wholesale market. One of its main functions is to prevent companies from exerting market power that would keep prices of power unnecessarily high and limit the consumer benefits of competitive, deregulated market. Operating in this new market, the FERC has much greater influence than it did previously over how the market develops and operates. The early years of deregulated power markets revealed how unprepared the FERC had been for some of the developments that occurred (Wolak 2003).

Wolak (2003) joins others (e.g. O'Donnell 2002) to argue that the FERC was dysfunctional during the California crisis. The state senator responsible for the original legislation that deregulated the industry in California, Steve Peace (2000), wrote to the Chairman of the FERC in 2000: "At its core, the Commission's responsibility is to assure that wholesale rates are just and reasonable. FERC – without explicit Congressional approval – chose to turn to the market in an effort to meet that mandate. When it did so, the Commission assumed the responsibility to assure that people did not profit by manipulating either the market rules or the market itself. In this case, parties have clearly done both. And, they are easy to find. They are the ones with the money. Your job is to make sure they don't get to keep it." Eventually FERC acted to require rebates of the companies that had unfairly profited from the situation in California. However significant damage had been done to the hopes and expectations of Californians about what such deregulated markets could deliver.

California's attempt to deregulate the power industry in the U.S. is widely viewed by experts and the public alike as a failure. While it is outside of the scope of this research to assess the conditions of failed deregulation in the power sector, it is important to note here that the electricity crisis of 2000-01 looms large in the minds of elite policy actors and of the citizens of the state. There remains a fundamental worry about the role of the market in the power sector, which is undeniably linked to this recent experience. In turn this explains at least in part the strength of regulatory institutions and of the regulatory culture in the energy sector that exists today in California.

Many of the existing institutional mechanisms for environment and energy policy in California were reshaped during this restructuring period. A main outcome of the crisis was a pulling away from deregulation in this sector, which in turn altered once again the opportunities and

mechanisms that could be used to address environmental concerns of the energy sector. After an interim period of crisis management (roughly from 2001 to 2002), the state legislature eventually passed legislation re-instating some of the key features of the previous, regulated market. This included putting the electric utilities back in charge of long-term power procurement under the regulatory eye of the CPUC (CA-Code 2006a). This regulatory authority is currently one of the key policy levers for early action on climate change in the power sector of California.

5.6. Learning from the electricity crisis

Following the 2000-2001 electricity crisis, California's Energy Commission (CEC) and the California Public Utilities Commission (CPUC) strengthened collaboration to lead the design and implementation of the State's energy policy in an environmentally and economically sound manner. Increasingly climate change has figured among the priority objectives of the two agencies in executing their regulatory authority.

The failure of electricity deregulation provided an important window of opportunity for energy and environmental policy. As Devra Wang explained: "California pioneered these policies in the early 80s, got rid of them when they moved to restructuring. …What the state tried to do before the crisis …was just leave everything up to the market – 'we'll buy everything on a short-term basis.' [In that case] no one is looking ahead and making those long-term investments."

Working quickly to respond to the electricity crisis of 2000-2001, California lawmakers passed legislation in 2001 and 2002 (CA-Code 2001a; CA-Code 2002b) to re-establish an aggressive policy framework for energy efficiency in the power sector (Bachrach *et al.* 2003). This framework includes broad electric power procurement authority for the electric utilities to oversee resource procurement to serve their customers, including investment not just in supply but also in demand side resources (e.g. through energy efficiency investments). The 2002 legislation explicitly instructed utilities to exploit "all practicable and cost effective" conservation and efficiency improvements (Bachrach 2003). Another law passed in 2001 (CA-Code 2001a) and directed the CPUC to establish a "decoupling" policy separating the level of allowable electricity rates from the level of capital investments undertaken by the utility (Bachrach 2003; Bachrach *et al.* 2004). Devra Wang explains that the establishment of the logic to "decouple" the allowable rate to be charged for electricity and the investment in new power generation changed the financial calculus for the utilities. She said: "…they [the utilities] were no longer hurt financially by selling less or encouraging energy efficiency and they could no longer profit by trying to sell more. So that removed one of the key barriers to energy efficiency." She notes the strength of this

framework is: "…putting the utilities back in charge of making the long-term investments and looking at the integrated portfolio, including both energy efficiency and other resources...".

5.6.1. CEC and CPUC collaboration 2002 - 2005

In a later development, the role of the CEC was strengthened following the electricity crisis with the passage of new legislation in 2002 (SB 1389) (CA-Code 2002). This legislation required the CEC to "conduct assessments and forecasts of all aspects of energy industry supply, production, transportation, delivery and distribution, demand, and prices." The law further stipulated that: "The Energy Commission shall use these assessments and forecasts to develop energy policies that conserve resources, protect the environment, ensure energy reliability, enhance the state's economy, and protect public health and safety." Also at this time, California's principal energy agencies -- the CPUC and the CEC -- collaborated to develop the state's Energy Action Plan, first in 2003 and updated in 2005 (California 2003; California 2005e).

The Energy Action Plan (EAP) aims to deliver reliable, affordable and environmentally sound energy to Californians, including the recognition of climate change as a central part of the challenge. CPUC President Michael Peevey said in the press release for the first report: "The Energy Action Plan is a very progressive program for California. It recognizes the severe threat global warming presents and adopts an environmentally sensitive, green agenda. The agenda emphasizes reducing per capita electrical use and relying on renewable energy sources such as solar, wind, and biomass, along with greater emphasis on energy efficiency programs to meet California's future energy needs" (CPUC 2003). According to Devra Wang: "the Energy Action Plan …said that 'energy efficiency is top priority.'" Thus from the start in the post-restructuring period, California's elite energy policymakers flagged climate change as a key policy issue and aimed to set out energy policies to address it with a notable emphasis on energy efficiency.

Beyond strengthening energy efficiency (and renewable energy) policies, the CEC and the CPUC have more recently begun to work through the Energy Action Plan to champion policies to directly mitigate greenhouse gas emissions. Practical implementation of these policies occurs through regulatory decisions of the CPUC in power sector and more recently through the CEC for the municipal power sector (see Chapter 4).

5.7. CPUC leadership: power sector greenhouse gas policies 2004-2007

Beyond the general policy guidance issued by the CEC and the CPUC (California 2003 and 2005), and the regulatory authority of the CEC to issue and uphold appliance and building

standards, the CPUC has regulatory authority over the investor-owned power companies, which can affect GHG performance across the state. The CEC supports the CPUC as it is responsible for working with utilities to gather data and monitors the performance of these utility investments in energy efficiency, load management and renewable energy. In this way, the CEC provides critical input to the CPUC to support the evaluation and adjustment of regulatory policy over time.

The remainder of this section focuses on CPUC efforts to integrate climate policies into its regulatory action. Three climate change related decisions of the CPUC in the power sector are highlighted here as examples of this broad regulatory authority: 1) the loading order requirement; 2) the establishment of a GHG adder; 3) the GHG performance standard for base load power (Bachrach 2003; Wang 2006i). All of these work in the same direction and they largely pre-date the current Schwarzenegger administration's high-profile climate change initiative. Rather than bold, ambitious and long-term, these policies are practical, clear first steps to address climate change in one important sector. They do not require new legislative authority but work through existing regulatory authority to send a clear set of signals to all players operating in the California market for power.

5.7.1. Loading order – energy efficiency and renewables first

As noted above, the 2003 Energy Action Plan established both a loading order preference for utility procurement planning and accelerates the renewable portfolio standard previously set by state law. Also the Energy Commission's 2003 Integrated Energy Policy Report used the loading order as the foundation for its recommended energy policies and decisions (CEC 2003b). The loading order policy states a preference for, first, investment in energy efficiency and demand management, as far as possible to avoid the need for new generation. Second, where new generation is needed, it prioritises renewable energy and distributed generation. This is to be followed by clean, fossil fuel, centralised generation (California 2003; CEC 2003b; CEC 2005a). Devra Wang, of NRDC, points to the importance of these rules for energy efficiency in California: "…we've basically laid the whole policy foundation in California, for a very aggressive, energy efficiency effort. …In January of this year [2006] the investor in utilities and the state launched the most aggressive energy efficiency program in history."

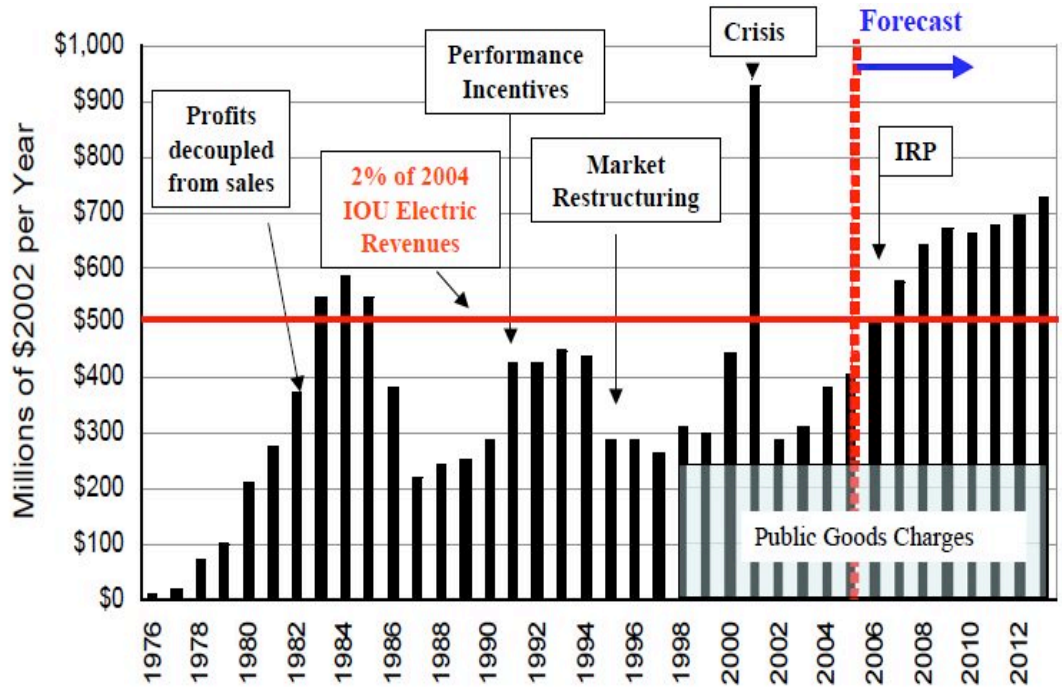
In the pursuit of this loading order preference policy, in 2005 the CPUC set out aggressive targets for energy efficiency requiring investor-owned utilities to invest in energy efficiency whenever it is cheaper than adding new resources and directing the investor-owned utilities to invest roughly $2 Billion in energy efficiency over the over the period 2006-2008 (CEC 2005a; Chang 2006a;

CPUC 2005a; CPUC 2005c; CPUC 2005d). The programme is estimated to avoid investment costs from power generation, transmission and distribution of more than $5 Billion, and to yield significant net savings to consumers of about $2.7 Billion over the lifetime of the investments (CPUC 2005a). This series of decisions succeeds earlier decisions that set out more modest investment requirements in energy efficiency (CPUC 2004a; CPUC 2004c) (see also Figure 5.7).

Thus the CPUC began requiring investor-owned utilities to take responsibility for integrated energy portfolio management to bring demand side resources together with supply side resources to find the least-cost portfolio of investments across both types of resources. Devra Wang noted: "…what we had seen for a number of years after the public goods charge was created -- it was viewed as a limit on the amount that could be invested in energy efficiency. But of course we weren't getting all the cost-effective savings with it. The [C]PUC adopted a number of policies that directed them to go beyond that." As investment for energy efficiency continues to rise, an increasingly small share of this investment in financed by revenues from the public goods charge with the difference coming from utilities' own investment (CPUC 2005a).

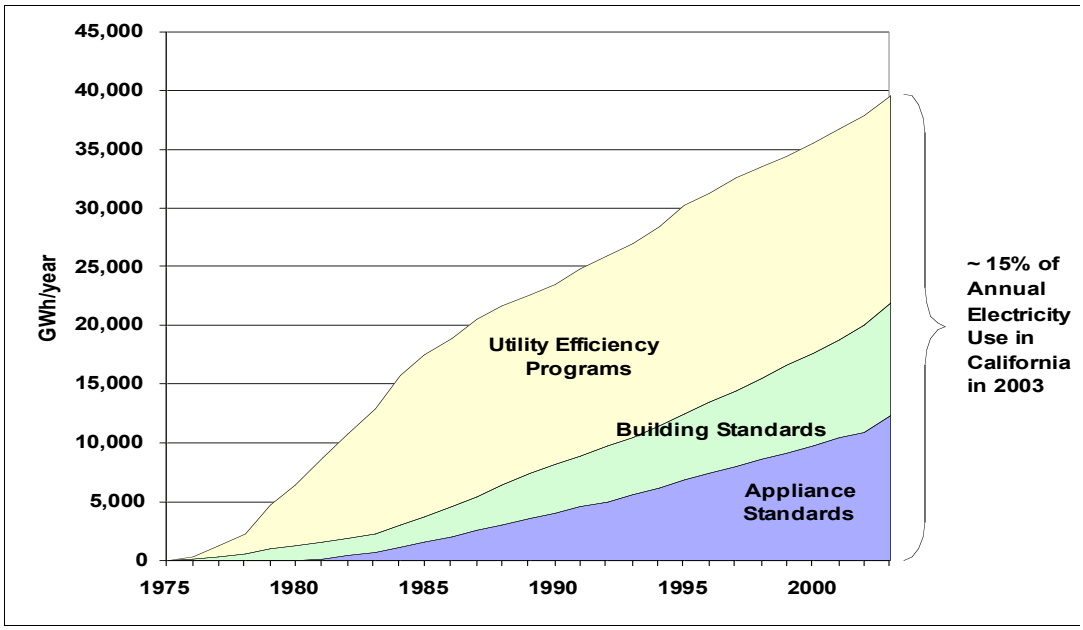
Combined, utility investment programmes and efficiency standards have helped to lock in the savings and limit energy use and emissions per capita in California (Wang 2006i; Chang 2006a; see Figures 4.4 and 4.5).

Figure 5.7: Investor Owned Utility Investment in Energy Efficiency, California 1976-2012 (actual & forecast)



Source: Rosenfeld 2008b

Figure 5.8: Energy Efficiency Savings in the Electricity Sector, California: 1975-2003



Source: CEC 2005a / Chang 2006b.

As shown in Figure 5.8, the estimated energy efficiency savings in California are estimated to be about 15% of annual electricity use in California. A recent CPUC (2006e) report summarises results from three decades of investment in energy efficiency:

> "These efforts are now annually saving more than 40,000 gigawatt-hours (GWh) of electricity and 12,000 megawatts (MW) of peak demand — avoiding the need to build 24 large (i.e., 500 MW) power plants, and equal to the annual power needs of more than 5 million California homes."

In an economic analysis, Bernstein et al (2000) estimate the net benefits of California's investment in energy efficiency to be equivalent to about 3% of Gross State Product in 1995 (see Chapter 8).

5.7.2. GHG adder or the financial risk policy

A second climate change policy implemented by the CPUC with respect to regulated electric utilities is to require them to consider the risk of GHG regulatory costs when considering new resource investments (CPUC 2005b). This policy takes into account that within normal resource planning procedures, utilities forecast costs to consider the life cycle costs of their investments (Bokenkamp *et al.* 2005). This cost was first recognised in the Energy Commission's 2003 Integrated Energy Policy Report, which stated: "the state should…account for the cost of greenhouse gas emission reductions in utility resource procurement decisions" (CEC 2003b). In April 2005, a CPUC decision established the value of the "adder" for use in procurement planning (of regulated utilities) (CPUC 2005b). The term "adder" refers to an additional cost of CO_2 emissions to be considered when evaluating the cost of power (cents per kilowatt-hour) performance of power generation alternatives (i.e. natural gas versus coal-fired combustion options). This adder thus increases the estimated cost of power and thus creates a financial penalty for carbon-intensive options compared to less carbon-intensive options. [76]

The adder was set initially to $8 per tonne of CO_2 and it is to escalate by 5% for each following year. The effect of such an adder in the California regulatory context will play out differently depending upon the type of fuel powering electricity production. It will only apply to investor-owned utilities – i.e. those that are regulated by the CPUC. For a conventional coal-fired power plant, NRDC estimates that this policy adds $8 per MWh more to the cost of power for

[76] The GHG adder is not actually a charge or a tax on operations but it is a planning tool for evaluation and comparison of cost-effectiveness across alternative investment options.

such a facility whereas for a gas-fired power plant it would be $4 per MWh more expensive (Wang 2006i). This is because it is necessary to pay for the cost of carbon emissions by taking the "adder" into account. Devra Wang explains: "So it's a small adjustment but it will help level the playing field there to recognize that there are going to be these costs that aren't currently factored into the price, but that you are going to have to bear and therefore need to be taken into account when making your investment decision." The GHG adder helps to guide utility investment towards lower emitting sources by factoring in the cost of carbon into financial assessment of the facility before it is built.

Over time, it is likely that the GHG adder will become redundant. Devra Wang explained: "In some ways it's a stepping-stone to these other policies. …[It] is something that's needed in the interim before there's a cap on emissions." It recognizes there will be a cap or some type of policy on emissions and that there is a value to those emissions that needs to be recognized today, as Devra notes: "…once there is a cap or something else in place that actually puts some type of value on those emissions you would be automatically forecasting for those costs."

5.7.3. GHG standard for baseload power

A third strand of CPUC policy is the most radical to emerge to date in California. This is a cap on greenhouse gas emissions from baseload power – initially to be implemented through a performance standard -- to be applied to all baseload delivered power in the state. The CPUC first initiated a rulemaking proceeding in 2004 and consultations with stakeholders about such a standard early in 2005 (CPUC 2004b; CPUC 2005e). In 2005, the CPUC issued a policy statement (CPUC 2005f) outlining the broad lines of its policy. This administrative decision was taken as a means to implement the broad climate protection goals that had been set out in the Energy Action Plan of 2003, which is a collaborative policy statement between the CEC and the CPUC (California 2003). The CPUC 2005 decision directed staff to develop an investor-owned utility greenhouse gas performance standard "that is no higher than the greenhouse gas emission levels of a combined-cycle natural gas turbine" for all procurement contracts longer than three years (CPUC 2005f). In the case of coal-fired generation, such a standard implies capture and storage of carbon dioxide.

By 2005, these actions – both the Governor's Executive Order and the CPUC and CEC policies – had combined to send strong signals to the business community in California that greenhouse gases were increasingly regulated in a comprehensive manner. The Governor's action further

empowered the CPUC to continue down the regulatory pathway that it had begun a few years earlier.[77]

In January 2007, the CPUC modified its original 2006 CPUC decision to make it an interim emissions performance standard for baseload power generation. (CPUC 2006b; CPUC 2007). The ruling describes this as "a minimum performance requirement for any long-term financial commitment for baseload generation that will be supplying power to California ratepayers" (CPUC 2007). Since much of the baseload power in California is procured from outside of the state, this ruling therefore reaches beyond state boundaries to improve emissions performance. In recognition of the emerging policy framework for regulation of GHG emissions across all economic activities in the state, the ruling also states that the (CPUC 2007):

> "…emissions performance standard or "EPS" is intended to serve as a near-term bridge until an enforceable GHG emissions limit applicable to LSEs is established and in operation."

The latter is a reference to the expectation that a sector wide, or broader, cap on power emissions will emerge under the Global Warming Solutions Act (CA-Code 2006a) through the California Air Resources Board as it coordinates state-wide emission reductions. Interestingly the Perata Law also requires a GHG emission standard to be established by the CEC for municipal utilities (i.e. in addition to the investor owned utilities that are regulated by the CPUC).

When asked about the origin of the policy to promote a GHG standard in the power sector, Commissioner Boyd of the CEC recalled that the idea first surfaced in the stakeholder process soliciting input on the first Integrated Energy Policy Report, which was published in 2003 (Boyd 2006i) (CEC 2003b). Attention to the issue grew and in the second report, in 2005, it was flagged directly (CEC 2005b). In the same year, non-governmental environmental advocacy organisations collaborated to prepare a timely report outlining the need for policy in this area: "Clearing California's Coal Shadow from the American West" (Milford *et al.* 2005). Its title alone alludes to the need for a policy response to limit the "hidden" out of state emissions from power supplied to California from across the border to satisfy its rapidly-growing thirst for power.

[77] In the Energy Action Plan of 2003, the CEC and CPUC committed to ensure that energy supplies in the state limit climate change impacts (California 2003) and, more recently, they committed to be consistent with the Governor's climate change goals (California 2005e). The CEC, in its 2005 Integrated Energy Report, also specifically committed to working with the CPUC to implement the GHG standard through its procurement planning.

Nancy Ryan, who was CPUC President Peevey's special assistant in 2006, spoke about the decision to cap baseload power emissions and the role of non-governmental environmental advocates in promoting the idea. In a previous position with Environmental Defense, she was one of the authors of the "coal shadows" report (Milford *et al.* 2005). She commented on its origins: "I think it was two strands that came together that really reflected the geographic scope of the group of people that worked on that report. One was from the folks in Colorado looking around them and seeing this huge number of new coal plants proposed, in their state and surrounding states. Frequently there would be public statements by the developers that they anticipated selling into California, and that they see California as the big growth engine in the West, and so the perception that these plants would be built with California as the "anchor tenants," borrowing the language of shopping malls. Then the other piece of it was that California has this 'activist' commission here [i.e. the CPUC], the Governor's process underway, and just this perception that we're on the cusp of doing this long term procurement for utilities in this state. And the question is what's the baseload recourse going to be? Are we going to go with liquefied natural gas, or are we going to go with coal? And how much renewable [energy] and energy efficiency can we really get? So a lot of issues teed up in California, giving this perception that you could write a report that would be relevant, that would be addressing an issue that's important to decision makers in California right now. It's informing them on a piece of the puzzle."

A legitimate question is why choose to regulate this one piece of the larger GHG footprint that belongs to California. Nancy Ryan pointed out that this part of the footprint is particularly significant. She said: "It's often overlooked. I find when I talk to people in California …they're totally surprised to find out how much coal-fired power California gets --- and appalled in many instances. Not always, but often. So, I guess that would be a third piece of what that report was intended to do. It was to just make people aware that this is going on, that the state's spending all this money, taking steps to address global warming and yet, there's this big back door leakage that, if the state doesn't do something about it, is going to completely vitiate the actions being taken in the State."

Another of the report's authors, John White, highlighted the context and regional scope of influence for the GHG cap. He said: "If we're gong to be the ones whose money builds the next generation of coal plants, we have a right to say how that money is spent. That's a revolutionary idea, but very consistent for us."

A recent *ex ante* economic analysis suggests that the standard compares favourably to alternative GHG policies; it arguing that a performance standard will out perform alternatives (i.e. a scaled-

up adder or accelerated Renewable Portfolio Standards), both in terms of quantity of reductions achieved and cost-effectiveness (Kamins 2006).

Figure 5.9: The Navajo Generating Station, Arizona

Note from Source: In the heart of the American Southwest, supplies coal-fired electricity to the Los Angeles Department of Water and Power and is one of the nation's single largest sources of global warming pollution.

Source: Milford *et al.* 2005; reprinted here courtesy of Michael Collier (aerial photographer) and the Grand Canyon Trust.

Yet the broad reach of this policy to tackle the carbon "embedded" in the power consumed by Californians, begs the question of consistency with other climate policies. As Pierre duVair (CEC) said of his discussions with electric utility representatives, the question arises: "Why do we just look at one imported good? Why just electricity. And coming from an electricity company you can understand the point of view – well wait a minute – we import a lot of things that have an upstream GHG footprint. And I just [say]… 'Well it's a big source; it's an easily identifiable point source. You need to start somewhere. We may as well start with electricity.' But it's a legitimate question, if California is concerned about GHG emissions associated with consumption of goods and services, why just focus on electricity?" Beyond this "fairness" issue is one of legal authority. There is some concern that the California standard may be challenged by the wholesale power industry and possibly even neighbouring coal states as a hindrance to interstate commerce (Callison 2006a; Callison 2006b). Such a legal challenge could arise now that the interim rules for implementation of the procurement standard are in place (CPUC 2007). However, as with the legal battle over the Pavley vehicle regulations (see Chapter 6), even if the rule is challenged the power industry will inevitably position to implement the standard should the standard be allowed to stand.

5.7.4. Discussion: a paradigm shift?

Changes in legislation (e.g. the Warren-Alquist Act) combined with the policy guidance of the state energy agencies and the technical, regulatory decisions of the CEC and the CPUC have led

the way to what Hall (1993) refers to as a shift in policy paradigm. The end result is a move away from centralised energy supply and power generation sources in favour of more decentralised power generation sources and energy services such as energy efficiency and demand side management. Referred to as integrated resource planning, this policy approach recognises the need for policy intervention to acknowledge and value the public good benefits of conservation, energy efficiency and other alternative energy options.

At least in the energy sector, California's policy framework sets out to meet the three main goals of affordability, reliability and environmental sensitivity. These energy policy goals cut across environmental, economic and social challenges. The framework does not focus on climate change (or any other environmental problem) per se however climate change is recognised an important environmental problem (California 2003; California 2005). The shift in policy to specifically address climate change is only recent and builds on the prior set of policy objectives that frame the issues in a different, yet largely compatible way. Devra Wang confirmed this when she said: "For the most part these policies …all arose without regard …to the greenhouse gas implications. …It's only recently that it has been tied together in the framework of ...a global warming perspective." However a range of newer policies, largely originating in the CEC and CPUC, are specifically designed to reduce greenhouse gases.

The progress made in integrating climate change into the long-established framework for energy policy firmly demonstrates the start of a paradigm shift away from policy that promotes conventional fossil fuel towards new and cleaner technologies and fuels throughout the state, and beyond, given the coverage of imported power. As Lainie Motamedi, of the CPUC, said: " the Energy Action Plan... sets the loading order for looking at energy efficiency first, renewable second and then other types of more traditional generation resources. But [it] really focused this agency, as well as the Energy Commission on looking at efficiency and clean resources rather than typical carbon-based generation. ... That created a pathway for a number of different policies ...energy efficiency goals that are essentially double to what are statutorily mandated and we've accelerated the Renewable Portfolio Standard beyond what was statutorily mandated." In this view climate policy has helped to build collaborative effort between the CEC and the CPUC to drive bolder and stronger clean energy initiatives that in turn shape the shift away from conventional fossil fuel energy systems.

Evidence of fundamental change in the direction of policy as a result of climate change is clear in the power sector. Here the combined effects of climate change policies with previous environmental initiatives have begun to shift investment decisions in long-lived infrastructure toward low-GHG options. John White provided an example of the influence of GHG policy over

the coal sector: "….the coal guys think that they should inherit the Earth. They think for all the reasons I described that they're the answer and in their states, they control the politics. But that's why the [power] generation [GHG] performance standard in California was ..like the knuckle-ball, because it's like, ok well you guys get to build whatever you want but we're not financing it with our money. So you all go finance that 2 Billion dollars worth on your own customers." John White attributed this to California's policies; he said: "…the existence of the carbon adder, the generation procurement policy, the loading order, the RPS, all of that has slowed the coal guys down. We haven't stopped them cold. But we are starting to see projects go away."

A particular case in point is the recent cancellation of a planned investment in a large coal-fired power facility, known as "Granite Fox" by the company Sempra (Voyles 2006). Sempra was to build this $2 Billion, 1200 MW, facility in Nevada, but by 2006, it had indefinitely shelved the project (White 2006i). This was largely as a result of California policies that would not allow its utilities to purchase power from the facility without investment in carbon capture and storage technology. The project also encountered local opposition on environmental grounds (Voyles 2006). California's policies have thus begun to change the economics of large-scale investments in coal.

According to some experts, these policy reforms will lead to significantly different outcomes in the power sector than would have occurred in their absence and signal an overall shift in the direction of policy. John White says that "…directionally what we have done is to accelerate the introduction of clean coal technology as much as we accelerated the introduction of low emission technologies on motor vehicles. To me it's a very similar kind of policy. Now there may be efforts to end-run it and weasel out of it and get exceptions to the rule, but so far I think this has been a very important shift and hopefully we will be able to sustain it." He continued to assert the fundamental nature of this shift: "…of all the things we're doing this year, the generation performance standard, the climate adder… the chilling of enthusiasm, official enthusiasm for new long-term commitments to 20th Century coal technology as opposed to 21st century state of the art [carbon] sequestration -- I think that's a sea change. I think it has affected the whole western regional power market."

President Peevey of the CPUC is leading the charge to make the GHG standard and clean energy in the power sector a reality. He sees the standard as a way to limit the long-term environmental and financial risk of new investments in the power sector. He said: "We use coal in California; we bring it in by wire. What we're saying simply is ok, if there's going to be a future for this [coal-fired power], it's going to have to be as clean as CCGT [combined-cycle natural gas

turbine] or even cleaner. We'd be a market for this great resource the United States has, but it has to be on an environmentally acceptable basis. It is folly to build pulverized coal plants that have 50-year lives, knowing what we know about the science of global warming." Thus California, through the CPUC and now state law, has begun to transform GHG-performance of the power sector. Given the size of the California market and its rapid growth, there is reason to believe that the California regulations will pull clean coal technology, or alternatives to coal, forward in time.

5.8. Conclusion

In tracing the history of key developments in California's environmental regulation, a story emerges about how and why climate policy could move quickly in the absence of Federal action. It is a story that connects climate policy developments to California's past experience and institutional competence in related policy areas. This interpretation derives from looking "inside-out" at the policy process. That is, the story originates from the perceptions and recollections of actors that are directly engaged in climate policy decision-making in California today, one that sees climate change policy as a natural evolution of previous action in related areas: air pollution regulation and energy and environmental policies. As Hall (1993) suggests, it tells a story about social learning that builds on past experience to derive lessons for the future to shape policies on the relatively new yet related issue of climate change.

The chapter highlights two examples of California's past pro-environmental policies in the areas of air pollution and energy efficiency. Air pollution law in California has developed over more than half a century and is intimately connected to both the emergence of energy efficiency policies and the more recent Pavley legislation to regulate CO_2 emissions from vehicles (see Chapter 6). Energy efficiency (and alternative energy) policy in California goes back about three decades and has served as an institutional platform for climate change mitigation policy today under the CEC and the CPUC.

The chapter has set policy developments in California in the context of national and international events that shape the context for decision-making over time (Tables 5. 1 and 5.2). This timeline demonstrates that in each of these areas, action in California was partially in response to discoveries and events occurring beyond its boundaries. For example, the discovery in the late 1940s that air pollution from vehicles led to photochemical smog and is harmful to human health, or in the case of energy efficiency, concern in the 1970s about the spread of nuclear power combined with oil security issues due to OPEC embargos. However the timelines also show that action in California was generally swifter and more aggressive than federal action to address these problems, eventually leading the nation with regulatory solutions.

On the issue of climate change, the chapter shows that CPUC and CEC regulatory policies to limit GHG emissions pre-date the creation of the state's 2005-06 policy framework. Operating under existing regulatory authority, these institutions have worked together to advance mitigation in the energy sector. This action has grown in an organic manner out of pre-existing institutional authority and regulatory competence, incited in part by leadership of the policy elites from within each of these institutions and from the non-governmental community that interacts with it.

The examples developed here demonstrate that active participation in the policy process by well-organised non-governmental actors has made a difference to policy outcomes. On the issue of air pollution, affected stakeholders became a grass-roots force to call for change and force action to improve the local environment in southern California, a call that eventually influenced state-wide action and institutional capacity. In the case of energy efficiency, the non-governmental force came from an epistemic community, comprised of a local network of expert representatives from environmental non-governmental organisations working closely with academics and their research institutions. In both instances, the openness of the California policy process provided ample opportunity for ideas from the non-governmental community to influence decisions at the core of government, first on air pollution, then on energy, and more recently on climate change. These examples support the Habermasian notion of deliberative democracy and the potentially powerful role that actors in the "outer periphery" have to influence policy decisions (see Chapter 3).

Beyond the issue of agency and representation of different types of interests in policy decision-making, these cases show that the polycentricism of California's environmental governance structure is a force for innovation. Indeed as Starr (2005) suggested, California has a tendency to devolve authority and to govern through the establishment of issue- or location-specific boards and commissions (see Chapter 4). While authority is overlapping (i.e. for energy policy between the CEC and the CPUC), it is also relatively independent of the more centralised and more lethargic state-wide political process. The independence of these institutions created a window of opportunity for leaders to move climate policy forward in spite of the lack of a formal policy framework at the centre of state or federal government.

Finally past achievements of regulatory actions to curb air pollution and enhance energy efficiency in California have helped to create a sense of technological optimism and understanding that environmental performance can go hand in hand with a strong economy. Past actions have also delivered a strong green technology business presence that, in turn, has shifted the politics of the climate change issue (see Chapters 8 and 9).

These examples demonstrate at once a multilevel, social-practice model of governance and a political economy perspective that acknowledges that role of policy elites as drivers of policy change (Grindle and Thomas 1991; Kingdon 1984). Practices in both the CPUC and CEC have evolved over time in response to external social and political forces. In turn policy elites in each have shaped "policy spaces" through which they are moulding new conventions and beliefs to respond to climate change. The policies outlined here are small first steps but they demonstrate leadership and ongoing commitment to integrate the new issue of climate change into a pre-existing energy and environmental regulatory framework.

The next chapter revisits some of these conceptual themes as it completes the review of early climate change policies in the State of California. It also highlights the organisational changes that were brought about with the 2005-06 policy changes swept in by Schwarzenegger administration.

6. OTHER KEY ELEMENTS: THE REGISTRY, TRANSPORTATION AND ORGANISATIONAL CHANGE

6.1. Introduction

This chapter describes remaining key elements in the current climate policy framework in California. These complete what is emerging as a comprehensive framework to manage and limit GHG emissions (Box 6.1). The early elements include the first piece of 1988 climate change legislation and later in 2000 the establishment of the California Climate Action Registry. The chapter also highlights the landmark Pavley (vehicle) Bill, which passed in 2002 and is intimately connected to the history of air pollution regulatory law in California (Chapter 5). Finally the chapter comments on organisational issues and the transition from fragmented strands of sectoral actions to an overarching state-wide policy framework.

Both the Registry and the Pavley Bill provide interesting examples of forces of multilevel governance at work in California. Both take shape through issue-based institutional structures, providing significant autonomy for decision-makers within each to move ahead more quickly and independently of broader based state or federal frameworks. Yet developments in each area are also intimately linked to national trends and activities with a common force being the intention to influence activities not just within the State of California but also more broadly across the United States.

6.2. Early climate change legislation

California legislative action on climate change began in 1988 (see Box 6.1), through the passage of a Bill sponsored by State Senator Byron Sher (CA-Code 1988). Byron Sher is a well known political leader for the environment in the state -- or as Diane Wittenberg, President of the California Climate Action Registry, put it, he is "…the dean of environmental legislation" in California.[78]

[78] Sher was a member of the California State Assembly from 1980-1996, and a member of the California State Senate from 1996 through 2004. Aside from leading passage of this initial GHG legislation, Byron

Box 6.1: California Climate Policy - Timeline of Key Historical Events

1957 – California passes the Air Pollution Control Act authorizing each county to establish an air pollution district

1963 – First California tailpipe air pollution control measures take effect

1973 – Warren-Alquist Act establishes energy conservation as a resource; provides authority to establish state-wide appliance and building energy efficiency standards; authority to forecast energy requirements as part of energy facility permitting process.

1988 – Sher legislation (1): CEC to study climate change impacts, develop policy recommendations

1991 – 1997 – The CEC studies the problem, prepares state-wide GHG inventories and issues several reports with policy recommendations.

1998 – California deregulates electricity sector, establishes public goods charge on electricity

2000 – Sher legislation (2): Voluntary registry for entity-level GHG emission inventories

2000-2001 – California electricity crisis, blackouts occur

2002 – Pavley legislation: requires control of CO_2 from motor vehicles

2003-2005 – Collaboration between CEC and CPUC expands: Joint Energy Action Plans, energy policy with attention to climate change (*e.g.* through CEC Integrated Energy Policy Report), electricity sector regulations (CPUC):

- Aggressive energy efficiency targets; integrated resource planning – loading order preference, decoupling policies
- Accelerated renewable portfolio standard; million solar roofs programme
- "Leakage" policies – GHG adder; GHG procurement standard

2004 – Pavley regulations issued, effective from 2009, aiming to reduce tailpipe emissions of CO_2 by about 30% in 2015 timeframe

2005 – Governor Schwarzenegger issues Executive Order establishes GHG targets for 2010, 2010 and 2050 (June); automakers sue state of California over Pavley regulations (December)

2006 – California legislature passes several laws on climate change (and related issues): Global Warming Solutions Act (AB 32) codifies 2020 targets; Perata Bill mandates GHG procurement standard for in and out-of-state baseload power delivered in California; Levine Bill requires energy efficiency targets for municipal utilities.

Source: author, based on Chapters 4, 5 and 6.

The 1988 law mandated the CEC to evaluate and report on the effects that climate change would have on California, for example on water supply and the agricultural sectors. In October 1990, the state published its first greenhouse gas inventory of emissions and sinks (Brown 2005b; CEC 1990). Interestingly this inventory includes emissions from imported electricity, an issue that received policy attention only much later. Under the new legislative mandate, the CEC also

Sher also championed the successful legislation on GHG registries, renewable energy and energy efficiency during his time in the state legislature.

organised a symposium on the topic of climate change that reviewed the scientific aspects of the problem and developed a number of recommendations for strategies to deal with it (CEC 1991a; CEC 1991b).

According to Pierre duVair, Senior Climate Policy Analyst of the CEC, there was then: "a lull in the mid-90's…" He noted that this timing related to international developments, that is "after the Kyoto Protocol in the late 90's, [it] heated up again." In 1997, the California state government and, in particular, the CEC began again to look in earnest at the question of what to do about climate change. As part of a partnership with USEPA, the State of California issued a 1997 report that focused on possible response strategies; it recommended expanding energy efficiency programmes and other energy policy responses (e.g. promotion of renewables and alternative fuel vehicles) (CEC 1998). Between 1999 and 2000, the CEC organised two different conferences; Pierre duVair, who had helped organise the conferences explained: "We held workshops on the status of the climate science and on early actors from the business and corporate sector - who's taking action and why."

These events led to voluminous conference proceedings, documenting the latest science, including the implications of climate change for California (CEC 1999b; CEC 2000). On the policy side, the documents provided insights from a number of multinational and other large business players in California about their early efforts to mitigate emissions. They also report on an exchange of views amongst key stakeholders about what role if any California should play in specific policy responses to climate change. The summary of the "science" workshop concludes that the State has some responsibility to act, in particular to better understand the risks associated with potential impacts; to provide public information and education materials in collaboration with the scientific, environmental and business communities; to monitor climate change; to contribute to scientific consensus; and to developing a consensus for action among stakeholders (CEC 1999b).

In the view of the CEC, and the stakeholders that it convened, the role of the state at that time should be largely confined to research, information and education. Thus the states' role with respect to direct policy responses in the period 1999-2000 was much more ambiguous and indirect than it is today, with little constituency for direct political intervention at the state level on the issue of climate change.

6.3. The California Climate Action Registry

In 2000, Governor Gray Davis signed the first major piece of California legislation on climate change into law (CA-Code 2000) focusing on establishing a registry for the reporting and tracking of entity-level GHG emissions in the state.[79] Again, led by State Senator Sher, the legislation became known as the "Sher legislation." In addition to establishing the California Registry, the legislation also required the Energy Commission to update the state's inventory in consultation with other agencies by January 2002 and every five years thereafter (Brown 2005).

Although Governor Davis had signed the 2000 Sher legislation, its provisions had been contentious. Some industry and business associations had lobbied hard for the Governor to veto the Bill, and environmental organisations were divided in their support for it (Olsen 2003). The legislation raised issues of how to establish a credible record to allow "credit for early action" for businesses operating in California, in the face of unlikely progress on this issue nationally. A key issue was whether a system established in California alone could be protected and eventually validated once national action was taken. Although the initial legislation had support from more than a dozen large corporations in California, other businesses and industry groups were concerned about state-level action on climate change. Environmental groups, most of which have nation-wide operations, were also concerned about the risk of fragmentation through state-level action (Olsen 2003).

Pierre duVair explained that at the time of the Governor's signature "…Governor Davis had said: 'Go back and work with industry'. This was: "… because he had heard they weren't happy with the last minute process to develop this voluntary greenhouse gas reporting legislation" (duVair 2006i). Senator Sher subsequently led a working group, comprised of those opposing and supporting the Bill, including business and industry groups and environmental organisations among others, to hammer out the details of the clean-up legislation. After nine months of intensive work, the group arrived at a number of significant compromises that altered original provisions for the registry. In 2001 a clean-up Bill passed with no opposition (CA-Code 2001b; Olsen 2003).

The 2000-2001 "Sher legislation" created the California Climate Action Registry (CCAR) as a not-for-profit private/public partnership – or a voluntary greenhouse gas registry. In the words of Diane Wittenberg, President of the CCAR: "We work primarily on helping companies and

[79] This law was revised in 2001 by "clean-up legislation" (see CA-Code 2001b).

agencies and others, …inventory their greenhouse gas footprint according to specific carbon accounting protocols." The CEC was established as the main institutional liaison within the state for the Registry.

The establishment of a Registry in California was at least partially a response to requests from business leadership, anxious to prepare in a timely way to deal with the issue of climate change. Energy Commissioner Jim Boyd underscored the role of business in advancing the timing of the legislation: "it was people in the business sector, who …provided the impetus for the legislation that created the Registry, and it frankly got done as a result of that involvement, probably a couple of years before it would have through the logical process we were going through in the state…" Similarly, Diane Wittenberg recalls that the law was "at the request of some CEOs to Senator Byron Sher." She said: "…they had gone to Washington first, had gotten a cold reception, came to California and said, 'We would like a way to protect early reductions' and he [Senator Sher] basically said, 'Well, California would like to encourage early reductions, so I think we have a meeting of the minds' and the Registry legislation then was created." The legislation encourages California authorities to give "appropriate consideration" to emissions (e.g. reductions) documented through the Registry process in any future regulations (Brown 2005b).

In an analysis of the history of the California Registry, David Olsen (2003) also traces successful passage of the legislation to the failure of the federal government to act. He shows that the initial corporate champions for the "Sher legislation" had mounted their initial campaign for "Early Action Crediting" at national level, working through a U.S. coalition of companies known as the "CEO Coalition to Advance Sustainable Technologies." Unsuccessful, they turned to the states, and in particular to California.[80]

Diane Wittenberg explained the main challenge in establishing the system: "It had to be rigorous enough that California would stand behind the data, that really led it to become a standards organization to a certain extent. I think the success of the Registry is partly because it does have high and rigorous standards, many of which are prescriptive -- it's very prescriptive legislation. California tends to have two kinds of Bills; ...[either] it's a 3 paragraph Bill or a 20 or 30 page Bill that lays it all out... this was the latter." The final piece of legislation establishing this system had been elaborated in some detail in the follow-up process. The high level of detail was necessary to

[80] The initial coalition of business leaders in California included some of the leaders nationwide, including: BP; CH2M Hill; Science Applications International. Other early supporters were new to the California initiative e.g.: Calpine; Dole Foods; Kinko's; Los Angeles Department of Water and Power; Gap, Inc.; Patagonia; SeaWest Windpower; Shaklee; Silicon Energy. See discussion of the early nationwide coalition, and its links to developments in California in Olsen 2003.

assuage concerns of various partners that the CCAR would provide a verifiable record of accomplishments for California participants.

6.3.1. Governance of CCAR: a public-private partnership

The CCAR received seed funding from the state for its first year of operation. But Diane Wittenberg explained there have been shifts in support from the state for the operation of the registry with initial funding sufficient to fully fund the activity: "The state initially contributed a million dollars to get the registry off the ground. It carried us through a couple of years... It funded all the software development. The state subsequently funded us at the rate of about $200,000 per year for a few years. Now we are funded primarily through member fees, contracts and conference revenues." In the years to follow, funding came in annual allocations from the state budget; the amount of funding declined steadily from about a quarter of a million per year to zero allocation at all from the state budget in 2005 and 2006. Diane Wittenberg explained that the state authorities intended to support the Registry but in the end ran into some political problems, which blocked the allocation; thus the Registry was forced to become self-supporting at least for this period. She said: "…now we're funded primarily from earned income and private foundation grants. [Earned income is from] Membership fees, conference sponsorships, some contracts. …I think we'll be funded in the future by the State. …It's not a permanent decision [that] the Registry must be self-funded. I don't think there have been any decisions like that, but we've evolved into being more self supportive."

In spite of the essentially privately funded operation of the Registry in recent years, Diane Wittenberg notes important differences from a purely private enterprise. She said: "…it still has kind of quasi-agency status in the sense that all of our Board is appointed by the legislature and we work closely with [State] Agencies. [The Registry has] unofficial status in the sense that the State supports the Registry data and protects it." No other states at this time (2006) had this type of public/private partnership to promote voluntary GHG reporting and registration. There is thus an expectation on the part of the Registry's management that the State will continue to play an important role in the Registry both in terms of future funding and ongoing management oversight.

Diane Wittenberg explained how the public-private organisational structure links to the bottom-up nature of climate policy as it is emerging in California. She said: "there isn't anything else like it. It is kind of a whole different animal… the Registry is a kind of infrastructure that will support various policy options. Normally you put a policy in place, like Kyoto is very top down, right? Under Kyoto, there's no call for a Registry function like California's. We operate with, if you want to call it that, the luxury of no [federal] policy. So we started from the bottom up and… so

what California is doing is moving from this voluntary reporting that is rigorous to mandatory reporting, which will then become the basis for caps and then probably move to trading. [That would be] …a natural progression. That policy decision hasn't been made yet, but along with… a portfolio of solutions, of standards, efficiency standards and things like that."[81]

6.3.2. Scope of CCAR reporting protocols, reporting and certification

In spite of its "bottom-up" nature, the California Registry is designed with an eye to compatibility with federal regulation of GHG, whenever it may come. Diane Wittenberg explained this: "We work very proactively with other states and with USEPA. USEPA … aren't supposed to be working on this. But we make sure we're aligned because, …USEPA is the ultimate end game within the US. You don't want to go on some tangent that the USEPA staff thinks is crazy…" She explained that they also work "very closely with WRI, whose protocols we're based on and WBCSD, and ISO." By comparison to the WRI/WBCSD GHG reporting protocols (WRI/WBCSD 2004), which were developed to provide an international benchmark for companies choosing to report voluntarily, she said: "Those are global standards -- that's at 50,000 feet and we operationalise them and they're at 10,000 feet; so where they offer choices we might pick a choice, but it would be within their universe."

More specifically CCAR protocols or reporting standards have begun to reach beyond state boundaries to influence reporting of GHG emissions by company operations elsewhere in the U.S. and in the world. In particular Diane points out "the standards have become so well accepted that people feel that's a good way to protect their baseline no matter where they are. In fact, we have companies that say, 'Well, we're not members of the Registry, but we use your accounting protocols.' The Registry protocols are available on the Registry Website to anyone and the idea is to promulgate these standards." Interestingly, some companies use the reporting standards for their own comprehensive reporting purposes, challenging the system to adapt also to their needs, which extend beyond the interests of the State of California. Diane Wittenberg highlights: "We had to change the rules to allow international [reporting] … Eastman Kodak and Dow report

[81] This statement was true at the time of the interview, however since this time, the policy decision was taken to codify 2020 greenhouse emission reduction targets in California (AB32, 2006). In that legislation, corporations and other large emitting entities are strongly encouraged to begin voluntary reporting through the CCAR before they are mandated to develop greenhouse gas emission reports through state regulations to be issued under the law. AB32 thus has implications for the Membership and importance of the CCAR and the Bill commits to use CCAR protocols and its standard data as far as possible. The law requires all major emitters to report 2008 emissions; reporting is scheduled to begin in 2009 and a draft rule was under consideration at the time of writing (CARB 2008).

internationally. And about half of our Members' facilities are outside the state of California and some of our [Members] have no emissions within the State of California at all. So none of those things were really anticipated because we expected everyone to have at least operations in California."

Once you voluntarily join the Registry then reporting companies must inventory their GHG footprint according to the Registry's protocols. It also must have the inventory certified by a third-party certifier chosen from a list of certifiers approved by CCAR and CEC. The reporting company hires those certifiers; CCAR and the CEC can also choose to participate in that certification process to perform spot-checking. The final product, in certified form, is made available to the public. The certification procedures resemble those of financial accounting audits where the accredited certification company attests to the accuracy of the information. Once the company inventory has been certified, aggregate emission totals are posted to a public website (Wittenberg 2006i).[82]

Working with third party certifiers often from multinational consulting firms provides other benefits that include diffusion of the CCAR protocols to other locations and regions outside of California. Diane Wittenberg explained how this works: "…our network of certifiers … seem to have been one of the best ways to bring our protocols to many other venues around the world because they're international certifiers and say, 'Well, here are some good protocols.' But they also bring back to us ways to make our protocols better and I think convergence on general reporting is happening."

6.3.3. Future challenges and cross-scale linkages

As of 2006, the CCAR had identified four different areas of continued development for its work on reporting protocols (Wittenberg 2006i):

i) entity-wide protocols, focusing on new areas such as forestry, agriculture;

ii) project reduction protocols where the Registry is looking at performance based standards by project, including in project areas not otherwise covered through regulatory issues;

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[82] Certified inventory reports from participating companies can be downloaded from http://www.climateregistry.org/CARROT/public/reports.aspx [accessed 22 May 2008]; one of the contentious issues and challenges in moving from a voluntary to a mandatory reporting system is the need for information and scrutiny of facility level emissions trends; as of 2008 only aggregate emission totals for each reporting company were publicly available on the website, however new regulations were advancing to require facility level reporting.

iii) city/local reporting protocols; and

iv) creation of a multi-states registry.

Needs related to forestry and agriculture protocols and to project based credits related to the recent evolution of California climate policy to develop a comprehensive set of policies to reduce GHGs significantly in coming decades. Another driver is the emerging voluntary market both within the state and nationally. The interest in city-scale measurement and reporting protocols and in the multi-states registry as well as in the offset measurement for the voluntary market derives from national and transnational climate change actions rather than those that are specific to California.

On measurement protocols for cities for example, Diane Wittenberg pointed to the multiple applications of progress in this area. ICLEI[83] has successfully promoted action on GHG mitigation in the US at city-level. Diane Wittenberg said: "We're working on that with the State … that's in the Climate Action Plan. Then we've been working with ICLEI. We have a couple of cities who are going to be the first … you look at all those cities and then you look a little closer and they don't report consistently. The hardest part is boundaries, what's in and what's out… some of them are reporting [individual] buildings in the city, and others are skipping things like the airport. And you've got everything in between. …So we're looking forward to tightening up the way that cities are reporting. ICLEI …would try and push this to other cities outside of California and let those states kind of take the ball with their own cities."[84]

Regarding the multi-states registry, the complexity and magnitude of the challenge is magnified in the absence of federal action. In particular, New England states have been aggressively working together to achieve GHG reduction targets (Regional GHG Initiative known as RGGI) and are developing a registry system to monitor progress (RGGI 2006a; RGGI 2006b). Diane Wittenberg highlighted the challenge of synchronising these state or regional systems: "We're really working hard to coordinate better… Again, you don't want discounting between regimes and so this is how you ensure that even if you have different superstructures, the content is the same. The companies are the biggest pushers of all this because they're petrified… their view of hell would

[83] ICLEI is the International Council for Local Environmental Initiatives, which now also operates a Cities for Climate Protection Campaign. See http://www.iclei.org/index.php?id=800 [accessed 12 November 2007].

[84] Since the time of the interview, the City of San Francisco announced its successful completion of a CCAR approved GHG report: (CCAR 2006).

be different states with different measurement protocols, which is not impossible. So they've really been pushing for this consistency."

Looking across these latest strategic directions of the CCAR, there is a clear targeting of activities that establish coherence between California measurement and reporting approaches through CCAR and those emerging in other contexts. These contexts span activities in other states as well as in other countries, i.e. through voluntary markets. CCAR's management is thus directing its activities to areas that will have international and transnational influence, e.g. by working with ICLEI in developing standardised approaches to monitor emissions from cities. At the time of writing, this strategy had already begun to bear fruit. For example, in 2007 and as anticipated by the CCAR a multi-state registry was agreed and launched (Registry 2007), while in 2008, the CCAR launched a voluntary markets certification procedure (CCAR 2008). Such examples demonstrate strategic organisational behaviour to extend local successes more broadly to similar activities nationally and internationally as well as the value of early action.

6.4. Transportation: Pavley Bill and vehicle regulations, 2002-2004

In 2002, the State of California passed landmark legislation that added CO_2 to its previously established regulatory framework for air pollution. Known as the Pavley Bill (CA-Code 2002a), the legislation was sponsored by then junior Assembly member Fran Pavley, a former schoolteacher from Santa Monica, in southern California. The Bill was approved by the legislature with no votes to spare, and signed into law in 2002, by Governor Gray Davis.

This landmark event in US climate change policy occurred in the same year that the California legislature was scrambling to address the electricity crisis. The Pavley Bill was the first law in the nation, to regulate CO_2 emissions from motor vehicles. As noted by Commissioner Jim Boyd: "The Pavley Bill has become world famous… it was a CO_2 tailpipe standard Bill. I mean, the first Bill to really …control something. And it picked on automobiles, which made great [sense] …if you look at our inventory, that was ….the biggest contributor." Although the debate leading up to its passage was sharply divided along partisan lines (Rabe 2005), and the law preceded his election in late 2003, Governor Schwarzenegger has been a staunch supporter of the law since he came to office. The passage of the Pavley Bill may have been a sign of the times, part of an overwhelming reaction of the California legislature to pro-actively position the state on energy issues and to make a statement about the need to avoid the costs of inaction to a long-term yet important environmental problem.

In the contentious regulatory process that followed the Bill's passage, the State approved motor vehicle CO_2 regulations in 2004, effective for model year 2009 vehicles. When fully phased in, standards are estimated to result in about a 22 percent reduction as compared to the 2002 fleet in the 2009-2012 period and about a 30 percent reduction over 2013-2016 (CARB 2004). Through their manufacturer associations, automakers promptly challenged the regulations in federal court, contending that California was addressing GHG emissions through fuel efficiency making the law inconsistent with federal legal objectives in the sector, which are achieved through the federal CAFE standards. By law only the federal government can regulate fuel efficiency; the state is pre-empted from action in this area. The automakers' suit also claims that EPA is precluded from granting a waiver under the Clean Air Act because Congress did not authorise EPA to regulate greenhouse gases under the Act.

Legal challenges are thus central to how these vehicle regulations will play out in California and in the US (Merrill Lynch and WRI 2006). A recent ruling by the Supreme Court of the US is a key development, which found that the US EPA does have the authority under the Clean Air Act to regulate greenhouse gas emissions (US 2007). If US EPA chose not to regulate it must justify this position under the law, i.e. through arguments that climate change does not affect the health and wellbeing of the US population. The Supreme Court ruling also effectively required the US EPA to rule on California's request for a waiver to implement its new vehicle regulations. In late 2007, the US EPA Administrator, Stephen Johnson, denied the 2005 California request for a waiver on the grounds that such action was superseded by passage of recent US federal vehicle efficiency standards (Johnson 2007; Witherspoon 2005).[85] This decision was promptly challenged by the state in federal court, a challenge that is awaiting decision (State of California 2008b). Also in 2008, the California Attorney General's office, led by none other than former Governor Jerry Brown, was pursuing the federal government to turn over relevant documents that were used to construct the arguments in the US EPA decision (California 2008c).

Were the Pavley vehicle regulations to be allowed to stand in California, they would have far-reaching effects across North America. To date, twelve other states and Canada have announced their intention to adopt the California vehicle regulations (California 2008a), which

[85] There are several other relevant suits. First is the suit brought by auto manufacturers in federal court, a challenge, which was overturned by the Court's ruling that, were the waiver to be approved, the State indeed had the right to regulate (California 2008a). Second, the state of California brought suit against several major U.S. and Japanese automakers, arguing that CO2 emissions from their vehicles have harmed human health and the environment in California, claiming compensation for these damages (IHT, 2006).

would extend market coverage from California's one-tenth of the U.S. market to one-third of the North American vehicle market (Merrill Lynch and WRI, 2006).[86] If the past is a reflection of the future, the regulations and the technologies they engender could also be diffused widely outside of the United States.

One of the State's main lines of legal defence of the Pavley vehicle rules is that California has a state interest to control climate change and that interest intertwines with responsibility and authority to control air pollution, in particular in the vehicle sector. As John White points out, the pre-emption for states to regulate vehicles relates to fuel economy alone and not to emissions. Pertaining to the suit brought by vehicle manufacturers, he said: "The car companies say 'CO_2 equals fuel economy we're done,' but part of the difference in our emphasis is it's not just CO_2. We have nitrous oxide, we have methane, we have the chlorofluorocarbons and potentially more pollutants beyond the Kyoto-six. We argue that this is fundamentally on air pollution authority." Indeed a central part of the legal argument to let the Pavley Bill and subsequent rules stand is based on the evidence that California is directly impacted by climate change and more vulnerable than other parts of the US, therefore action to mitigate climate change is in the interest of protecting the health and welfare of its citizens.[87] John White further explained the argument with the use of local climate impact examples: "[Also]…because air pollution will be made worse by climate change because of higher temperatures.... and because the water supply, the snow pack and water delivery systems are all affected, …we have a compelling state interest in reducing climate change emissions across the board. And we have the authority based on the work that we've already done [on air pollution]."

According to most observers, the Pavley Bill was a watershed for climate policy in the state. Steve Schneider, a renowned climate expert and Professor for Interdisciplinary Environmental Studies at Stanford University, commented: "The Pavley Bill (Clean Car Regulations AB 1493)… … started out relatively innocently, but when it got publicity because Detroit spent millions of dollars trying to …black list this school teacher and California State Assembly Representative from the Santa Monica area, that got publicity. ... California is a state where outside corporate money fighting state environmental interests will typically create a backlash and fail. So in Detroit, that's the only thing they have left, are the courts. They lost the political battle

[86] The following states have adopted or will adopt California vehicle regulations for CO2: Arizona; Connecticut; Maine; Massachusetts; New Jersey; New York; Oregon; Pennsylvania; Rhode Island; Vermont; Washington (Pavley 2006; Arizona 2006).

[87] Based on interviews with Michael Hanemann and John White on this issue.

in California, even though they dramatically outspent Fran Pavley." Thus the passage of the Pavley Bill was consistent with past experience and understanding that state regulators had the power and determination to trounce automakers when clean air was at stake. History was simply repeating itself. For the second time in a fifty-year interval, California had voted for clean air over objections from the auto industry.

At least some observers believe that the Pavley Bill was an important turning point in the way the State of California is approaching climate change with international implications. For example, John White said: "I think the Pavley law [2002] really gave us a sense of our power. Bill Clinton called the speaker of the assembly to congratulate him on passing the Bill. It passed with no votes to spare. Hard fought, street fight with the oil and the auto industry and we beat them. Around the world in Australia and London and Germany, Tokyo there were headlines: 'California Acts.'" Even industry analysts are taking the California law very seriously, in spite of the legal challenges. Merrill Lynch (2006) reported: "While it remains unclear how CARB will specifically implement the various GHG requirements that have been signed into law, what is clear is that these requirements are, in fact, law. Lawsuits or not, the auto industry will likely be impacted by this regulatory trend." Though the legal battles continue, the Pavley law is challenging the world's automakers to take climate change seriously and requiring them to build greenhouse gas performance into its business plans.

Mary Nichols clearly linked the success of the passage of the Pavley Bill and subsequent regulatory action to prior experience with both air pollution and energy efficiency policy. She said: "I don't believe there's any other state that would've even considered doing what we did… no other state would have anything like the claim to legitimacy that we have because of our historic role under the Clean Air Act. …Other states, after years of advocating, got the right to adopt California's standards, but nothing other than California standards in the 1990 amendments. …Energy efficiency later on also has been an area where California was willing to set stricter standards."

The US EPA Administrator, Stephen Johnson, joined others to acknowledge California's role in leading the US in innovative environmental action when he closed the letter denying California's request for a waiver for the Pavley vehicle regulations with the following words (Johnson 2007): "Finally, I want to acknowledge the leadership, that you and your state have shown to increase vehicle fuel economy, to address energy security, and to reduce greenhouse gases. I agree that increased vehicle standards can be a win-win for the environment and the economy. I have no

doubt that the national standards Congress adopted and the President signed into law this week were enacted, in part, because of your efforts."[88]

6.5. Organisational change leads policy reform

A number of organisational changes accompanied the movement of climate policy to a priority place on the California public agenda in the 2004-6 timeframe. This included shifting power and coordinating authority away from the CEC and towards the CalEPA beginning in 2004 and then eventually the California Air Resources Board in 2006. Participants in the policy process highlighted the significance of the Governor's initial decision to shift authority to coordinate state-wide climate policy away from the CEC to CalEPA. In practical terms, this occurred through a legislative decision on the state budget shifting authority and funding away from the Energy Commission to CalEPA (CA-Code 2004). The budget Bill that states (CA-Code 2004):

> "Under existing law, the State Air Resources Board, the State Energy Resources Conservation and Development Commission (CEC), and the California Climate Action Registry all have responsibilities with respect to the control of greenhouse gas emissions. This Bill would require the Secretary for Environmental Protection to coordinate greenhouse gas emission reductions and climate change activity in state government."

Adrienne Alvord, the special assistant to Assemblywoman Fran Pavley, outlined possible reasons for this decision: "That was not an administration-level initiative, but it did come from within the administration. The legislature kind of fronted it. I think that there were people that the administration brought in over at CalEPA who were deeply interested in doing very aggressive climate policy and they wanted to take the reigns." Adrienne Alvord was most likely referring to Terry Tamminen, who had managed the Governor's environmental platform during the election campaign and who was named as Secretary of CalEPA shortly after his election (see also Chapter 9).

In 2005, the Governor's Executive Order called for the California Environmental Protection Agency (CalEPA) to establish and lead the Climate Action Team (CAT). The CAT is a multi-agency effort tasked with a two-fold responsibility: i) analysis of the impacts of climate change on California; ii) development of strategies to achieve the targets and

[88] The legal battle over the California standards continues as of December 2008. However the Obama administration is expected to reverse the EPA denial of the waiver request once in office, as it was part of the set of campaign pledges to do so (as with his opponent as well, Senator McCain).

mitigation/adaptation plans for the state. The duality of the assignment is important because it placed impact science alongside of policy development as two parallel and equally important activities for attention in the state policy process. The 2006 budget Bill further shifted the authority and funding away from the CEC to CARB for the preparation of the state-wide GHG inventory, a decision signed into law in July 2006 (i.e. prior to passage of AB32) and effective as of 1 January 2008 (CA-Code 2006f). The 2006 budget Bill thus anticipated the shift of authority away from the CEC as a central feature of Assembly Bill 32 of 2006, which was signed in September 2006.

Whatever the original reasons for the change, the shifting of authority initially to CalEPA and later to CARB had numerous effects on the policy process. Importantly, it removed any constraints that might have existed due to past activities. CalEPA was well placed to bring all relevant players to the table with some authority, including those responsible for emissions in non-energy sectors (e.g. forestry, industry, waste) as well as the energy sectors (see Box 6.2). Yet CalEPA is a relatively small "umbrella" organisation. It has limited manpower and organisational complexity since it has an executive management structure rather than a more independent commission/board.[89] As a small institution it is likely to be more manoeuvrable on a politically difficult issue. It was thus easier to envisage CalEPA driving policy innovation and change in close collaboration with the Governor and his appointees, than to work through the more structured, larger CEC (or another such institution in the state). Clearly the Governor, and his principal agent on this issue, Cal EPA Secretary Terry Tamminen, were hoping to move climate policy forward during their tenure and were not interested to work through the complex management structure of the CEC or any other "Board" or "Commission". As a state agency CalEPA is directly answerable to the Governor.

[89] For example, CalEPA budget in 2002-3 showed only 45 full-time staff positions, while the California Air Resources Board had more -- roughly 1000. All combined the various boards and agencies under the coordinating authority of CalEPA have staffs roughly one hundred times greater in size than that of CalEPA (CalEPA 2003). By comparison, the Energy Commission had roughly 500 full-time staff positions funded in its latest budget year (2006-7) (CEC 2006).

Box 6.2: Key institutions and main functions related to climate policy in California -- members of the Climate Action Team[90]

California Environmental Protection Agency (reporting to the Governor)

- Environmental and air pollution policy
- Oversees specialised agencies including the Air Resources Board and the Waste Management Board
- Convener of the Climate Action Team (which includes all of the institutions noted below)

Air Resources Board (under oversight of Cal EPA)

- Oversight and coordination of GHG emission reductions to meet state goals (from 2006)
- State GHG inventory (from 2006)
- Air pollution regulations, including emissions from stationary sources and vehicles

Energy Commission

- State GHG inventory (1988 - 2006)
- Climate change research through oversight of the Public Interest Energy Research programme
- Integrated energy planning and policy (supply and demand); energy facility siting including transmission facilities
- Energy policy (joint with CPUC), including establishment of energy and environmental goals
- Regulate appliance and building energy efficiency (through standard setting)
- Monitoring energy efficiency and renewable portfolio performance

Public Utilities Commission

- Energy policy (joint with CEC), including energy and environmental goals
- Power procurement investment oversight, including energy efficiency, renewable portfolio, and greenhouse gas performance

Resources Agency and its Departments[91]

- Natural resources management policy
- Department of Water Resources: water resources management, planning
- Department of Parks and Recreation and Department of Fish and Game
- Department of Forestry and Fire Prevention: forest land management and fire protection.

Department of Food and Agriculture

Business, Transportation and Housing Agency[92]

[90] The Governor's 2005 Executive Order states that the Secretary of CalEPA "shall" coordinate work to implement the climate goals with the Secretary of the Business, Transportation and Housing Agency; Secretary of the Department of Food and Agriculture; Secretary of the Resources Agency; Chairperson of the Air Resources Board; Chairperson of the Energy Commission; and President of the Public Utilities Commission – or their representatives. In practice, senior representatives of these different agencies are members of the Climate Action Team. See the latest composition of the team: http://www.climatechange.ca.gov/climate_action_team/members.html [last accessed 12 December 2008]; latest Scoping Plan for AB32 cites a slightly larger set of agencies as part of the CAT, see CARB 2008c.

[91] The Resource Agency is a large umbrella agency with a broad mandate; its mission statement is: "To restore, protect and manage the state's natural, historical and cultural resources for current and future

As Schwarzenegger's election coincided with the intensive effort of rulemaking to implement the Pavley Bill, it was not an unreasonable to centralise the co-ordination of all climate activities under CalEPA, which already oversaw the CARB and thus indirectly the Pavley regulations. As John White pointed out: "….about 30% of the reductions needed are coming from that [Pavley] law." There was an interest by the Governor to ensure that it was people in his administration that would lead the charge on climate policy. Adrienne Alvord said: "I'm not sure if Schwarzenegger had a particularly strong feeling about where the program should be, I think he just wanted to tap people in this administration."

Both the Governor's 2005 Executive Order and the 2006 Assembly Bill 32 leave implementation details in the hands of senior civil servants. As noted, the Governor's Executive Order and his budget Bill in 2005 charged the California Environmental Protection Agency (CalEPA) with the coordination of recommendations and implementation of greenhouse gas mitigation strategies. CalEPA was to coordinate recommendations through a joint agency process, referred to as the Climate Action Team (see Box 6.2). However, Assembly Bill 32 made an important change in who had the direct authority to implement the law. It acknowledged the role of the CalEPA and reaffirmed the role of the Climate Action Team under its guidance to continue in an advisory capacity, but it places the central coordinating role in the hands of the California Air Resources Board (CA-Code 2006a). The law also sets out more explicitly a wide range of tasks and functions and an explicit timeline for the implementation of the 2020 emission reduction targets.

Thus in 2006 the California Legislature shifted the main authority for coordination and implementation of AB 32 to the CARB (and explicitly one-step away from CalEPA). The CARB would be responsible for designing and seeking agreement on a plan of implementation, and for enforcement and coordination amongst other state agencies and stakeholders to achieve the 2020 GHG target (CA-Code 2006a). Given the occasionally tense relationship between the Schwarzenegger administration and the Democratically controlled legislature, this shift in authority may have been intended to ensure the regulatory independence of rule-making to implement climate policy. Indeed, given differences between the legislature and the Governor in

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generations using creative approaches and solutions based on science, collaboration and respect for all the communities and interests involved." In practice decision-making authority is devolved across 8 different Departments, 17 different Boards or Commissions and 9 different Conservancies – each with specific mandates ranging from water supply and nature preservation to rule-making concerning hunting and fishing and use of off-road vehicles. Only the principal departmental actors are listed here.

[92] This includes most notably California Department of Transportation (Caltrans), which is responsible for California transportation planning and infrastructure. Caltrans is an active member of the CAT – see http://www.dot.ca.gov/climateaction.htm [last accessed 12 December 2008] .

the preparation of the Bill (see below), this organisational shift may have been intended to distance the rulemaking under the new law from direct control of the Governor's office.

In this "new" leadership role, the CARB is expected to demonstrate an ability to act swiftly and with authority to advance GHG mitigation policies across all sectors of the economy. The earliest actions taken by the CARB in 2007 demonstrate clear political tensions between the Governor's office and the CARB regulators, who are now legally "in charge" of state-wide decision-making under the AB 32(Wilson 2007a; Wilson 2007b)(see Box 6.3).[93] An optimistic view is that these are growing pains and that CARB will be successful in providing the necessary leadership to bring about timely reforms.

Although a number of those interviewed questioned the original decision to shift the locus of power away from the CEC, there was broad support and high enthusiasm amongst many policy elites and stakeholders about the Governor's leadership on climate change. As Commissioner Boyd of the CEC put it: "we're playing with politics here with a small 'p.' You have to strike while the iron is hot, you have to do what you can… when you have leadership as high as a governor or a state like this constantly willing to stand out there and push it, you push wherever you can." Amy Luers (UCS) also noted: "… Schwarzenegger has been incredible on climate issues… it's really wonderful for the climate cause to have him be so vocal, not just here, not just for California, but also from an international perspective." Adrienne Alvord, legislative specialist in Fran Pavley's office, offered a similar view: "…because he's a Republican, because he's Schwarzenegger and world famous it would be a huge step forward for climate policy if Schwarzenegger took a strong position." The Governor's leadership was thus seen as the critical element for change. Once the leadership was established however, the legislature wanted to ensure that a politically independent body was in charge of rulemaking.

[93] Evidence of this came in 2007, when Governor Schwarzenegger fired the Chairman of the California Air Resources Board, Bob Sawyer, immediately after a vote on "early actions" to move the state toward achievement of the 2020 GHG target (Wilson 2007a). The Chairman voted in the minority against the slate of only three early action items, arguing that the decision was not strong enough. Environmental organisations and some of the media agreed with the Chairman's vote, criticising the Board's first official GHG mitigation decision as weak (Mercury-News 2007). A senior official of CARB also resigned in protest, citing interference from the Schwarzenegger administration with the Board's decisions. The administration is said to have lobbied Board members to support the slate of only three early actions (Wilson 2007b). Mary Nichols was appointed by the Governor as Chairman of CARB in 2007; she is a respected regulator having served in various senior positions in the California government and with US EPA as Assistant Administrator under the Clinton Administration, where she had responsibility for implementation of the Clean Air Act, including the SO_2 emission trading program.

6.6. Managing the transition - early stages of aggressive mitigation policy

Climate change policy thus began to emerge nearly two decades before the recent passage of AB32, with the first legislation in California focused on climate change passing in 1988. Initial policy was focused on study of the issue of climate change, aiming to understand the risks it presented to California's economy and its people, the range of causes and possible responses. However it was only later that policies moved forward to mitigate GHG, first through a separate law in 2002 to control vehicle emissions and then in 2003-2005 though regulatory decisions within the domain of energy policy. These early mitigation actions were further empowered by Governor Schwarzenegger's leadership which emerged clearly in June 2005 with his announcement of climate mitigation goals to guide action in the State of California.

The legislative action to codify state-wide mitigation goals for 2020, which came in 2006 with the passage of the AB-32 (see Chapter 4), responded to the concern that without a statute to make the targets legally-binding, little real policy reform would have followed the Executive Order of 2005. As Adrienne Alvord said: "if his [Governor Schwarzenegger's] administration lost interest or he didn't feel like [pursuing] it anymore that we would lose whatever gain we might make through …programs." This translated into interest in the legislature to codify the Governor's targets through law. It also served to provide an overarching policy framework for the wide range of sectoral initiatives.

As noted in Chapter 4, in 2006 accompanying legislation also codified and broadened regulatory policies to cover all electric power operators, municipal and investor-owned utilities. Both the Perata and the Levine Bills built upon policies that were previously set out in the Joint Energy Action Plans (California 2003 and 2005), which were jointly developed by the CEC and the CPUC. These policies were later elaborated by the CPUC through its regulation of investor-owned electric utilities. This move demonstrates that the CEC and CPUC have been a testing ground for new ideas to move toward clean energy solutions that limit GHG emissions. They also show the value of early leadership in regulatory institutions where smaller scale regulatory decisions were initially hammered out by the CEC and the CPUC in more narrow regulatory contexts. Interestingly, these ideas have become regulatory action which have eventually worked their way into law, and thus become a stable part of the long-term policy framework to address climate change in California. These examples and others (see Box 6.3) demonstrate a back-and-forth relationship between different centres of authority in California, with ideas, experience and drivers of policy change at state-wide level often emanating from issue-based decision-making and institutions forming a web of polycentric governance mechanisms.

Box 6.3: Moving climate-related policy forward: executive, legislative and administrative authority

A number of examples demonstrate the back-and-forth relationship between the California Legislature, the Governor, and the leaders of state regulatory institutions to act with resolve on energy and environmental issues. Even if an initiative fails legislatively there may be an opportunity to move it forward through an Executive Order of the Governor's Office or through regulatory decisions under existing authority in either the CPUC or the CEC in the power and energy sector. Two prominent examples are:

- **Renewable Portfolio Standard (RPS)** was initially established in 2002 through state legislation setting out the requirement for 20% of the state's electrical energy requirements to be met by renewable energy by 2017 (CA-Code 2002c). The CEC was authorised to implement the RPS. In 2003 the Energy Action Plan accelerated the RPS target year up to 2010, in part to address the issue of climate change (CEC 2003b). The CPUC is advancing this target through its authority in the investor-owned utility sector (CPUC 2006c).
- **California Solar Initiative:** Governor Schwarzenegger first announced this in his State of the State speech (California 2004a). Working with the legislature, the Governor sponsored draft legislation in 2005 to "encourage installation of solar panel systems on one million new and existing homes over the next 13 years" (to 2017) (California 2004b), but this legislation did not pass immediately. Meanwhile the Governor announced the intention to advance the programme (despite legislative delay) in February 2005 (California 2005g), and issued an Executive Order to this extent. The CPUC and the CEC issued their Energy Action Plan II in 2005 (California 2005e), supporting the programme, and the CPUC advanced work on the initiative, through its authority in the investor owned utilities sector, aiming to spend $2.8 Billion on solar photovoltaic technology for California rooftops over an 11-year period (2006-2016) (CPUC 2004d) (CPUC 2006d). As the CPUC was moving into final decision-making for the initiative, 2006 legislation passed to codify the initiative (CA-Code 2006e). The CPUC's interim decisions on the initiative were adapted to conform to the law, including lowering slightly (to $2.1 Billion) the amount of spending associated with the CPUC part of the Initiative. The CPUC and CEC now actively work together to implement the initiative.

Particularly in the power sector, CPUC decisions have led state legislative action with administrative decisions often preceding legislative action; the latter have the unique advantage of generalising the scope and broadening the applicability of the policy change.

One of the points of contention in the legislative battle over Assembly Bill 32 was whether it would require GHG emission trading as a mandatory part of the implementation plan to achieve state-wide emission reductions. Although original drafts of the Act contained provisions requiring an emissions trading system, the final version did not. The Democratically dominated legislature opposed the requirement for emission trading while the Governor and "progressive" business (see Chapter 9) strongly supported it and this is still the case. The law as adopted only requires CARB to consider emission trading as one of the options for implementation. Interestingly, the Governor signed Assembly Bill 32 (AB32) despite opposition from much of the Republican business community. However, the Governor's commitment to a cap and trade system is clear as stated in a more recent Executive Order (California 2006b), which states the Governor's intent to establish an emission trading system, even though AB32 put the CARB in charge of such decisions (see

Box 6.4). The Executive Order directs CalEPA to design such a cap and trade system with an eye to making the system compatible with other regional and international trading systems, i.e. in the EU and in the Regional Greenhouse Gas Initiative of the North-eastern states. In spite of this action, the Governor does not have the legal authority to require that the CARB to adopt an emission trading system as part of the implementation plan (see Box 6.4).[94]

6.7. Conclusion

The early stages of climate policy in California follow a pattern that is familiar at national scale, one that begins with study of the nature of the climate problem, moving on to document and inventory emissions, finally to assess mitigation solutions, set goals and design and implement policies. Early policy actions to address climate change began modestly to build institutional capacity in this area by targeting research, dialogue, inventorying through the CEC and entity-level voluntary reporting through the public private partnership of the CCAR. This was followed by more aggressive mitigation policy which is firmly anchored in prior regulatory capacity to control air pollution from motor vehicles and to steer investments in the energy sector towards clean energy systems, including energy efficiency (see Chapter 5; also Box 6.1).

More recently California legislation has established a broad-based state-wide policy framework to address climate change and this has been accompanied by a number of organisational changes to shift power and authority into "new" locations within state government. With climate change clearly on the policy agenda, the nature of decision-making needed to transition away from consultation and awareness raising -- the main prior approach within the CEC -- to more active regulatory decision-making to implement new and reformed policies and programmes to limit emissions. Moving from consultation to policymaking, the regulatory orientation of CARB combined with the convening authority of Cal EPA, offered an opportunity for leadership under Governor Schwarzenegger to take hold and move policy forward on climate change in a timely manner.

[94] In December 2008 the CARB adopted the "implementation plan" for AB 32. Interestingly it does foresee a cap and trade system, phased in to cover roughly 85% of California's total emissions by 2020 (CARB 2008c). It outlines this system as part of a broader multi-state effort to establish a regional cap and trade programme – through the Western Climate Initiative – where California commits to work with other western states and Canadian provinces to limit emissions by 15% (compared to 2005 levels) (WRCAI 2007; see also http://www.westernclimateinitiative.org/ [last accessed 12 December 2008]).

Box 6.4: To trade or not to trade? Early action to implement AB 32

Implementation of AB 32 has only just begun and the initial year following the Act's passage indicates the nature of the unprecedented challenges before the CARB, which has lead responsibility. A central issue and point of tension between the Governor's Office and the legislature in the passage of the Act was: what role for GHG emission trading? The language of the Act favours a regulatory approach and although not inconsistent with emission trading, it relegates trading to a subsidiary and optional role within the broader mix of instruments.[95] Ultimately the Act establishes regulatory authority under the CARB to do the rulemaking that will decide the mix of instruments to be used to implement the target.

The Governor seemed to defy the California legislature, and the language of the Act, when he issued an Executive Order shortly after its passage, calling for a "comprehensive market-based compliance" programme and permit trading between California and other regional partners (*e.g.* Europe and RGGI) and establishing a clearer role for administration (through the Secretary of CalEPA) in the decision-making process for implementation of the Act (California 2006b). Two prominent legislative leaders, Senate President Pro Tem Don Perata and the Speaker of the House (and co-author of AB 32) Fabio Nunez, immediately challenged the validity of this Executive Order (Perata 2006). This exchange on implementation of the Act became even more contentious and public in July 2007 when the Governor fired Chair of the Board (CARB), Bob Sawyer, following the first round of decision-making to implement the act. This led to the resignation of CARB chief of staff Catherine Witherspoon. Both Sawyer and Witherspoon publicly accused the Governor's Office of interfering with the decisions of CARB and of trying to control outcomes of the "independent" Board, which has a long history of independent regulatory action.

Emission trading in California is controversial due to active opposition from the environmental justice (EJ) community and past experience with this market mechanism. The EJ community has argued that trading may lead to a delay in clean-up of the state's most polluting facilities, which are often nearest the most poor and vulnerable of the population. Also, past experience with market mechanisms in California has led to some notable policy failures and made regulators wary of over-reliance on the markets to control emissions (*e.g.* 2000-01 electricity crisis and NO_x emission trading) (see Dwyer 1993 on the latter).

Central to this dispute is the role of market-based versus more traditional regulatory approaches in the implementation of Assembly Bill 32. Moreover there is a legitimate question about the balance of powers between the Governor and his office and the legislature. While it is the legislature that represents the citizens of California in passage of such a law, the implementation language remains relatively open. In conferring authority to implement to an "independent" regulatory body, the CARB, the legislature intended to limit the influence of the Governor's Office in those decisions. However the Governor still has the power to appoint (and terminate appointments) to the Board, calling into question the independence of the Board itself (Wilson 2007a; Wilson 2007b).

Through these early actions states and their institutions are positioning with knowledge and experience that will inevitably influence the shape of federal action to come. There is already some evidence, for example from the California Climate Action Registry, that early action to develop tools and advance institutional innovation can be transferred more broadly to other states

[95] It is important to note that earlier versions of the language of the Bill contained a requirement for the use of emission trading as a central instrument for implementation. Although supported by the Governor, this version failed to pass the California legislature.

and help to join states in common action. Similarly there is an expectation that California's vehicle CO_2 emission rules will be ultimately approved and have an important influence across the US, despite the delay caused opposition from the Bush administration. These examples show that the issue of scale has become an important source of political argument in favour of action at sub-national state level. In this way, scale considerations are shaping the way that leaders and organisations are addressing climate change in California and elsewhere in the US (see also Chapter 9).

Finally, the chapter shows clear evidence of a back-and-forth relationship between institutional, administrative rulemaking under pre-existing administrative authority in areas of energy policy and air pollution control, on the one hand, and new state legislation on the other (see Box 6.3). This derives in part in the issue-based governance that exists in California, where relatively independent institutions exist to govern different aspects of the problem, e.g. for entity-level voluntary reporting in the California Climate Action Registry, the California Air Resources Board overseeing the vehicle sector and air pollution more generally, the California Energy Commission overseeing the regulation of energy efficiency through its appliance and building standards, and the California Public Utilities Commission regulating the investor-owned utilities. Interestingly this polycentric governance structure has allowed innovative, sector- or issue-based policy to emerge relatively quickly – within existing regulatory authority -- to design and test innovative policy solutions in advance of more complex and comprehensive state-wide policy packages.

Climate change policy in California is taking shape but it is relatively new. As John White said, it is "…a fragile policy, it's not a robust policy yet." The preceding discussion suggests that the early start on climate policy in California is intimately linked to its previous pro-active socio-environmental history, to its past successes, experimentation and social learning in policy arenas, which in turn connected to polycentric, multilevel governance in areas related to climate change, notably on air pollution, and energy efficiency.

This short history leaves open many questions about whether and how "California is different" in the way it is approaching climate change policy. The next two chapters explore the climate policy discourse in California in some depth looking at the interface between policy decision-making and expert knowledge is further explored in-depth. These chapters focus in particular on co-construction of the arguments for policy change. In particular, they consider how the climate change problem and policy solutions are framed in the policy debate, what argument and evidence is drawn upon to support state policy decisions, and on the range of actors and interests supporting these arguments.

7. FRAMING THE CLIMATE CHANGE PROBLEM AS REGIONAL ENVIRONMENTAL RISK

7.1. Introduction

This chapter outlines one of two dominant framings of climate change in the mitigation policy discourse in California: a policy frame that defines the problem of climate change as one of local environmental risk. This frame focuses on climate change impacts in California. It is coupled with a second policy frame, which is explored in-depth in the next chapter, focusing on "win-win" policy solutions where mitigation policies are presented as having both environmental and economic benefits.

Acting to limit climate change will rely at least in part upon the ability to construct persuasive arguments and compile compelling evidence about the nature of the threat of climate change and about the belief that policy will make a difference. Of course there are competing narratives or policy frames and no single, correct interpretation of the "facts" (Majone 1984; Hawkesworth 1988; Schön and Rein 1994). Particularly with the multilevel governance dimensions of climate change, a central research challenge is to understand how tension is resolved over contested meanings and frames for interpretation in any decision-making context (within and across scales) across a wide range of relevant actors and organisations (Chapter 3). Also, it is important to consider carefully the context for climate decision-making, along side of the scientific information relevant to the problem (Chapter 1). However, what counts as relevant in the policy process is determined to some extent by the policy frames that are used or, as Miller (2000: 211) states, the "perceptual lenses, worldviews or underlying assumptions that guide communal interpretation and definition of particular issues."

This analysis focuses on the evidence and argument used to co-construct the local environmental risk policy frame in California. Thus it situates the discussion in a co-constructionist conceptual framework that combines the strengths of realist, scientific discovery on one hand with contextual insights and lay knowledge on the other. In this conceptual framework, social processes mediate meanings of global warming to interpret scientific and expert knowledge in a political context for decision-making (Jasanoff 1990; Jasanoff and Wynne 1998; Woodgate and Redclift 1998). This occurs in culturally specific ways to shape understandings of climate change in the policy process (Douglas and Wildavsky 1982).

The analysis also aims to build on the previous chapters to understand how knowledge, preferences and social norms are shifting over time to respond to climate change to consider opportunities for social learning. In addition to the role of different types of knowledge, it looks at networks of influence and power across different types of actors, sub-politics and the possibility for meaningful action to emerge from the "bottom up" on the basis of co-constructed meanings of climate change. The chapter explores in particular science-policy interactions and an emerging epistemic network that supports decision-making in California, drawing expertise and political support from non-governmental actors as well as the expert community.

The chapter begins with a general review of historical arguments for climate policy starting with developments in the US and internationally in the 1980s to provide a contextual backdrop for similar yet more localised action in California. This is followed by an in-depth discussion of the local environmental risk policy frame and a discussion of the types of knowledge and evidence used to construct this frame in California. The chapter traces the development of expert knowledge on climate change impacts in the California context as the evidentiary basis for claims about climate change as local environmental risk. It also assesses the role of experiential knowledge, or local context, in interpreting this expert knowledge in California, both within the climate policy process and more broadly across lay publics. In this way I explore additional cultural and contextual factors in California that have helped to shape climate change policy in the public sphere. These themes are further developed in Chapter 8 with respect to the second policy frame – win-win policy responses.

7.2. Climate change as environmental risk: early developments

The 1980-90s in the US marked a period when a number of scientific, political, institutional and media trends converged to propel climate change clearly into the public sphere from its previous status as a largely scientific issue (Corfee-Morlot et al. 2007; Table 7.1). First, science was increasingly being designed and used for policy purposes, on issues of global environmental change, and particularly in the area of climate change (Agrawala 1999). For example, in 1983, two US government sponsored science reports were issued however each had conflicting conclusions about the need for policy action to address global warming. A US Environmental Protection Agency (EPA) (1983) report stressed the urgency of dealing with global warming problems, while a National Academy of Sciences report saw no need for immediate steps despite concern about the issue (NAS 1983). These initially conflicting viewpoints eventually converged in increasingly consensual science-policy recommendations to support policymaking in the US (Hart and Victor 1993; Corfee-Morlot et al. 2007).

Second, significant US policy action on climate change advanced in this period. By 1988 the United States Congress was debating details of legislation to address climate change through the window of energy policy; by 1992, The National Energy Policy Act was signed into law by President Bush (Sr) (Hecht and Tirpak 1995). This followed earlier US legislation acknowledging climate change as a policy problem (i.e. the US National Climate Act of 1978 set up the National Oceanic and Atmospheric Administration - NOAA).

Third, the 1980s brought important scientific discoveries that clearly linked human activity to global environmental wellbeing (e.g. in addition to climate change, acid rain and stratospheric ozone) (Corfee-Morlot et al. 2007). This decade ushered in a new set of concerns grounded in scientific knowledge about global environmental issues, and these were the subject of increasing press coverage (Mazur 1988; Mazur and Lee 1993) and attention from non-governmental environmental organisations (Liverman 1999). This was also a period of rapid expansion of the membership and influence of environmental organisations in leading OECD countries (Brulle 2000).

Fourth, international attention also began to turn to the issue of climate change in the 1980s. A series of landmark international scientific conferences were organised by UNEP, WMO and ICSU in Villach, Austria and Belagio, Italy between 1980 and 1987. These meetings brought policymakers together with scientists to debate the policy implications of climate change. In 1988, another turning point came in the Canadian-hosted international conference on the "Changing Atmosphere: Implications for Global Security" concluded with a non-binding statement of government participants to work towards a 20% reduction in CO_2 emission reduction by 2005 compared to 1988 (WMO/OMM 1988). This was a significant political development as it was the first international meeting of western governments to call for restrictions on greenhouse emissions (Hecht and Tirpak 1995). It was the first of what was to become a series of inter-governmental meetings to call for international action to mitigate climate change (e.g. Noordwijk, Netherlands 1989; 2nd World Climate Conference 1990). As noted in Chapter 2, the IPCC was created in 1988 by the UNEP and WMO to lead international scientific cooperation on climate change and in particular to conduct coordinated assessment of impacts and response strategies (Agrawala 1998; Bodansky 1994).

Finally, tracing developments from Stockholm in 1972 to Rio de Janeiro in 1992, indicates a shift in environmental attention from local and regional issues to global issues, which was also accompanied by a broadening of the environmental debate to include participation in international negotiations from a range of previously unheard voices (Liverman 1999; Shabecoff 1996). These voices extended beyond business and scientific communities to include environmental non-

governmental organisations, women and local communities as well as social scientists. Shabecoff (1996) highlights the end of the 1980s as a turning point where there was a fundamental shift in the appreciation for the inter-linkages between economic wellbeing and the environment. Rio was a landmark event as it confirmed a shift in understanding amongst developing and developed nations alike that local and global environmental issues were central to international relations, security and development.

In the California context, by the late 1980s the first climate change legislation had passed and the CEC had begun to develop climate change projections and assess impacts in the California context (see Chapter 6). A number of publications also brought attention to the potential risks of climate change for the California economy pointing in particular to vulnerability in the water sector as well as to increased risk of forest fires and sea level rise (Gleick 1987a; Gleick 1987b; Smith and Tirpak 1989). These included prominent attention to California's vulnerability in the first US national assessment of climate change impacts (Smith and Tirpak 1989) as well as more focused academic research on particular issues, such as in the area of water resources (Gleick 1987a; Gleick 1987b).

By the mid 1990s, the US federal agency – the National Oceanic and Atmospheric Administration -- had established a Regional Integrated Sciences and Assessments (RISA) programme and set up a regional centre in California to support state of the art scientific assessment (NOAA CPO 2008).[96] This was located at the well-known Scripps Institution of Oceanography of the University of California at San Diego.[97] Later in the mid-2000s, research funding from the State of California PIER programme for the California Climate Change Centre, was combined with federal research funding from NOAA for the RISA centre – known as the California Applications Program (CAP) -- to create an even stronger research capacity in the state for regional climate assessment. The 2006 annual report from the CAP reports on the aim of the research (Cayan 2006):

> The California Applications Program (CAP) and the California Climate Change Center (CCCC) aim to develop and provide

[96] Franco *et al.* (2008) also note that other federal research funding was available in this period, notably from US DOE for decade-to-century scale climate projections in the western US region.

[97] It is important to note that Scripps has historically been and remains today a powerhouse in scientific research circles on climate change. Some of the earliest scientific research on climate change emerged from Scripps led by scientist Roger Revelle; Revelle was one of the leaders in the scientific community that advanced tools to track climate change over time, starting in the 1950s, and later to suggest that it might be a policy-relevant problem. See Hart & Victor 1993; Weart 2003; Corfee-Morlot *et al.* 2007.

> better climate information and forecasts for decision makers in California and the surrounding region. Applications addressed include problems involving water resources, wildfire, and human health. Time scales of interest range from seasonal to secular changes associated with natural and anthropogenic influences. By working directly with users and practitioners, CAP and CCCC are working to evaluate climate information needs and utility from the user perspective.

This research platform has provided the State of California (and other regional decision-makers) with timely, region-specific scientific impact assessment, which, in turn, has become an important source of argument and evidence in the policy debate in California.

Table 7.1: Key international and national developments in climate change across scientific, political, media and environmental movement domains: 1980-2000

	Late 1970s/1980s	1990s
Science	Ozone hole discovered (85) Concern about abrupt climate change emerges from paleoclimatology Observed GMT data show rapid global warming. Contested nature of climate science emerges.	IPCC 1988 report establishes scientific basis for policy concern. IPCC second scientific assessment confirms human fingerprint on the Earth's climate (1998). Political debate about the "hockey stick" millennium trend in GMT (1998 ongoing…).
Leadership & key political events, institutional developments	1979: OPEC oil embargo Early 80s: Science-policy advice split about the need for immediate climate policy action 1980-87: Villach and Belagio Conferences. 1987: Montreal Protocol on stratospheric ozone [check] Late 80s: scientific-policy advice converges on the gravity of global warming problem and need for policy attention. 1988: Toronto statement – governments pledge to achieve CO2 emission reductions 1988: WMO/UNEP (governments) create IPCC 1990: UNGA resolution begins international negotiations on climate change	2nd World Climate Conference calls for a Convention 1992 Framework Convention: enters into force 1994. 1997 Kyoto Protocol: entry into force 2005. Policy gap widens: scientific consensus on scale and magnitude of problem, & need to respond vs. limited levels and types of policy action.
Media coverage	Political construction of climate change as a risk problem and as part of broader set of global environmental changes Climate change linked to energy (e.g. follow on from 1970s energy crises). 1981: Hansen in NYT links observed warming trends and extremes to human causes.	High level of media attention returns – focusing on sense of urgency, problem-solving Climate change increasingly linked to extreme events (heat waves, fires, drought)
Environmental social movement	Massive growth in the environmental movement Acid rain, ozone, global climate change become emblematic issues Recognition of global environmental risks and rise in multilateral environmental cooperation Progressive business goes "green."	Environmental movement increasingly institutionalized, politically fractured and weak. Action on climate change characterised by transnational/international action, working from within policy institutional processes.
US policy developments	1978, US National Climate Act passed, establishes National Oceanic and Atmospheric Administration (NOAA) 1983, two US government-sponsored science reports have conflicting conclusions about the need for climate policy action global warming 1988 the United States Congress debates legislation to address climate change through the window of energy policy	1992 – National Energy Policy Act signed into law Mid-1990s – NOAA establishes Regional Integrated Sciences and Assessments programme
California policy developments	1988 Sher legislation on climate change	1998 deregulation of the electricity industry 2000 – CCAR established

Source: adapted from Corfee-Morlot et al. 2007

7.3. Climate change problem as regional environmental risk

The political debate on climate change in California has drawn upon extensive research on regional impact, using this as a source of evidence in the construction of argument on the need to act. In anticipation of the 2006 legislative debate to come, the Governor's 2005 Executive Order called for a new comprehensive report on the science of climate change. This report argued that California was particularly vulnerable to climate change in many ways and this, in turn, became a foundation for arguments that California's particular exposure and vulnerability to climate change called for state level action, particularly given the void of federal action to address the problem.

In the documents that accompany and support the policy debate in California, including the media of this period, climate change is often represented as a threat to human well-being and to natural systems (e.g. see (Bustillo 2004; Luers *et al.* 2006). This framing is apparent in Governor Schwarzenegger's initial announcement of greenhouse gas emission reduction targets, when he said: "I say the debate is over. We know the science. We see the threat and the time for action is now"(California 2005b). In this view, climate change is associated with already observable and predicted impacts, both in California, across the United States and abroad.

The active framing of climate change as a regional environmental risk problem by California policymakers is apparent in the language used to support recent policy initiatives. This includes the Governor's Executive Order (California 2005a), however, a similar framing is set out in recent state climate change legislation, notably in the California Global Warming Solutions Act of 2006 (GWSA) (CA-Code 2006a). In particular, the AB 32 includes a passage of "findings and declarations" that highlights the threat of global warming to California. Table 7.2 highlights the language used in each of these areas to frame the argument that climate change is a problem of environmental risk in California.

The science of environmental issues is frequently contested, and this has certainly been part of the public debate about climate change in the United States and elsewhere (see Chapter 2). The impacts of climate change play out through complex interactions between human and natural systems. It is broadly recognised within the scientific community that there will be a mix of impacts of climate change, some positive and some negative. This is particularly the case if cost-effective adaptation measures are taken to ensure that potential benefits from climate change, for example in the agriculture sector, are captured (Field *et al.* 1999; Hayhoe *et al.* 2004; Smith and Mendelsohn 2007; Wilson *et al.* 2003).

Table 7.2: Climate Policy Discourse in California: Climate Change as an Environmental Risk Problem

Governor Schwarzenegger's Executive Order (S-3-05) (California 2005a) - Excerpts	Global Warming Solutions Act of 2006 (CA-Code 2006a) – Excerpts
Policy-Relevant Conclusions	
California is particularly vulnerable to the impacts of climate change *Mitigation efforts will be necessary to reduce greenhouse gas emissions and adaptation efforts will be necessary to prepare Californians for the consequences of global warming*	*Global warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California.* *National and international actions are necessary to fully address the issue of global warming. However, action taken by California to reduce emissions of greenhouse gases will have far-reaching effects by encouraging other states, the federal government, and other countries to act.*
Impacts Evidence: Climate Change Risk in California	
Increased temperatures threaten to greatly reduce the Sierra snowpack, one of the State's primary sources of water *Increased temperatures also threaten to further exacerbate California's air quality problems and adversely impact human health by increasing heat stress and related deaths, the incidence of infectious disease, and the risk of asthma, respiratory and other health problems* *Rising sea levels threaten California's 1,100 miles of valuable coastal real estate and natural habitats* *The combined effects of an increase in temperatures and diminished water supply and quality threaten to alter micro-climates within the state, affect the abundance and distribution of pests and pathogens, and result in variations in crop quality and yield.*	*The potential adverse impacts of global warming include the exacerbation of air quality problems, a reduction in the quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural environment, and an increase in the incidences of infectious diseases, asthma, and other human health-related problems.*

On an issue like climate change, where science findings will always be characterised by some degree of uncertainty and ambiguity about distant outcomes, political leadership is necessary to make the issue tractable. Policy will need to move ahead despite inevitable uncertainties. As Terry Tamminen noted: "Sometimes that's what it takes... for some leader to stand up and say: 'I know you, the vast majority of the public, have other things on your mind. I'm telling you I've looked at this, and the debate is over. We've got to act. There's a real threat.'" Jeffrey Calliston, host of a public radio programme on policy in California, underscored his general understanding

of climate change and the debate about science: "I have posed the question several times when we've had guests, scientific guests....every scientist I've ever spoken to has said the consensus among scientists is that it's caused by humans. … and that's basically California's position: that it's human-caused."

These statements suggest that there was great value in leadership from the Governor, especially in the face of contested-science of climate change. They also suggest that local environmental risk framing helped to cut through the ambiguity about what climate change would mean to the future of the state and its people. It defined climate change as a "threat" that required a preventive, risk management response.

The State of California has demonstrated a relatively long-standing interest in research on climate change and its impacts as well as on clean energy technologies and practices (such as energy conservation and demand management) dating back in policy terms to the original 1988 Sher legislation. For example, climate expert and Staff Scientist at Lawrence Berkeley Laboratory, Norm Miller said "…there's been a lot of research through the California Energy Commission, which has had its own research program for years now, and historically California has set a precedent at least nationwide if not internationally on progressing certain attitudes and change." This in-state research capacity, part of which is funded federally, and base of expert knowledge appears to have contributed to widespread media coverage and public understanding of the potential for climate change to have serious physical and economic impacts in the State of California. Also through the epistemic network that surrounds and supports expert knowledge development on climate change, state government support for policy-relevant research may also have helped to deliver bipartisan political support for policy action to mitigate greenhouse gas emissions.

7.4. California mobilises impact science as evidence

The Governor's Executive Order had called for a new scientific report on the nature of climate change and its impacts in California, also to be coordinated by the Secretary of CalEPA under the oversight of the Climate Action Team (CAT) and it was this report which would become an important piece of empirical evidence in the lead up to the legislative debate in 2006. The report was to be delivered in the same timeframe as the policy recommendations – by January 2006. The Executive Order required (California 2005b): "…That the Secretary shall also report to the Governor and the State Legislature by January 2006 and biannually thereafter on the impacts to California of global warming, including impacts to water supply, public health, agriculture, the

coastline, and forestry, and shall prepare and report on mitigation and adaptation plans to combat these impacts."

In addition to announcing GHG targets as part of a new policy initiative on climate change, the Governor's Executive Order thus also called for an assessment of climate change impacts in California. Terry Tamminen, the Governor's energy and environmental advisor, explained why. In his view the Governor's Executive Order was intimately linked to a view about the "threat" of climate change. He said: "I do think you've got to tell people why you should care about this. And if there is going to be some short-term economic pain - a tax or a reduction of doing something you're currently doing – why are we asking you to do that? I think it's incumbent on government to explain that and be accountable for it." Michael Hanemann, a UC Berkeley Professor and one of the principal researchers responsible for delivery of the new evidence, confirmed this view. The impact report was necessary to the policy process because "…[it] is important to emphasize why these emissions targets make sense." Accordingly the Governor used the Executive Order to both call for action and for "new" evidence about why firm action was needed.

The Governor's Executive Order had the effect of putting regional impact science research at the centre of the policy process. Suddenly this research was needed to offer concrete evidence to support the Governor's bolder climate policy direction and emission reduction targets at the state level. In practice, delivering a new scientific impact assessment for the Governor's initiative was a significant challenge. Since the beginning at least the mid-1990s, the local scientific research community had been slowly contributing to the growing body of evidence about how climate change was affecting California and would likely play out in the future. Up until this point, most of the large research community working on different dimensions of regional climate impact assessment in California had been working at arm's length from the political process and they were not necessarily working in concerted manner.

Professor Michael Hanemann was part of a three-person team to coordinate the impact assessment that was to feed into the 2005-2006 policy process under the Governor's Executive Order. He commented on how difficult newly agreed short-term deadlines were to satisfy. The deadlines met with significant opposition from the academic community that was expected to deliver on them. Michael Hanemann said: "… everybody sort of freaked out and said, 'This is 6 months and there's no way we can do this.' So [we] worked to calm people and we persuaded them that, you know, it's worth the effort."

Michael Hanemann reflected on the reasons to deliver "new" evidence of climate change impacts in the California context in a very compressed timeline. He said: "Of course, everybody said: 'So why the end of January? What's wrong with the end of February? What's magic about January?' And there were two answers. One answer was the Governor said the end of January and the Governor is not going to change. Only wimps miss deadlines. But why did the Governor say the end of January? Well, the answer is the legislature was assembling around then and so I think, it's part of this, the Governor wanted to turn it over to the legislature and then let them deal with it and so he didn't want to be running into the legislative session."

Thus it seems that the Governor's eye may have been not only on gathering political support for his own targets and on specific plans to implement them, but also on the legislative session that was about to feature debate and voting on a number of important pieces of new legislation relating to climate change.[98] Most important among these was the Global Warming Solutions Act (AB 32), which was signed into law in September 2006 (see Box 6.1 and Chapter 5). Also at this time, the California legislature was debating other proposals that would, if passed, affect greenhouse gas emissions from the electricity and transport sectors, covering issues ranging from investment in energy efficiency to cleaner power plants and biofuels. The Governor's interest in expanding and updating the evidence about the impacts of climate change would provide scientific evidence to support his call for targets, but would also potentially bolster support for the proposed legislative action on climate change.

7.4.1. Bringing in the impact science

How did a regional environmental risk framing become a dominant element of the policy discourse and process in California? To understand the answer to this question it is important to trace the construction of scientific knowledge and evidence on climate change impacts in California, identify who has supported this research and why, and how the research been used in the policy process over time. Expert knowledge about regional climate change impacts in California appears to be particularly strong compared to other regions of the United States and beyond. It derives from not just one or two studies, but from a series of in-depth regional impact assessments that began in the late 1990s. It also emerges from a continuous investment in scientific research by the state government.

[98] As outlined in Chapter 6, it was well known that Fran Pavley would co-sponsor legislation to address the issue of statewide targets to reduce GHG emissions; early drafts of such legislation were delayed to await the positioning and eventual leadership of the Governor on this issue.

Since the late 1990s, at least five distinct and different full assessments have been carried out, each with a slightly different cast of authors and with slightly different objectives and audiences in mind (Table 7.3). Of course, each assessment has built on previous work, and this layering of assessments, with cross-over in authors and research institutions appears to have facilitated a learning process that has improved both the technical quality of the research and its policy-relevance over time. Governor Schwarzenegger's call for "new" evidence must be seen in the context of prior attention by the state government, and in particular by the CEC's Public Interest Energy Research programme, as well as by the environmental advocacy community in California to climate impact assessment.

Climate change impact assessment at regional scale is technically complex, expensive and time-consuming to carry out. This is in part because it requires significant resources to support climate change modelling as input to structure the analysis. Another factor that raises the cost and complexity of impact assessment is that it is data-intensive and requires modelling capacity to integrate local and regional socio-economic, demographic and environmental data and projections. There is thus a need to gather local data and develop predictions about socio-economic factors that determine patterns of local development and demand for resources that will be affected by climate change e.g. historical and predicted water demands, agricultural and urban development trends, and land use. A full assessment of climate change impacts in any region requires the integration of many different types of knowledge and expertise, several different types of models, ranging from atmospheric and oceanic science to regional ecology assessments, geographic analysis and economic modelling (Parson and Fisher-Vanden 1997; Shackley and Wynne 1995). Coordination of climate impact assessment in any regional context is a large and complex undertaking. It is a relatively new area of environmental research that requires the construction of new visions or scenarios of the future or socio-economic scenarios. The timeframe to perform such a climate change impact assessment is necessarily longer than what would be typical for a "policy analysis" exercise. The long-time frames for assessment also mean that it is difficult to use off-the-shelf predictions or economic forecasts to support other types of decision-making.

California regional science and impact assessments have benefited in recent years from public funding from the state government, with this funding layering into a strong base of federal research funding (see section 7.2). In large part this has occurred through the Public Interest Energy Research (PIER) programme. PIER climate change research has two main strands: climate change modelling and impacts; and climate change policy analysis and economic modelling (Franco *et al.* 2003). PIER funding is gathered through an earmarked public goods

surcharge on electricity and a share of the revenues are administered by the CEC to support climate change research. Over the last few years this programme has funded climate change research at a level of about $4-6 million per year (see discussion Chapter 5).[99]

In a first comprehensive review by an independent review panel, the Panel noted the importance of the PIER research in contributing to California's policymaking process (CCST 2005): "The promise of the PIER program is that it can cast its activities in the context of California's unique environmental, economic, and demographic forces."

Another important factor in accumulating evidence about climate change impacts in California is the availability of significant expertise and capacity in various institutions across the state. This includes California's world-class public university system (University of California with its 10 separate campuses across the state), at least three other world-renowned private universities (the California Institute of Technology, Stanford University and the University of Southern California). It also includes significant expertise and applied research capacity within the government institutions of the state (e.g. on air pollution, energy water and agriculture impacts) and other specialised scientific research institutions (e.g. Lawrence Berkeley and Lawrence Livermore National Laboratories).

Table 7.3 shows that the reports issued under the Governor's Executive Order are part of a longer series of reports on impacts in California. Further these reports draw on a base of scientific literature and some earlier national assessments, most of which was federally-funded scientific research on climate change in the western US (Guido *et al.* 2008; NOAA CAP 2008; Smith and Tirpak 1989). Thus this recent work adds a new layer of information to prior work in this area and focuses it specifically on California impacts. All reports have served a role to communicate information on the risks of climate change. Aside from documenting the nature of predicted impacts associated with climate change, they have provided opportunities for more active exchange between authors and other members of the scientific community on the one hand, and the state officials and other members of the policy community on the other, as a principal audience for the assessments. Norm Miller explained the "communication" function that began with the earliest assessments in 1999. When asked how the findings of the assessments were communicated to policymakers, he responded: "We have scheduled meetings with legislators and their aides. We talk to them about specific topics related to our findings. When the '99 paper

[99] As noted in Chapter 5, the PIER programme covers more than just climate change, extending also to energy technology RD&D.

came out, Christ and I and Pam Matsen spent two days going all over the place – and when the '01 paper[100] came out, we did it again and when the '04 with Hayhoe came out, we did it again."

Many of the senior policymakers interviewed for this project referred to these briefings on climate change impacts by scientists as a turning point for their understanding of climate change as a policy-relevant issue. The briefings offered an interactive exchange in a small, intimate setting between scientists and policymakers. The recognition of these briefings among policy elite demonstrates the power of a recursive, analytic-deliberative exchange to enhance understanding and influence policymaking (Stern and Fineberg 1996). The briefings provided the opportunity for scientists and experts to interact in small groups and to discuss and exchange views at key moments in a decision-making process.

To understand the influence of scientific impact assessment, it is valuable to fully explore how expert knowledge was constructed in the California region, and where and how deliberative-analytic outreach occurred over time to communicate and build understanding of the results.

7.4.2. 1999 UCS study -- gets the attention of decision-makers

The first assessment of climate change impacts in California was released in 1999. The assessment emerged from an innovative partnership between the Ecological Society of America (ESA) and the Union of Concerned Scientists (UCS) study.[101] Christ Field, a Stanford University professor, and several other California academics authored the study (Field *et al.* 1999). He and others of the California-based authors of the study have contributed to subsequent assessments in California and are actively engaged in climate change research internationally. They could

[100] Referring here to the Wilkinson study, which was not finally released until 2002.

[101] According to the "blurbs" available on the 1999 report:

The UCS "is an independent, nonprofit organization dedicated to advancing responsible public policies in areas where science and technology play a critical role." For more information about UCS today see: http://www.ucsusa.org.

The ESA is a "scientific, non-profit organization with more than 7,000 professional members. ... ESA seeks to promote the responsible application of ecological data and principles to the solution of environmental problems." For more information about ESA today see: http://www.esa.org/aboutesa/ * Note their membership is larger today.*

therefore be characterised as part of what would become a powerful "epistemic network" of scientists active on the issue of climate change in California.[102]

The ESA/UCS partnership provided a platform for cooperation and assured that the study would not remain purely a scientific study. Given the policy specific mission of UCS, once completed the study was accompanied by an active outreach effort. According to Cole and Watrous (2007), the ESA/UCS partnership was "the brainchild of UCS's Peter Frumhoff, Director of the Global Environmental Programme." This successful partnership continued through 2003, to support two more regional climate impact assessments in the United States; one in the Gulf Coast/Gulf of Mexico region (Twilley *et al.* 2001) and another in the Great Lakes (Kling *et al.* 2003). A principal aim of all of these studies was to raise awareness amongst the general public as well as amongst decision-makers about the regional risks of unmitigated, human-induced climate change.

The 1999 ESA/UCS assessment was the first of its type for the California region (and perhaps in the nation). It built upon state-of-the-art regional climate scenarios and modelling to assess impacts on ecosystems, as well as the essential services that California ecosystems provide to society, such as pollination services from insects and animals in crop-growing regions (Field *et al.* 1999, p. 40). It was the first study to point out the broad types of climate changes that could be expected in California with global warming: more rain and less snow, greater winter runoff and less flow in summer streams, more frequent and possibly more intense El Niños (Field *et al.* 1999, p. 10).

The study was successful in drawing attention to the issue of climate change amongst Californian policymakers. As Mary Nichols,[103] former Secretary for Resources in California (under the Gray Davis administration) said of the 1999 study: "…..that study's certainly had a dramatic effect on getting the attention of political leadership." Cole and Watrous (2007) (2007) also highlight the study's political influence in California. Not only was this study innovative from a scientific perspective in that it brought the issue of global warming and its impacts down to regional scale for the first time in California, but it also provided a vehicle for communicating the issue of climate change to regional and local decision-makers.

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[102] Note Norm Miller is another co-author of this study. Norm Miller and Christ Field were both co-authors of the Hayhoe *et al.* 2004 study (see below) and are authors in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.

[103] Mary Nichols was the head of the Environment Institute at the University of California at Los Angeles at the time she was interviewed. She was formerly the Secretary of the California Resources Agency under Governor Gray Davis (1999-2003). In 2007 she was named the Chairwoman of the California Air Resources Board (CARB). CARB is the state agency that was mandated in the 2006 Assembly Bill 32 to decide how the state would achieve the 2020 emission reduction target set out in the law.

Table 7.3: Overview of Recent California Regional Impact Assessments 1999-2006

Year & Reference	*Type of Publication: Title*	*Lead Coordinating Institutions: Authors*	*Sponsor*	*Main Audience*
2006 (UCS 2006)	UCS Brochures & Internet Website: *California – Climate Choices* Glossy summary brochures & internet website	Union of Concerned Scientists based on *Our Changing Climate*	Union of Concerned Scientists - ClimateChoices.org	Public and policymaker
2006 (Luers *et al.* 2006)	Government report - glossy: *Our Changing Climate: Assessing the Risks to California*	California Climate Change Center: Luers, Cayan, Franco, Hanemann, Croes	California Public Interest Energy Research Programme	Public and policymaker
2006 (**Cayan** *et al.* 2006)	Government report – technical: *Scenarios of Climate Change in California: an Overview*	Dan Cayan, Amy Luers, Michael Hanemann, Guido Franco, Bart Croes	California Public Interest Energy Research Programme	Policymakers and scientific
2006 (Supporting material: appendices to the 2006 PIER report)[104]	Government reports – web documents: These are technical appendices to the Cayan *et al.* 2006 "PIER report" (above), which was one of several parts of the CAT report to the Governor	77 different authors including leading academics and experts within the state civil service	California Public Interest Energy Research Programme	Scientific
2004	UCS Brochures & Internet Website – companion documents for communication purposes on Hayhoe et al article findings: "*Climate Change in California: Choosing our Future*" Includes separate flyers on	Prepared by the Union of Concerned Scientists based on or in cooperation with Katherine Hayhoe and 18 other co-authors.	Energy Foundation and various others that support The Union of Concerned Scientists	Public and policymaker (Sacto briefings)
2004 (Hayhoe *et al.* 2004)	Scientific journal – Proceedings of the National Academy of the Sciences (PNAS): *"Emission pathways, climate change, and impacts on California"*	Katherine Hayhoe *et al.* – 17 other authors	The Union of Concerned Scientists for Hayhoe only plus various research sponsors	Scientific
2003 (Hanemann and Torn 2003)	Government report/web-document –review of EPRI study with research recommendations: *A Review of the Report: Global Climate Change and California*	Michael Hanemann of UC Berkley and Margaret Torn Lawrence Berkeley Laboratory	California Public Interest Energy Research Programme	Scientific, Research Community (including government sponsors)
2003 (Wilson *et al.* 2003) and (Smith and Mendelsohn 2007)	Government report/web-documents; *Global Climate Change and California: Potential Implication for Ecosystems, Health and the Economy* (also a book in 2007)	EPRI: Wilson, Williams Stratus Consulting: Smith Yale University: Mendelsohn	California Public Interest Energy Research Programme	Scientific
2001 (Wilkinson 2002)	Government report – web document: California	US National Assessment Team – Regional report	US Government	Public and scientific
1999 (Field *et al.* 1999)	NGO report – glossy: *Confronting Climate Change in California: Ecological Impacts on the Golden State*	UCS: Field, Daily, Davis, Gaines, Matsen, Melack, Miller	The Union of Concerned Scientists and the Ecological Society of America	Public & policymaker

Source: author based on sources cited in the first column.

[104] See http://www.climatechange.ca.gov/climate_action_team/reports/index.html#supporting (accessed 23 February 2007).

Interestingly, Mary Nichols remembers the influence that the ESA/UCS study had on people's perceptions of climate change with respect to the emblematic issue of water in California. Mary Nichols said it was "…some of the first work that really caught the public's attention. …[It] showed that based on currently observed patterns of changes in rainfall and temperature and so forth, so that our freshwater system wasn't going to work..." Policymakers became attentive to the climate change issue once it became clear that climate change would affect the elaborate yet delicate balance between supply and demand for freshwater in different parts of the state.

As head of the Resources Agency in 1999, Mary Nichols and her Deputy Secretary, James Boyd (now an Energy Commissioner) took on the role of assisting UCS to disseminate the key messages of the study. They provided the entry point for UCS to explain and discuss the work with government decision-makers. With respect to initial efforts to use the study to educate staff in State government, Mary Nichols said: "I was part of helping to get it out. ...I was at the Resources Agency and I invited them to come in and do a presentation for … all of my department directors and …helped them get an audience in other places, too. …of course, they were doing a very good job on their own, but [the] timing was perfect... There have been two [other] reports, but the first one kind of got the ball rolling." James Boyd specifically referred to the 1999 publication (Field *et al.* 1999) as "…one of the watershed documents in California." He said: "When I was Deputy Secretary and this document came out, we had all the scientists come in to Mary's staff meeting and present this report to us. We wanted to understand it. And it so moved and affected people, that we chose this as the vehicle for getting other state agencies [engaged], so we went around and briefed every major agency in the state. I went to the Secretary[105] of CAL EPA, who was a little sceptical, and asked him …have a staff meeting of all his department heads …and we did that with the, I call them, so-called super agencies in California." In this way, this earliest of impacts studies became a vehicle for communication with elite policymakers about what the issue of climate change would mean to the State of California.

7.4.3. 2000-2003: EPRI-led study and US National Assessment

Shortly after the ESA/UCS study, two more climate change assessments began which were to add to the breadth and depth of scientific literature on the regional impacts of climate change in

[105] This was Winston Hickox, the person who was in 2006, at the time of the interviews, spearheading climate change responses within the California state employees pension fund (CALPERS) "green initiative". Winston Hickox was also interviewed for this research and he also remembered the use of the ESA/UCS study as the basis for outreach and communication on climate change among the upper echelons of state government.

California. One was part of a US National Assessment, launched in 1997, and completed in 2000 (NAST 2000). The approach taken to this federally-funded effort was particularly innovative because it engaged regional teams of researchers and included a stakeholder assessment process to consider how climate change would intertwine with and influence future development (Moser 2005). However the benefits of this national "bottom-up" assessment were cut short and final results delayed or obscured by politics as a change in administration at the federal level, shifting from President Clinton to President Bush in the White House, occurred at the end of 2000. California was large enough to be considered a region and assigned a separate part of the US assessment. In part because of the political wrangling in Washington, and a concerted effort from interest groups opposed to action on climate change to delay release of the full assessment, the final California report was never properly published, however it was made available on the internet (Wilkinson 2002).

The diminishing role of the federal government on climate policy and impact assessment under the Bush administration from 2001 meant that the US National Assessment had little political influence or connection to policy. However the assessment was successful in contributing lessons on how to approach the issue of regional impact assessment in the area of climate change (Moser 2005).[106] The California report resulted in a 400-page document, widely accessible on the internet, but it lacked concrete policy recommendations (Wilkinson 2002). It derived from numerous workshops and expert contributions, thus a relatively open and deliberative process of preparation. Quantitative climate change scenarios underlying the impact assessment reflect a single emission scenario run with two different climate models. While it was innovative in terms of the consultative process that encompassed its production, the report appears to have had no direct influence on policy. Indirectly the California part of the national assessment may have contributed to the establishment of an epistemic community around the issue of regional climate modelling and impact assessment in California. Of course it also added to emerging research on regional climate change, contributing to a knowledge base and epistemic network that has continued to support California's own PIER climate change programme.

The earliest point at which state funding went towards climate change impact research appears to be in 1999, when a contract for $2.1 million was issued to the Electric Power Research Institute [EPRI] to study the impact of climate change on California's ecosystems, human health and the economy. As a first exploratory attempt to consider climate change under PIER, this work was

[106] At least one researcher involved in the national assessment also noted that it was "a lesson in how not to do an assessment" (Anon. 2006i).

given low profile. This was because it was unclear whether the Governor(s) at the time would be supportive of work that might propel climate change onto the California policy agenda (Anon2 2006i). The relevant governors were Pete Wilson (R), who held the office from 1991-1999, followed by Gray Davis (D), in office from 2000-2003. In this period, there was only weak political support for action on climate change, and the government mandate at the time was largely limited to one of research and greenhouse inventory efforts. These were first mandated in 1988 with the Sher Bill. A more recent mandate for a registry effort had also just begun in this area in 2002 (see Chapter 6; also Box 6.1).

The EPRI study was a multi-year effort and was not published until 2003. It differs from the other main assessments in California in its focus on the economics of climate change impacts. It also made a serious attempt to integrate a view on adaptation into estimates of the damage costs of climate change. However the study was considered by some experts to be overly optimistic about the costs of climate change in California (Franco 2006i; Hanemann 2006i) (Hanemann and Torn 2003). In particular, the study assumes that adaptation is successfully implemented in all market sectors of the economy and that a variety of actors, from farming and forestry operations to water resource managers, have the foresight and the ability to respond in a timely way to a changing climate. Despite large benefits in some sectors of the economy (e.g. forestry), the study foresaw a need to mitigate in part due to very high economic losses associated with growing demand for power and due to higher temperatures and an associated increase in air conditioning needs (Smith and Mendelsohn 2007; Wilson *et al.* 2003).

Thus, at least some of the climate change research originally sponsored by the state drew conclusions that differ from recent interpretations suggesting that the impacts of global warming in California are only detrimental (Smith and Mendelsohn 2007; Wilson *et al.* 2003). Smith and Mendelsohn (2007) in particular highlight a combination of negative and positive effects of climate change on the agriculture sector. They also tend to be very optimistic about the potential for adaptation to offset many potentially negative impacts. In another recent example, a survey of agricultural impacts by Baldocchi and Wong (Baldocchi and Wong 2006) states: "Our survey of the pertinent literature reveals a combination of positive and negative effects of warming and elevated CO_2 on crop production." Despite ambiguity about positive versus negative impacts in some sectors, even Smith and Mendelsohn (2007) conclude that the risks of future negative effects of climate change in California are significant enough to warrant mitigation action today.

In an apparent effort to distance itself from the results of the EPRI study, the PIER program also funded a review of the study which was released later in the same year (Hanemann and Torn 2003). The review concludes that it is premature to consider the economic estimates as valid

given that there is still broad uncertainty about the underlying physical impacts of climate change. It recommends a broader research programme and a more standardised approach to structuring regional research in this area such that robust and comparable results can be developed across different sectors of the state. [107] Guido Franco, the CEC staffer who manages the PIER climate change research programme, explained this view with respect to the PIER 2003 climate change research plan (Franco *et al.* 2003): "Our plan was to first develop the tools – to do the impacts and then to do the economics because we realized in some cases, I mean, we can jump ahead to do the economics and adaptations but one of the problems that we faced was that we don't have the tools to estimate the physical impacts." Without the tools and confidence in the physical impact estimates it was impossible to believe in the economic estimates of climate change impacts.

Thus in parallel with the completion of the EPRI report and the National Assessment, the CEC had also begun to sketch out a long-term research plan on regional climate change. This research roadmap was released in 2003 at the same time as the EPRI final report (Franco *et al.* 2003).[108] As Guido Franco, the chief architect of the PIER climate programme, explained there was "a two-way exchange of information" between the National Assessment (regional California study) and the emerging research effort within the state government to design and produce regional climate research that would support a regional policy process. Guido Franco explained: "Bob Wilkinson[109] …was a member of my team, the team that developed the PIER climate change research plan. So actually it was a two-way exchange of information: we got information from him and he also inserted in his assessment report the discussion about research." The team preparing the research plan also built upon the work of EPRI, which had focused on the economic implications of impacts. As Guido said, as a starting point "we took a look at the [National] Assessment report and the work that we had done with EPRI…." Thus although both studies were considered by the expert community to have serious flaws, they provided a basis for learning about what to do differently in any further research. The research plan that Guido refers to was not published until 2003, (Franco *et al.* 2003), however inputs to the plan were solicited in parallel with these earlier assessments on climate change impacts in California.

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[107] This finding is consistent with a recent review of the literature on the global costs of climate change and its connections to understanding regional climate change and its impacts, *e.g.* (Corfee-Morlot and Agrawala 2004; Jacoby 2004).

[108] This work was further elaborated and is now released as a book. See (Smith and Mendelsohn 2007).

[109] Bob Wilkinson, a professor from UC Santa Barbara, was the lead author and coordinator of the California report under the US national assessment. See (Wilkinson 2002).

A side benefit of the early assessments was to focus attention on the need for a more serious research effort devoted to the issue of climate change, and this dovetailed with growing interest from the state energy and environmental policy community. The EPRI contract demonstrates that CEC leadership had begun to orient a portion of its annual research funding to climate change impact assessment even before there was strong leadership on this issue in the Governor's Office. This early work was "under the political radar screen." That research on climate change emerged at all in the PIER programme in this period was clearly due to policy entrepreneurship of CEC staff, and possibly due to the interest of a single Commissioner. However by 2003, the PIER climate change research programme had secured a legitimate place in the wider programme, with about $4 million of the $62.5 million available annually being dedicated to climate change (see Chapter 5).

As with the National Assessment, the EPRI study received little attention in California's policy circles. However it did stimulate further thinking and agreement about the need for an "in-house" or "captive think-tank"[110] on policy-relevant climate change research in California. Although the attention to climate change in the policy process was still limited, the research community had begun to anticipate that these issues would become important in the coming years (Franco *et al.* 2003) and promoted a research plan to develop useable knowledge for the policy process as a first step in this direction.

As the EPRI study was being completed in late 2002 and early 2003, an idea emerged for the creation of a California Climate Change Center. In part this idea grew out of the EPRI study and the fact that the work had been largely out-sourced to experts outside of the state. Not surprisingly for a first effort of its type, the study had raised many legitimate questions that required further research. Yet those who knew the most about the study itself were not part of the large pool of talented researchers located in "in-state" institutions. As Michael Hanemann recalls: "I was approached in the late spring of 2002… Kelly[111] and Guido had made the decision that the next time around they wanted to have some sort of …captive think tank, which was the idea of creating the California Climate Change Center. They were torn between Scripps and Berkeley and in the end they decided to do both ..." Thus the California Climate Change Center was born, which was a collaborative effort led by University of California at Berkeley and the Scripps Institute of Oceanography out of UC San Diego.[112] The Center was intended to spearhead and

[110] These terms come from M. Hanemann interview – May 2006.

[111] Kelly Birkinshaw, CEC Program Manager of PIER Environmental Area.

[112] See discussion of Scripps – section 7.2

integrate the growing range and depth of PIER policy-relevant research on climate change in California.

The research plan was a carefully designed document intended to guide funding for public interest research on climate change, with a focus on impacts. Its aim was to yield significant new results within a five to ten year period (Franco *et al.* 2003). Guido Franco explained that it would take this amount of time to conduct the research needed to better estimate first physical and then economic impacts of climate change in a regional context. He said: "…in two years we will have more, but you have to wait for four or six years to have a better picture. Just to give you an example, [regarding] the sea level rise and how our shoreline will change in the future, we will be working with Scripps and U of Florida to develop new models that will more realistically simulate how our shorelines may change in the future. That's a prerequisite before we try to estimate the economic impacts…. but developing the model will take two to three years. I mean there are things that could be done now but …this issue is going to be with us…"

Guido Franco also highlighted the overall goal of the PIER climate research programme: "Our goal is to minimize the negative impacts of climate change on California. So what we're trying to do is bring together economists and physical scientists, and it has not been easy to do, and see if together they can come up with more realistic estimations of economic impacts." He explained that the programme would cover various dimensions of climate change research, from climate change modelling at regional scale, to physical impact assessment to the economics of impacts and policy, including both mitigation and adaptation policy.

Having been kicked off in 2004, the California Climate Change Center was just establishing itself when Governor Schwarzenegger was turning his attention to climate change. The California PIER research plan on climate change had been approved and launched as a basis for the Centre's work (Franco *et al.* 2003). However, the Governor's initiative on climate change created a new set of more pressing political demands that would require engagement of that same research community. In particular, the Governor's Executive Order in June 2005 called for a report on impacts as well as a report on mitigation policy recommendations by January 2006, roughly six months away. As Guido Franco said: "…because of the Executive Order, we had to accelerate our work."

As with most political agendas, the shift of climate policy from the back to the front of the policy agenda in California, created new demands on the expert research community. Just as relevant to the policy process as the impact assessment was macro-economic analysis of the cost of mitigation policies to achieve the Governor's ambitious targets for state-wide emission

reductions. Thus a macro-economic assessment of mitigation policies was quickly layered into the new Centre's work for 2005 and 2006 (see below).

7.4.4. 2004-2005: 'Let's motivate mitigation'

The policy frame used by Governor Schwarzenegger and his administration to promote climate change is based on a "cost of inaction" discourse as a means to say "let's motivate mitigation" (Luers 2006i). The discourse draws on evidence of the impacts and risks of climate change to argue that policy to mitigate climate change is necessary. This suggests the need to closely couple research on climate change impacts with policy proposals to limit emissions of greenhouse gases.

Amy Luers, a California scientist with the non-governmental organisation Union of Concerned Scientists' Berkeley office,[113] described this framing as a way to: "…help get more focus on defining a plan of action for managing [climate change], what we can avoid -- because some of the impacts we can't avoid." The risk framing was central to the Governor's announcement of targets and follow-up effort to move policy forward. It sets out to persuade the public and relevant decision-makers about the need for mitigation efforts on the basis of unacceptably high costs of inaction.

Evidence on environmental risks of a rapidly changing climate necessarily draws upon regional climate impact assessments in a particular way so as to frame near-term decisions as part of a long-term environmental problem (Corfee-Morlot *et al.* 2005). This can be done by:

- focusing the impact assessment on the long-term, *i.e.* on 50-100 year timeframes and the risk to socio-economic and natural systems as Californian's currently know them.
- bracketing the full range of uncertainty of possible physical impacts of climate change, rather than attempting to do a specific economic valuation of damages linked to impacts. In this way the assessment accepts that uncertainties in understanding and characterising physical impacts are still great and that more time will be required to do credible costing work.
- downplaying the role of adaptation to mitigate risks of climate change. There is no explicit modelling of adaptation (even though it is widely acknowledged by policy elites and by the scientific community that adaptation will play an important role

[113] UCS is a national environmental non-governmental organisation with a headquarters in Boston MA.

> and should be part of any policy response); rather the focus is on the aggregate physical effects of climate change.

One of the first studies to explicitly use and refine such an approach was released within the first year that Arnold Schwarzenegger was in office. It was led by Katherine Hayhoe, an out-of-state researcher who was joined by 18 co-authors (Hayhoe *et al.* 2004) (referred to here as the "Hayhoe study"). This assessment contained an important innovation in the way that uncertainties were characterised. A decision was made early on amongst experts to handle this difficult issue through the selection of emission scenarios. One of the authors, Norman Miller – a climate modeller from Lawrence Berkeley Laboratory, explained this in the following way: "There's a twist in that study compared to previous ones we've done. The distinction is important in that up until that paper everyone used one emission scenario. And now a set of emission scenarios were used to throw out the idea that these outcomes are partly behavioural – whether or not you go up the Cheney fossil-intensive path or an information technology path. That was really the distinction of that work. But that was the only difference – everything was just re-running the models." Policy choice, or uncertainty about the future of mitigation policy was designed into the scenario analysis of the Hayhoe study.

Perhaps the trademark of this study was therefore the way in which it bracketed uncertainty about the future. It did this by using high and low emission scenarios to draw out robust findings across a range of key areas of risk, looking in particular at how risks shift with lower emission pathways in the future. It considered several areas of risk that are emblematic for Californians, including impacts on agriculture (in particular the wine producing industry), snowpack and water supply, human health from increases in number of extreme heat events or air pollution events, and risk of fire.

A renowned Stanford scientist and co-author of the Hayhoe study, Steve Schneider explained some of the reasoning behind the methods used in the study: "The study was very cautious, also it did not give you the 'full answer,' rather, it had high and low projections. It compared alternative scenarios, using two different climate models, and as a result it was pretty credible. …I put a lot of pressure on the other authors not to come up with the single best guess answer that politicians like to get but rather to bracket uncertainty and show that even that even a relatively mild case is not trivial problem." This study avoided complicated technical explanations about the uncertainty underlying the impact assessment literature and was thus constrained to a discussion of low and high scenarios, corresponding to emissions resulting from a future with and without aggressive policy. This greatly simplified the use of the assessment to frame the issues for

climate policy. It set up the question of social choice. In other words, which future would Californians rather work towards and strive to achieve?

The Hayhoe study preceded Governor Schwarzenegger's climate change initiative. Work for it began in 2003, led initially by the Union of Concerned Scientists, who initiated the study by soliciting interest in it among scientists. UCS also hired a part-time study coordinator (Katherine Hayhoe) and scientific author who would eventually lead the author team (Cole and Watrous 2007). It was designed to provide timely evidence of the "costs of inaction" to strengthen political will amongst key decision-makers as the State proceeded to design and implement regulations under the Pavley "vehicle" Bill. Following passage of the Bill in 2002, the first important regulatory decision on greenhouse gases was still to come. In the rulemaking process, overseen by the California Air Resources Board, state recommendations for the new rules were meeting stiff opposition from the car manufacturers who were threatening to sue if they were not weakened to the point of being symbolic rather than environmentally meaningful (Cole and Watrous 2007). Importantly there was political uncertainty given the latest twist in California politics: Schwarzenegger had been elected in an extraordinary recall election in late 2003. The state had a new Republican governor and the question on everyone's mind was whether Governor Schwarzenegger would hold true to his election pledge and support the rulemaking to carry out this legislation.

Passage of tough vehicle regulations targeting CO_2 under the Pavley Bill would be one of the first 'tests' of the Governor's commitment to climate change as he came into office. The Hayhoe study was designed to provide strong evidence about the risk of climate change in California, and highlights the implications for the Californian "way of life" (Hanemann 2006i). If it could do so, it would likely bolster political will to stand tough against the automobile industry and require significant technological innovation to respond to climate change. Looking back, another of the co-authors, Dr Michael Hanemann, recalls that the report was timed from the outset to influence public and stakeholder opinions in this critical period: "…the fall of 2004 was an important time because the Air Board would be considering regulations for implementing the Pavley Bill …essentially UCS was looking at this a year, 15 months before then in the summer of 2003 wanting to influence the Air Board's adoption of regulations under the Pavley Bill."

The Hayhoe study involved collaboration largely amongst expert authors from throughout the state. While the collaboration across multiple institutions and disciplines was not an easy task, it was clearly worthwhile in forcing some convergence on robust policy-relevant conclusions across two different climate models and two different scenarios. Co-author Dr. Michael Hanemann commented on the significant scientific value of that collaboration: "…it was just better science if

you're forced to work with other people, where normally you would be separate teams. And it's the same sort of thing a little bit with this, you know. You sort of benefit from interacting with people who are substitutes for you in a sense, but who have slightly different perspectives, so it's that benefit as well as the inter-disciplinary [benefit]. It's getting other points of view, in a sense, from the same discipline."

Steve Schneider, another co-author, pointed out one advantage of the all-star line up of authors was that there was a great deal of internal review, which strengthened the product prior to finalisation. He said: "This was the most peer reviewed paper I've ever co-authored except for IPCC chapters. Because every single one of us in the 19-person team were all sticklers with opinions, and we were peer reviewing everybody else's section, it was really a hard job to pull that together, into the lowest common denominator form that satisfied everybody. No wonder it had zero trouble in [peer-] review, because it was super reviewed before it was even submitted."

The study was released in August 2004, published in a prestigious scientific journal – the Proceedings of the National Academy of Science (PNAS) -- and received significant coverage from the media. Steve Schneider attributes much of the media attention to the high calibre of the scientists contributing to the study: "They [Hayhoe, working on behalf of UCS] just basically …went out into the state from top to bottom of the state and pulled together many of the good people. And there are so many. The paper really had a major, a major impact, beyond what I would have expected because most of the authors were respected California experts." In his view, the all-star line up of the authors for the study, their impeccable scientific credentials, lent credibility to it and may also have helped to get media attention. The Hayhoe *et al.* study was covered in "more than fifty print and online newspapers the week of its release" (Cole and Watrous, 2007).

Once the scientific study was complete, UCS ran a sophisticated outreach campaign to accompany its release. The campaign consisted of the production of material for internet pages and colourful and short (4 page) handouts destined for the general public. These included two handouts on main impact sectors (snowpack and water, heat and human health) as well as separate flyers on "solutions" and another, reflecting the analytical structure of the report, entitled "Choosing Our Future." As with the earlier 1999 study, UCS also organised a series of briefings in Sacramento, to discuss the report's findings with legislators, state government officials and other influential decision-makers in the State's Capitol.

Michael Hanemann, who participated in these briefings, remembers: "That was a tremendously effective mechanism, one-on-one briefings or, a meeting with 2 or 3 people and just doing our

little PowerPoint presentation, but then answering any questions about the study." Beyond the one-on-one contact, which brought the experts to the decision-makers for question and answers about their work, was the broad scope of the briefings. Cole and Watrous (2007) note that "good press coverage opens doors." During the late summer and early Fall, study authors collaborated with UCS staff to meet more than 75 individuals across more than 30 California state and federal agencies as well as industry groups, community and faith groups. The briefings were targeted to explain findings relating to their specific sectors (Cole and Watrous, 2007).

These briefings included a large range of decision-makers throughout the government and in influential stakeholder groups. Michael Hanemann explained: "We talked to Alan Lloyd (then Secretary of CalEPA ….the Energy Commissioners, PUC Commissioners and the State, the Public Health Office, the…Air Board, Secretary of Resources and some of what's called the "Horseshoe", which is the Governor's inner-office. Also insurance companies, Sacramento Municipal Utility District, …[Also] CalPERS [California state employees pension fund], …so we met with Winston Hickox, who was the former secretary of CalEPA, who was advising CalPERS on environmentally-responsible investing. And the Council of Churches in Sacramento.…so it was maybe a dozen briefings." The extent of the briefings, combined with the timing was designed to secure an environmentally strong outcome in the Pavley regulatory battle.

In the face of strong opposition from the automakers industry, in September 2004 the California Air Resources Board approved the Pavley regulations (California 2005f). Evidence of climate change and its impacts on California were cited in official documents as part of the background and rationale for the law and the new vehicle standards. For example the CARB notice of change in regulations provides the following as background to its decision on the vehicle regulations for CO_2 (CARB 2005a): "In 2002, recognizing that global warming would impose compelling and extraordinary impacts on California, the legislature adopted and the Governor signed Chapter 200, Statutes of 2002 (AB 1493, Pavley). Chapter 200 directs the Board to adopt regulations that achieve the maximum feasible and cost effective reduction of greenhouse gas emissions from motor vehicles." More specifically, the Hayhoe study is cited by CARB as one of the many scientific studies on the science of climate change comprising relevant supporting information for the new vehicle regulations (CARB 2005b; CARB 2005c).[114]

[114] Note the Hayhoe et al study is far from being unique in this role; the document cited contained a listing of 122 different studies.

Regarding the political influence and media coverage of the study and the UCS campaign that followed, some participants attributed success to the all-star line-up of authors. Commenting on the UCS outreach campaign, Steve Schneider commented: "… that's not what got the publicity. In fact it was a little controversial. Some people on the team who were primarily academics thought that the affiliation with UCS would be damaging because the other side without reading it [would] say oh it's just an environmental …blog, which it wasn't, you don't get a blog into PNAS. …so they [UCS] did its outreach separately -- offline from the study -- but I saw very little publicity from that. Almost all the publicity came … from the press conferences of the authors on the peer-reviewed paper, it was the scientists' credibility that sold this work." In this view, most of the attention in the media derived from the credibility of the scientist authors themselves, rather than from the necessarily more plain language based and politically oriented outreach campaign organised by UCS.

As noted above, the Hayhoe study was widely covered in the media. Steve Schneider reiterated the strength of the work and its relationship to the line up of authors: "This study, 19 scientists from across the state, from every institution -- it was about as blue-blooded as any study anywhere. More blue blooded than IPCC chapters which typically have fewer authors per chapter….it was very difficult to attack it." Whether it was this study or a combination of studies combined with strong attention in the media, there is no question that many of the decision-makers interviewed in the course of this research had absorbed and spoke about key messages of this study and its 1999 predecessor.

The one-on-one briefings between scientists and policymakers appear to be a particularly effective way to stimulate thinking and understanding amongst key decision-makers. Michael Hanemann provided a concrete example: "We made a presentation to [Terry Tamminen, special advisor to the Governor] and 2 hours later he was having lunch with the Governor. We made a presentation from 10:00 to 10:30 except it ran on to 11:00 because he was so interested. We were going to have lunch and it turned out to be the restaurant in the Capitol where Terry and Arnold were having lunch and at the next table no less. And the Governor came late… and Terry walked Arnold over to us and said, 'These people are doing important work for California and you should meet them' and introduced us." Eric Heitz, President of the Energy Foundation and one of the main organisations funding the study, noted that the study has had an effect on the Governor's thinking and is often used in his presentations on the climate issue: "I've heard him mention it on several different public occasions. He really internalized that."

Looking across the experience with impact assessment and outreach and media coverage of climate change in California, it appears that UCS has usefully played the role of a "boundary"

organisation (Gieryn 1999; Gieryn 1983b; Jasanoff 1990), that is, actively working to bridge the boundaries between science and policy. Amy Luers of UCS explicitly outlined this function in her description of the organisation's goals: "…we see one of our roles as …a group that tries to be a liaison between the scientific community and policy community, and general public. One of the ways we do that is to try to potentially help work with these different communities to say... 'not only how can we most effectively frame and translate this to a broader audience, but also what kind of questions might we want to ask? …or… can we answer that in the scientific community so that it will be policy relevant?' So that it'll be easier to translate, easier to just tell a story?"

Despite its positioning as a boundary organisation, the UCS role was viewed by some of the Hayhoe study authors as potentially controversial, and possibly even harmful to the message by tainting the "scientific" work with political motivations. This demonstrates the difficulty of the boundary organisation function: how to do the bridging and yet continue to be perceived as politically objective and maintain credibility both within the scientific community that produces the findings. And how to at the same time maintain credibility with the policymaker audience that will use the findings in political discussion?

If boundary organisations are mistrusted by the scientific community that they claim to represent, who are the most important and appropriate actors to disseminate policy-relevant scientific findings? Norm Miller, a co-author of the study, shared his thoughts on this question: "…the most important actors are those people who can clearly, concisely translate the findings of the scientists to the understandings that are perceived by the policy makers, and the scientists themselves are the ones that do it, because they're the ones that understand it. So I would say: a scientist that can teach the information to a non-scientist who's intelligent in a way that they can understand it objectively and walk away with their own thoughts, probably will provide the most important impact on how that transcends from pure research to policy." When asked who in California was playing such a role, he noted: "Schneider is one person who does that well; Mike McCracken, he's in Washington; Dan Cayan; ….Michael Hanemann is one person who's done a lot from the economic perspective…; Christ Field, he's done that too." In Norm Miller's terminology, scientific experts are among the only agents that have the power and the authority to cross the boundaries between science and politics; they need to have scientific or other expert credentials as well as have the ability to translate findings into lay-person or "non-expert" common language.

The Hayhoe study also provides an example of a wave of impact "science for policy"[115] in California. That is, from the start, the study was designed to connect to the policy process, to provide evidence of climate change and climate impacts at regional scale. It brought global climate change down to a politically meaningful scale, and supported the argument that climate change provided a unique set of risks to California and a compelling case for the need to respond with preventive action. The Energy Foundation financially supported UCS involvement in the Hayhoe *et al.* study and associated outreach efforts. Eric Heitz, President of the Energy Foundation, commented regarding its connection to the emergent climate policy: "It was part of a plan insofar as there was momentum in California, there was interest on the part of lead policy makers, there was attention going to this in the press. …we then began to ask the question of, well, 'what are the ways we could get the public and the decision makers primarily focused [on the need for action]?' …one of them is to show that unless we do [something], these kinds of impacts are going to happen."

7.4.5. 2006: 'Let's motivate mitigation' – second take

As noted above, in the lead up to the passage of the Global Warming Solutions Act (AB32), the Governor's climate initiative had called for a "new" round of impact assessment and a report to the CAT by January 2006. This request stemmed from the need to provide evidence and the basis for a legal argument on the need to limit global emissions and the regional dangers of climate change.

Beyond wanting to make a stronger political argument for action, another more specific motive was that the state wanted to "own" the work on impacts which had such a strong communicative value. Michael Hanemann recalled: "Terry Tamminen had observed the publicity associated with the PNAS paper[116] and the outreach which the Union of Concerned Scientists had done and they were impressed with it and, I think, a little jealous of it. So they wanted to have something like the PNAS paper that they owned… I think, that was partly the seeds of the idea for this report."

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[115]This refers to the role of science in the policy process and the distinction between "policy for science" on the one hand, and "science for policy" on the other. The history of climate change as a public sphere issue shows that it began largely as a "*policy for science*" issue where the aim of climate policy was to ensure that relevant scientific research moved ahead in a coherent manner to better understand the nature of the climate change problem. More recently, climate policy can be said to focus more on policy design and implementation questions to shape solutions or responses to the problem of climate change; in this context "*science for policy*" has emerged to inform decisions about public policy. For a discussion see: (Agrawala 1999b; Brooks 1964; Corfee-Morlot *et al.* 2007).

[116] Hayhoe *et al.* 2004.

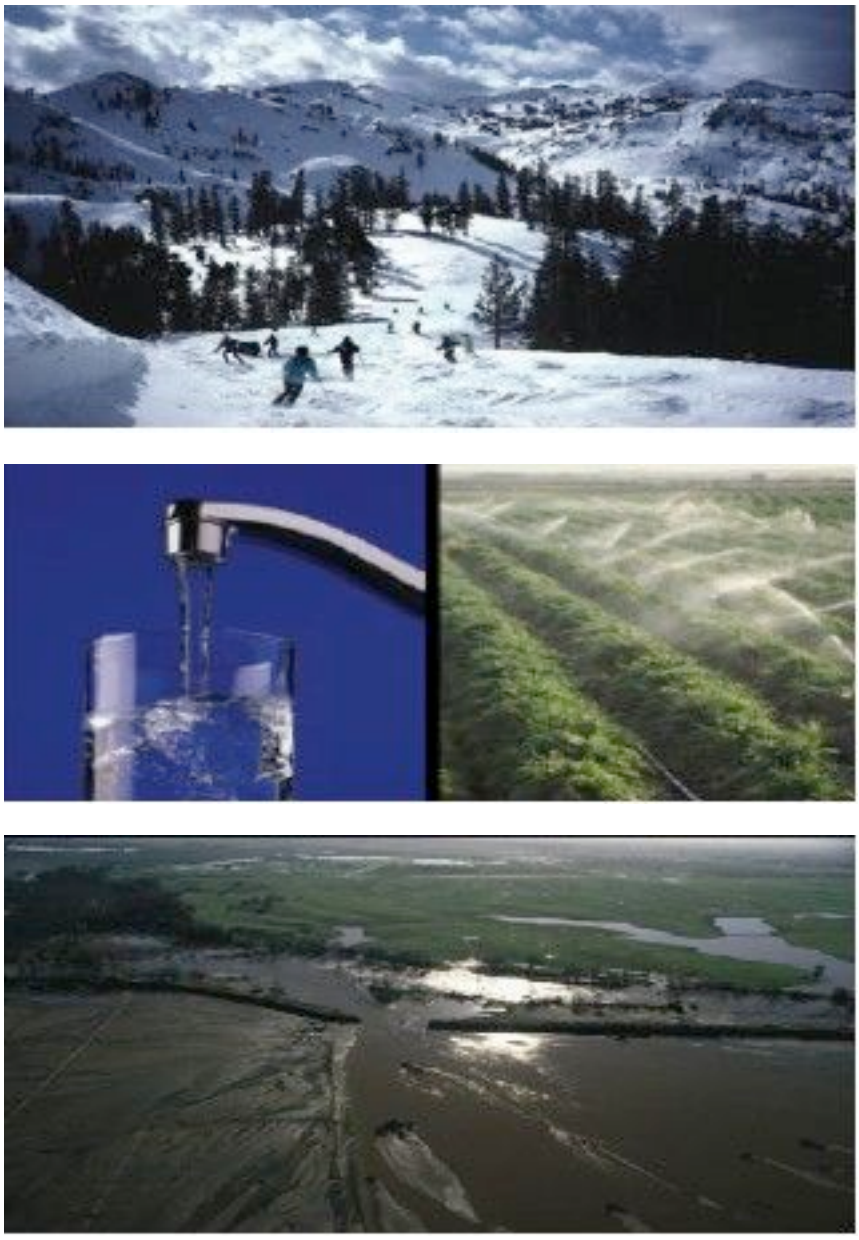
Anne Baker, Deputy Secretary for External Affairs at CalEPA, highlighted the additional layering of impacts research upon what was already going on. She said: "So there's actually been a thing called a 'virtual' climate centre here among our universities coordinated by the Energy Commission through a pot of funding that was doing a five-year [assessment] process on what are the impacts on California and they were about half-way through. So we raised about a half million dollars and said, 'We want you to stop where you are, …keep doing your work along with your schedule for two years from now, but give us - in five major areas - what the impacts are on the state.' And, you know, it's funny. Every time they do that they discover things, …differently or more so than they thought they were going to… I think some of the most important stuff in the [CAT] report is actually the scenario planning that came from the scientific community." Here Anne Baker is referring to the final CAT report, which was delivered to the Governor in early 2006 as well as the overview report on the scenarios of climate change in California (CAT 2006) (Cayan *et al.* 2006). The latter summarises an extensive set of impact science reports. This voluminous set of documents on climate change impacts in California accompanied the much shorter key policy volume, containing recommendations on how to best implement the Governor's targets.

Anne Baker also highlighted another reason that the California government became interested to use the impacts angle to communicate the urgency for policy to address climate change. She said: "[that] actually came from the Secretary [Terry Tamminen] at the time and myself going to Europe and looking at some of the documents in the UK about how does this impact." Anne Baker is referring to their visit to Europe at the start of their tenure where they discovered the UK government's on-going efforts to fund scientific research, regional impact assessment in the UK and related outreach to communicate with the general public about impacts of climate change (e.g. UKCIP 2002 on London).

The latest round of climate change scenario and impact assessment in California culminated in 2006. It included hundreds of pages of detailed reports as well as a short and colourful glossy report (Luers *et al.* 2006) (see Table 7.3). The latter was jointly issued by the California Climate Change Center and the Union of Concerned Scientists. Interestingly, as with the start of California's efforts to assess regional impacts through EPRI, the state government had once again turned to a non-governmental organisation to help advance its work on climate change. However this time it was to perform a new task: communicating climate change to the public. Just as working with EPRI, an industry think-tank, had been somewhat controversial at the outset of the PIER climate change research effort, working with UCS was also a concern to at least some of

those interviewed. Would the scientific authority of the new report be questioned because of the direct involvement in its preparation of an environmental advocacy organization?

Figure 7.1: Selection of photographs from Our Changing Climate: Assessing the Risks to California (Luers et al. 2006)



Note: Captions associated with photos (Luers *et al.* 2006) from top to bottom: a) If global warming emissions continue unabated, Sierra Nevada snowpack could decline 70 to 90 percent, with cascading effects on winter recreation, water supply, and natural ecosystems; b) Rising temperatures, potentially exacerbated by decreasing precipitation, could increase the risk of water shortages in urban and agricultural sectors; c) Rising sea levels and more intense storm surges could increase the risk for coastal flooding. [Credit for c): Robert Epplett/CA Governor's Office of Emergency Services]

Interestingly the state government also seems to be venturing into the important area of communicating climate change to lay publics as well as to decision-makers. The most recent state report on impacts in California, was issued in July 2006 just prior to the legislative session and as a final 2006 report under the CAT as called for in the Governor's Executive Order. The report's format and presentation also followed the example set out by the Union of Concerned Scientists – an environmental advocacy organisation -- in previous assessments to make extensive use of images to convey key messages (Luers *et al.* 2006) (see Figure 7.1).

7.5. Wither adaptation?

Officially adaptation is part of the policy discourse. The preamble of the Governor's Executive Order on climate change notes: "Mitigation efforts will be necessary to reduce greenhouse gas emissions and adaptation efforts will be necessary to prepare Californians for the consequences of global warming." This statement recognises that both mitigation and adaptation are needed in a comprehensive policy response to climate change since impacts are already occurring in California. Yet, this concern and recognition of the need for adaptation has been much slower to take hold in concrete state-wide policy action. While expert reports highlight the need for adaptation to accompany mitigation policy (i.e. [Hayhoe *et al.* 2004]) and there is some indication of recognition of climate change in targeted areas of government planning and investment behaviour, as discussed below, there was as of 2006 no broad policy framework or legal basis for adaptation in state policy or legislation. A concrete example of the lack of priority or urgency attached to adaptation as a policy issue is found in the notable absence of mention of adaptation in the Global Warming Solutions Act of 2006 (CA-Code 2006a).

In practice, serious attention or debate on adaptation has been sidelined in state-wide climate policy, which is focusing on implementation of the mitigation target mandated through the Assembly Bill 32. Lainie Motamedi recognised this when she said: "It's been sort of organic, for lack of a better word, a process that's come from a lot of different directions. We recognize that adaptation is an issue, but …the first order has been to figure out how we can reduce." Although the state government has heavily invested in research to better understand the potential impacts of climate change in the California (regional) context, this strong base of scientific knowledge has, first and foremost, helped to provide a platform of public support for climate change mitigation policy rather than to support action or policy on adaptation. As the climate policy process matures, this regional science knowledge base will undoubtedly prove useful to adaptation planning and assessment (Luers *et al.* 2006; Luers and Moser 2006).

Amy Luers, scientist with UCS, pointed to the inevitability of attention to adaptation at least in the science for policy research commissioned by the state, if not in the policy process itself. She said: "…there's a call for research every two years as part of the Executive Order… it's going to be inevitable in the next stage of this research that ... the focus is on...what kind of changes are unavoidable and how do we need to adjust to those. I think that there will be a real division and/or a… shift in the focus on the next report. …there's a fairly strong agreement that that's the natural next step for the focus." Steve Schneider also commented on this when he said: "I think adaptation will be part of the story. …I don't see any effort yet, in California and not much in the world either, although there's talk about it."

Today's focus on mitigation in the policy debate was not always the case. Adaptation featured prominently in early policy discussions led by the CEC beginning in 2000, where it was an important part of the intra-governmental and stakeholder dialogue and a key part of early policy recommendations developed by state agencies through a CEC consultative process in 2002 (Joint-Agency-Climate-Team 2001). These recommendations were forwarded to Governor Gray Davis in late 2001, in the hopes that they would be endorsed by the Governor and eventually featured in his State of the State Address planned for January 2002. However, Governor Davis chose to ignore these recommendations, despite the debate brewing over the proposed Pavley Bill on vehicle CO_2 emissions, and neither the adaptation nor the mitigation policy recommendations were ever publicly released. It is interesting to note that this set of recommendations was perhaps more comprehensive and bold on adaptation than on mitigation. This may have been at least partly due to a lack of leadership at the top of the state – i.e. in the Governor's office – for bold action at state level on climate change mitigation.

The combined emphasis on adaptation and mitigation apparent in the early CEC led policy discussion on adaptation and mitigation withered away as the political profile of climate policy grew under Governor Schwarzenegger's leadership in 2005. The rise of climate change on the political agenda was also accompanied by a shift in power on the climate change issues away from the CEC toward CalEPA and eventually the CARB (see Chapter 5). The push on policy under Governor Schwarzenegger was clearly focused on avoiding or limiting climate change impacts through emission reduction in large part by establishing world leadership and a "way forward" on mitigation. The Governor's Executive Order sets out a high level of ambition for mitigation by setting mitigation targets that are time bound and quantitative. Thus although the need for adaptation is acknowledged in the formal documentation, achievement of the mitigation targets is the focus of all the available "policy space" on climate change under the Schwarzenegger administration, at least for the time being.

There are a number of possible explanations for the limited attention to adaptation in state policy. With the 2006 legislation, the focus of the state government clearly shifted to develop concrete plans, policies and regulations to cut state-wide emissions, an effort that will undoubtedly require significant changes in investment patterns and behaviour. In this context, there was perhaps a perception amongst policymakers that attention to adaptation could make it difficult to advance mitigation responses (Luers 2006i). While many experts recognise adaptation as an essential part of the policy response to climate change, they also see it as a difficult starting point for climate policy. Despite the lack of comprehensive, state-wide policy, pockets of relevant activity to integrate adaptation into existing mandates for policy implementation can be identified.

In particular, certain natural resource management institutions within the state are attentive to adaptation and the risks of climate change. Notably the Department of Water Resources, the Department of Forestry and Fire Protection, and the Department of Food and Agriculture are already paying close attention to climate change and have begun to develop adaptive management strategies in their areas. As Ralph Cavanagh of NRDC noted: …where it [adaptation] really is starting to show up is in water resource planning and management. I think that people are looking seriously at the implications of warming for water storage. That's leading to a very serious discussion of the efficiency of water use, whether we need to begin investing more in desalting plants along the coast, whether there are storage options available that do not involve giant new dam construction projects." But as of 2006, these efforts were relatively autonomous and unlinked, focussing narrowly on sector-specific risk management activities where the mandates are to protect natural resources or economic activities from climatic extremes or changes.

Dealing with climate change through adaptation in the water sector is a natural extension of the state government's resources management mandate. Francis Chung, one of the state's lead engineers overseeing water resource management in the Department of Water Resources, explained: "climate change is a natural extension of what we've been doing…". He also underscored the need to look over the long-term, to see climate change as part of the future development problem. He said: "Climate change is all about the future; it needs to be put in context of …[other changes], for example, population, urbanization of agricultural land." Francis Chung confirmed that climate change was increasingly being integrated into the regular practice of water resources management and planning in California, however he also cautioned that the long-term nature of the problem combined with uncertainty of predictions was difficult to come to terms with.

Francis Chung cited two areas as key problems in California's water resources management. He noted that climate change added to the dimensions of these problems, in particular citing: "..long

term water supply [or] sustainable water supply for the state's economy" including long-term storage to satisfy municipal, industry and agricultural needs; and "short term events management, for example, floods." The latter problem of events management refers to changes in extreme climatic events, which accompany climate change, including not just the risk of flooding but also of drought. The challenges of dealing with climate change in a water management planning context stems in part from the fact that changes in variability – or extremes -- are expected to be much greater than changes in the mean temperature and precipitation patterns over time. In addition, given the wide scatter of results from different general circulation models (also known as global climate models), Francis Chung also underscored the difficulty in using such results in a policy process, in his words: "…what to do with these wide ranges of results?" For example, some models are wetter and some are drier. He said: "the notion of 'just prepare for the worst' - that is not how we live our lives…". He highlighted the need for risk analysis or probabilistic assessment to look at the expected values or expected benefits of alternative investments in water supply and protection strategies.

As Francis Chung put it, until full probabilistic analysis becomes available, the main option is "to look for robust results across the models with respect to temperature and precipitation." While Francis Chung noted his own belief in long-term research he also highlighted the difficulty of selling research with relatively long time frames to policymakers. He said: "the researchers' reaction – 'see you in 3 years' -- I will be fired if I tell State legislators that…" Thus the need to guide research so that it is "more usable today" (Dettinger 2006).

The former Chief Water Engineer for the California Department of Water Resources, Maurice Roos, noted the strong dependence of state water managers on academic research capacity to access and use relevant predictions of climate change. He said: "We do rely quite a bit on the university sector for input. We don't run these models ourselves. We just take their output and they're, they're trying to develop products that we can use." However even more pragmatic approaches to using available climate predictions to plan for the future have met with some difficulty and scepticism in the political process. While there is, according to Francis Chung, "gradual interest from the public and from politicians" the integration of very long-term climate change predictions of 50-100 years into the State Water Plan is not without controversy.

Francis Chung explained that the State Water Plan is approved in California on a biennial basis and funding approved for its implementation. However, at the time of the interview (in 2006), approval and funding for the Plan had been delayed because of a court battle over water availability and the implications for real estate development. Referring to a state law that requires developers to look ahead 20 years, Frances Chung said: "…[state law now requires that] any

development of 500 [housing] units or more have to show water supply availability." The availability of water supply to support a growing population and urban development risks becoming even more complex to assess and more frequent with time and with the additional stresses imposed by climate change (CDWR 2006; Schoch 2008). Francis Chung further explained that in 2006: "…'new' funding was still pending…" for the State Water Plan, in part due to reluctance from the fiscal conservatives in the government to approve spending for proposed water projects. With respect to climate change, he said: "It is very tough sell to talk about 100 years from now....How much money will be required to secure water for flood control? …How much are you willing to pay?"

Maurice Roos discussed how he had encountered similar difficulties in discussing the influence of climate change in water planning. In referring to his preparation of a priority list of climate change and water resources management research priorities for the PIER programme (Roos 2003), Maurice Roos said: "I talked to quite a few folks here in the Department, and also some of the water agencies, to try to get their ideas. … most of them… were worried about taking care of this year's problems. … this far out stuff doesn't have a lot of appeal." This suggests that a fundamental barrier to integrating adaptation to climate change into routine decision-making in the area of natural resources, is the need to consider the very long-term as a priority amongst other, more pressing near-term concerns. Further, the rise in interest in climate change by decision-makers may not translate into concrete action until knowledge about impacts becomes more useable, for example, including practical decision-making tools to allow working with existing knowledge across a full range of possible outcomes in the form of risk assessment and management approaches (Anderson *et al.* 2006; Dettinger 2006).

7.6. Understanding climate change in a California cultural context

Any successful framing of the climate change issue will resonate with public opinion. It will need to remain technically and scientifically credible by building upon expert knowledge but it will also need to recognise public understanding of the issues which could be expected to more closely link to experiential knowledge (see also Chapter 7).

7.6.1. Public opinion, the environment and climate change

Public opinion surveys, and indeed the behaviour of politicians, as well as the actions of the state government suggest that environmental issues have become an important political force in California (Baldassare 2000; Baldassare 2002; Baldassare 2004; Baldassare 2006). These same

surveys note that a bipartisan majority of the public support policy action to address climate change (see below).

Many of those interviewed pointed to climate change as an issue of growing political force, one that links closely to the long-standing environmental ethic that is found amongst Californians. Deputy Secretary of CalEPA, Anne Baker, considered action on climate change to stem from the "social culture" in support of the environment. She said: "we've always been out front on the environment. I think when we poll we find that 86, 90% of our voters support the mobile source reg of Fran Pavley's. They support doing something about climate change. We have a long history of doing that. We have a long history of a commitment to cleaning up our air, in particular, and this follows in that same vein. I think that's just a part of the social culture here."

An independent energy expert and consultant, Steve Schiller, believes however that there has been a fundamental shift in public attitudes on climate change in California in recent years. Prior to the Governor's initiative, he did not believe that climate change would influence elections or voting activity. Steve Schiller said about the public: "They care about jobs, they care about crime, they care about the economy, you know? Things like that, but climate …it's not the kind of thing someone makes a vote on." However, he believed that things may have changed course sometime in 2005. He continued: "if you look at the polls [and media] that came out after the Governor's original [announcement], and the Climate Action Team's Report, they got all this press. It's a big issue." He continued: "…I think there's a tipping point in public opinion… I know there was a tipping point for me, where… I said yeah, this is significant, it's significant enough so that it's important for us to engage. And so will there be a tipping point in public opinion? I think some of the leadership in the state has reached that tipping point. And their motivation for that, is altruism, trying to be a good leader, thinking that it has political value."

Others interviewed also indicated that some type of tipping point had been reached where the state was compelled to act. Lainie Motamedi of the CPUC placed that time about mid-2004 when she said: "A year and a half ago working on climate change, the initial kinds of reaction that we would get was, 'Well, you know, we're just a state. What can we really do?' …the call to action was unclear." However shortly after this, the CPUC began working closely with the CEC to mount an aggressive campaign to recognise climate change as a main motivation to accelerate and expand required investments in energy efficiency and renewable energy. Lainie Motamedi also underscored the role of the environmental community in communicating the risks of climate change in the California context and the influence that this effort had on perceptions about the issues. She said: "having the Union of Concerned Scientists [put]the IPCC report into layperson's terms and going around to the legislature as well as the Commissioners and …telling that story

through a California specific lens: impact on the ski industry, impact on wineries, impact on agriculture, health risks. All those kinds of things did elevate awareness about California's role."

Climate change expert Dr. Steve Schneider pointed to the strength of the epistemic network of researchers and experts on climate change as one of the reasons for this change in public policy priorities in California. In his view expert knowledge and expert actors have influenced both public opinion, for example through the media, and political attention to the issue of climate change. In addition to contributing to ongoing climate change research and impact assessments (see above), this community has been active in communicating about the risks of climate change in the Californian context with policymakers (Cole and Watrous 2007). Steve Schneider concluded of this evidence and of the influence of the large epistemic network in California: "So it makes it very difficult for anyone in politics to try and step around and pretend the issue doesn't exist, or to take the Bush Administration's attitude. It would be the kiss of death in California. It's a deep 'blue' state. And therefore you know, they're doing well by doing good. They're helping their political future and at the same time dealing with a common interest." Politically the scientific, expert base of knowledge about California impacts has provided a solid base for action.

The fact that climate change became a priority policy issue in California from 2005 on set it apart from US federal policy, or lack of policy, over the same period. Public opinion research in the US covering the period leading up to 2005 also suggests that California politics were well ahead of US public opinion and support for action on climate change. Leiserowitz's (Leiserowitz 2005) survey of US public opinion showed climate change to be recognised as important but that it is viewed as a geographically and temporally distant problem. This suggests that climate change has not become a priority US policy issue at least in part because the public did not see it as a problem would affect "me and my neighbours" but rather one that would affect other people, people living in distant places or in poorer countries, and only over time horizons of several decades of more (Leiserowitz 2006; Leiserowitz 2006). Leiserowitz concludes that although the US public recognises climate change as important and real, they attach little sense of urgency to it as a policy priority. This conclusion suggests that the void in US federal action has been permitted politically at least in part because the US public has been indifferent at best to whether action in the US is taken.

Evidence from research in California, including that presented here, suggests that the weight of California public opinion is quite different from that of US public opinion more generally. At least since 2005, climate change has been treated with a sense of urgency in California politics. When asked why California is different, Adrienne Alvord, legislative staff for Senator Fran Pavley, said: "The sense that the public is ready to entertain this kind of thing is also very

important and that's an intangible. You can look at polling information, but the strength of public opinion has really changed over the last year or so. [Hurricane] Katrina was a very large factor and also just increasing the volume on the reality of this problem from many sources. And then you have things like the Al Gore movie." In referring to the legislative initiatives in California on climate change, she concluded: "All these things play a part in the creation of the climate that makes something like this possible to consider, etc." In other words public opinion and the California context led to a clear coalescence of political opinion that the state needed to take aggressive mitigation action to limit emissions of greenhouse gases, paving the way for a safer climate.

7.6.2. Bipartisan political support

Part of the unique political climate in California on climate change at the time of the 2006 legislative debate, was the bipartisan support that the issue had garnered. CPUC President Michael Peevey echoed this view. He said: "I won't go so far as to say it's a total political consensus, but I think ...the majority of Californians believe in strong environmental programs. Poll after poll after poll shows that. Now, why are Californians more sensitive than people in Arizona or Nevada? I can't answer that question." The expert community in California also reiterated this view. When asked about 'Why California? Why now on climate change?' Steve Schneider commented: "California has a strong environmental constituency and you're rarely going to be hurt [politically] by at least having the appearance of being environmentally protective. I think that's part of the explanation for the bipartisanship that we've had... By and large it's pretty mainstream." The existence of broad bipartisan support for environmental protection appears to be widely understood among California's climate policy elite.

Ralph Cavanagh of the NRDC offered a slightly different perspective, cautioning that bipartisan support is not automatic but that it needs to be actively cultivated. He said : "There's a very strong base of public support that crosses some of the traditional lines in California. So you've got strong business support for many of the policies. Utilities in general have been very good, they've been very positive in terms of their views as to their willingness to support efficiency, renewables, their willingness to support statutory mandates addressing these issues." But he also said: "…it isn't that there aren't potential conflicts. A lot of people, including NRDC, put a lot of effort into trying to work these issues out in advance, trying to build a consensus." In his view, bipartisan support is something that can be garnered but requires concerted effort and attention, for example, on the part of advocacy communities.

In an election year, securing such bipartisan support may be particularly difficult and this was the case in 2006. The Governor was up for re-election in November and this was clearly creating a different set of political dynamics between the legislature and the governor on the issue of climate change amongst others. Steve Schiller noted: "... it's an interesting dynamic in terms of whether [climate change] legislation will be successful or not. We have an election year and that screws up everything. ...the Legislature, which is Democratic, doesn't want to do things to make the Republican Governor look better. And the Republican Governor doesn't want to do things to make the Democrats look better."

However, there was a sense from several observers that the tides of public opinion were with the Governor on climate change and that 2006 legislative action of some sort on climate change was inevitable. As Steve Schiller said: "…this will be a good feather in the Governor's cap if it gets through. It will be, it will be important for him. And on the flip side, he's going to have his business community, the Chamber of Commerce, …the conservative business community representation saying this is bad for California's economy." From the Governor's perspective the passage of GHG legislation in 2006 would reflect well on him, but it was not without some risk of alienating a core part of his political base that he moved ahead on climate change.

7.6.3. California cultural metaphors, the environment and climate change

California's unique geography and history has created a number of familiar cultural metaphors for well-being and the environment, which also played into public understanding of climate change. Among these is the healthy winter snow-pack on the beloved high Sierra mountains; this emblem has been romanticised by John Muir among others (Muir 1905). Secondly, and linked to the snowpack, is water. Large parts of California are semi-arid desert with a Mediterranean-like climate. This makes water a precious commodity and dependent on an elaborate set of infrastructure to move it from remote areas where it flows plentifully to urban and agricultural areas where it is needed. Thirdly, California's climate and its geography have also elevated political attention to flood and fire prevention as key issues in natural disaster risk management. Fourthly, is clean air or blue skies, especially given the significance of the fight against air pollution in the state's socio-environmental history. A final cultural metaphor is the long, beautiful and carefully protected coastline that forms the entire western border of the state. All of these environmental and policy areas are important in instrumental terms, as they relate to the economic development and well-being of people in California. However they are equally important in symbolic and metaphorical terms as they relate to the understanding of what California represents, and what it means to be Californian. Each of these environmental areas

provides a range of amenities or services that contribute directly to the quality of life of Californians. However beyond their instrumental value, these environmental objects also carry what is referred to as "affect imagery" – where images of the environmental objects elicit strong emotional responses from people throughout the state (Leiserowitz 2006).

Climate change risks are present in each of these areas in California (Cayan *et al.* 2006). As noted in Chapter 4, a major decline in snowpack is likely to accompany even mild levels of climate change over the coming century, with large repercussions for water supply and availability, in urban areas and the agriculture sector. Climate change will also increase the frequency of summer heat waves, aggravate air pollution problems and raise the risk of more frequent and intense brush and forest fires across the state, such as those experienced in October 2007 in southern California (see Figure 7.2) (Cayan *et al.* 2006). Finally coastal flooding and erosion will increase as sea level rises and along with an increase in heavy precipitation events. Combined with earlier run-off from the mountains, these extreme events will test the elaborate system of levees in the state to protect against floods.

Figure 7.2: Fire-fighting in Poway, California, 2007

Note from Source: Fire fighter Jason Falarski battles to save a house in Poway on Monday. For many in San Diego County, the scene was reminiscent of the deadly 2003 Cedar fire. Several hundred thousand people evacuated their homes as wildfires flared across the county, but the size of the exodus made escape impossible for some.

Source: LA Times, October 22, 2007; Photo: Wally Skalij / Los Angeles Times); see: http://www.latimes.com/news/local/la-fires-photogalleries,0,3419712.gallery.

Interestingly the risks of climate change in key areas in California are widely understood amongst the policy elite, and these are repeatedly recognised in the interviews with elite decision-makers and in policy reports and laws that deal with greenhouse gas mitigation policies (see also Chapter

6). Understanding of these risks is based on scientific knowledge about climate change and derives notably from the impact assessments outlined above. In addition, decision-makers consider this knowledge about climate change impacts – at least in these emblematic areas -- to be widely understood by the public.

This public understanding of the risks of climate change was suggested by several of those interviewed as one of the reasons for widespread public and political support for climate change action. Adrienne Alvord, the chief legislative staffer for Assemblywoman Fran Pavley said: "Global warming will hit California particularly hard." She mentioned sea-level rise as a main concern for California as a coastal state, and the risk of more severe seasonal fires given California's hot and dry summers. She also explicitly linked climate change and increased temperatures to air pollution when she said: "Increased temperatures of course. Everybody knows that it creates more severe problems with air quality. And air quality is the number one environmental concern in the state and we have terrible air quality despite continuing efforts to try and clean it up, so that's a big problem. That coupled with a historic consciousness about the environment, which I think has been a part of the culture of the state for many decades, ...combine to make people very interested in this issue."

Others interviewed also echoed the sentiment about the cultural bias of Californians in favour of environmental protection, and the link to vulnerability to climate change in key areas that are meaningful to people. For example Steve Schneider said: "…the air pollution in LA… has been a consciousness raiser in California, which led to California getting ahead of the EPA, nationally (and [that] stood up in court). … the 1991 Oakland-Berkeley fire and the more recent southern California fires also raised awareness …so people in California are a little worried about air pollution and worried about fires and worried about water."

Mary Nichols discussed past experience in California with flood and drought disaster management and the links to climate change. She said: "[floods and droughts] are issues that Californians have a long history of having had to cope with and they're pretty dramatic... people are very motivated to try to take action that could prevent that from happening because they know how much we spend on flood control and prevention and on water and ports and so on." Mary Nichols also stated that climate change impacts were another reason for California to step out on the issue of climate change, especially in the face of federal inaction: "…[CA will be] more adversely affected than other parts of the United States and that forms part of the reason why California has been willing to take action…."

Coastal zones in California are particularly vulnerable to climate change, especially where they are heavily populated and contain protected natural ecosystems. As expert Steve Schneider said of the San Francisco Bay Area (and analogue regions): "Are we going to build a barrier under the Golden Gate Bridge? Like the Thames? Or the one that's going to shut off the Venice Lagoon, which people are considering now as absolutely essential to the survival of the historical city? The trouble is, when you shut off the lagoon, you kill the wetlands. Not only that, but what do you do in a super heavy rain …now you've got the dam blocking water from running in and out …so if you close the barrages to avoid getting flooded by salt water in the storms and their surges, you might then get swamped by fresh water in the heavy rain storms coming from upstream. So, you just don't want to go there with that terrible set of trade-offs and management nightmares. But we're going there, and we're going there fast. And that's why California is trying to set an example for mitigation to lower this set of risks." In this view, mitigative action is a chief response to climate change. Of course many experts would also argue that adaptation is equally or more important. Yet by 2006, California had yet to set state-wide priorities in this area.

The strong set of public preferences to protect the environment in California is coupled with extraordinarily rapid population and economic growth. Several interviewees referred specifically to the context of rapid growth to situate the challenge of dealing with climate change. Jeffrey Callison, a public radio talk show host said: "the population is growing so fast in California and we've had terrible air quality problems in the past... we bump into environmental limits more often here than in some other states. Huge parts of California are all but uninhabited…If you take away the desert and the mountains and so on, a lot of habitable California is relatively densely populated. So the shortage of water in some places, [combined] with the air quality issues, with the farmland being consumed at great pace... anyone who has their eyes open can see that there are finite resources. They may disagree in how finite they are and what are appropriate measures to take to manage this finite resources, but you can't live in urban California and ignore the fact that there's only so much water, [and] the air turns brown in the summer and so on. So I think those factors combine to make California environmentally-friendly."

Adrienne Alvord also highlighted this link when she said: "As the population has increased I think people are more and more conscious of the need to …take action to preserve those environmental values whether [it's an] open space, clean water, clear air or [a] related issue."

7.7. Conclusion

This chapter focuses on how expert knowledge is used to help support the California climate policy discourse. It demonstrates how California policy elites have used evidence from

assessments of regional climate impacts to advance arguments for mitigation policy and co-construct meanings of the climate policy problem in their own context.

The framing of climate change as an issue of regional environmental risk is a prominent feature of the policy discourse in California. Largely dependent upon expert information and knowledge in the area of regional impact science, the environmental risk framing establishes climate change as a problem of regional or local "environmental risk." Highlighting the unique exposure and vulnerability in California to climate changes, from the risk of greater extremes of flooding, heat waves and forest fires, to the interaction with episodic air pollution and the more gradual sea level risk and coastal zone erosion, the "regional environmental risk" framing brings the issue of global change down to local scale and provides a vehicle for communication about climate change, in a way that is meaningful in a local context and conveys a sense of urgency.

The chapter also outlines the emergence of an active epistemic network, comprised of representatives of non-governmental organisations and the scientific research community, working together to support policy change. To some extent, this epistemic community has grown up around the issue of climate modelling and impact science and has been facilitated by the active research programme in California; however it has also benefited from on-going federal research funding on regional climate science. The non-governmental community is directly engaged in working with scientists, and indeed forms part of the scientific elite, working to produce research and to re-package it for communication to a lay audience. In particular, this California case shows that at least one environmental non-governmental organisation (ENGO) – the Union of Concerned Scientists -- has usefully played the role of a "boundary" organisation, thus bridging the boundaries between science and policy (Gieryn 1999; Gieryn 1983b; Jasanoff 1990). However having an ENGO play this boundary role is not without controversy; some members of the scientific community worry that affiliation with an ENGO could taint the credibility and usefulness of their research findings. Nevertheless UCS is shown to play a critical role to enhance dialogue between policy elites and the scientific community and strengthen understanding of climate change science at critical junctures in the policy process. Beyond demonstrating the role of boundary organisations in the policy process, the case reveals the power of recursive, analytic-deliberative exchange to support policy decision-making (Stern and Fineberg 1996).

Another theme explored in this chapter is the cultural context for policy action in California. Public opinion polls suggest that some of the explanation for policy change may lie in the cultural beliefs of Californians, who enjoy a particular respect for the environment and support strong environmental action. This typically translates into bipartisan support for environmental policy. Yet there are multitudes of contradictions and contrasts, ranging from the strongly pro-growth

policies of the government to the issue of individual consumption. One only has to look at the explosive growth in vehicle use in the state to understand these contradictions (see also Chapter 4). Nevertheless, the state may also be particularly vulnerable to climate change in areas that are emblematic or have strong cultural value as well as economic value. The use of photography and other images has helped to communicate to the layperson the meaning of climate change risk. For example, snow pack in the sierra and water are environmental cultural metaphors that have become central in communication and understanding of climate change. Further, interviews with policy elites revealed the resonance of images and messaging connecting weather and extreme events to climate change. That is, California's long-standing vulnerability to fires, heat waves and water shortages, which will only worsen with climate change, is a filter through which ordinary people and policymakers alike have come to understand the climate change problem. This understanding has been shaped in part by the popularisation of climate change impact science. In turn popularisation of the impact science is shown to be undertaken by politically-savvy ENGOs and, increasingly, by the state government itself.

One interesting conclusion is that adaptation was sidelined in the 2005-06 climate policy framework, despite the large and growing body of research on climate change impacts. This goes against growing levels of attention to adaptation in OECD nations and regions (Gagnon-Lebrun and Agrawala 2008). Instead as a policy issue adaptation appears to have withered away in this period to make room for mitigation. Several observers are confident that adaptation will move front and centre in the near future as the climate policy process matures;[117] yet in this area California would appear to lack leadership. Could it be that the political interests driving mitigation as the key agenda on climate change stand to gain from a more narrow focus? Or it may be part of a generic problem with adaptation, where those who stand to gain the most may be amongst the poorest and least politically powerful. By contrast, the champions for mitigation policies include an increasingly powerful green business lobby working in tandem with well-resourced and knowledgeable ENGOs. These issues are explored in more depth in the next chapter and in Chapter 9.

Interestingly, California's use of regional environmental risk as a policy frame for mitigation varies significantly from the approach that has been institutionalised by the IPCC. Since 2001,

[117] This appears to be the case today. On 14 November 2008, the Governor issued an Executive Order calling for preparation of a: "statewide climate change adaptation strategy that will assess the state's expected climate change impacts, identify where California is most vulnerable and recommend climate adaptation policies by early 2009." See California (2008) and the Governor's Press Release: http://gov.ca.gov/press-release/11035/ [last accessed 16 December 2008].

the IPCC's comprehensive assessment of the climate change literature has been structured in three separate volumes: science; impacts, vulnerability and adaptation; and mitigation (e.g. IPCC 2007a, b, and c). Yet the separation of impacts information from discussion of mitigation policy runs the risk of weakening the argument for action. It does not answer the question: *why should we mitigate?* The California policy elites appear to have anticipated this problem and structured their arguments to pro-actively respond to this simple question. In the words of one policymaker: "…you've got to tell people why you should care about this" (Tamminen 2006i).

Focusing on regional impact science and the characterisation of global climate change as regional environmental risk, this chapter addresses some of the "contested, multilevel aspects" (Powell 2007) of the policy debate. It shows how more local framing of the climate problem has been used as a source of argument for mitigation action in California. This California example shows that dealing with mitigation at sub-national or local scales may benefit from the use of regional projections and regional climate impact science to communicate the meaning of climate change in a regional context.

In summary, a large variety of factors combine to strengthen a bipartisan consensus and the resolve of the policy elite in California about the need for political action to address climate change. This includes understanding about the impacts of climate change, which is linked to availability of impact science and extensive efforts by the expert and the non-governmental (environmental advocacy) community to communicate these results to the lay public and to policy elites. Media attention has also helped to diffuse information and garner attention to the issues. This reinforces the view that impact science has become a boundary object in the policy process in California, that co-construction of climate as regional environmental risk is an active part of the policy discourse and that this has been successful to bring about change in part through an analytic-deliberative process that is facilitated by non-governmental actors.

8. FRAMING CALIFORNIA CLIMATE POLICY AS WIN-WIN

8.1. Introduction

This chapter builds on the previous one to again focus on policy frames and the process of constructing such frames. The chapter aims to elucidate a second dominant policy frame in California that presents mitigation as a 'win-win' policy solution. This discourse argues that as far as possible climate change impacts should be avoided through preventive measures, that is, by mitigating greenhouse gas emissions. It focuses on possible strategies and concrete policy options to reduce GHG emissions to argue that they will bring positive outcomes for both the economy and the environment (i.e. there will be no net costs to society). The chapter traces the development of this policy frame and the evidence for it.

The core principles for the policy frame are based on expert knowledge on the economics of mitigation where there is a continuum of possibilities that could characterise the cost-effectiveness or economic outcomes for any given mitigation strategy.[118] These range from the extremes of either economically disastrous or economically beneficial, win-win outcomes where there are gains for both the environment and the economy. In between these two extremes are a variety of other outcomes ranging from costly or 'much too high to bear' strategies, to 'affordable' strategies, where there will be some (net) costs but where these are judged to be affordable given preferences for the environmental outcomes they will bring. While those interviewed expressed a range of views across this spectrum, an overwhelmingly dominant view, especially from governmental representatives and environmental NGOs, was that mitigation policies would be win-win. This perspective is also embedded in recent official documents including the Governor's Executive Order and the AB 32 legislation.

[118] This continuum describes outcomes along different measures of cost-effectiveness for a given climate change or emissions target. This is because the policy process in California began with a politically-determined emissions target rather than raising the more fundamental economic question of optimality, i.e. what would be the economically optimal policy target for the State of California, where marginal cost of mitigation is equal to the marginal (avoided impact) benefit. Also in the interviews of policy elites and other non-governmental actors engaged in the policy process, no one raised the question of what would be the optimal target.

The conceptual framework for this discussion is the same as that in Chapter 7: a co-constructionist perspective that shows policy decisions to be inevitably driven by a mix of "facts" and "values" as decision-makers selectively choose facts to construct arguments to frame policy decisions (Majone 1984; Hawkesworth 1988; Schön and Rein 1994). Also, given the range of contested meanings of climate change, and the multilevel governance context for decisions, the analysis attempts to understand why a particular policy frame for mitigation has come to dominate in California and in whose interest is the dominant framing.

The chapter shows that evidence and argument advanced by policy elites with respect to mitigation as 'win-win' relies upon experiential knowledge and social learning from past experience with energy and environmental policy, as outlined in Chapters 5 and 6. It also draws on business perspectives such as financial risk deriving from investments in carbon-intensive infrastructure and, to a more limited extent, on expert knowledge about the macro-economic effects of policy.

8.2. Mitigation policy as 'win-win': the discourse

California's win-win policy discourse presents mitigation as necessary to transform the economy towards cleaner energy systems, clean technologies and practices that in turn will deliver improved local environmental protection, social and economic opportunities for California businesses, employment and local communities. This discourse is commonly used in recent California legislative and policy documents (Table 8.1), noting that due to past policy actions in related areas California businesses are in the forefront of clean technology and practices and their diffusion; arguments are also made that the markets for such technologies and services are said to be growth markets that these will be stimulated through mitigation policies. In short, this discourse derives from California's historical experience with energy and environmental policy (see key examples highlighted in Chapters 5 and 6; see also discussion below in section 8.4).

The "win-win" policy frame features a call for significant mitigation action in the "medium term" i.e. the 2050 timeframe and before, suggesting that significant reductions of greenhouse gases will deliver both economic and environment benefits to Californians. It also suggests a need to begin today to limit emissions so as to lead the way for global emitters to act to avoid the worst of long-term impacts. Despite recognition of inevitable, nearer-term climate change impacts and thus the need for adaptation, the focus of this policy frame is nevertheless on near to medium-term reduction of greenhouse gas emissions.

Governor Schwarzenegger underscored the 'win-win' framing of action on climate change when he announced his Executive Order in 2005 (California 2005b): "By working together we can meet

the needs of both our economy and environment. Together we can continue California's environmental heritage and legacy of leadership in innovation in cutting edge technology." Similar language appears in the preamble of the Executive Order itself (see Table 8.1). Assembly Bill 32 (AB32) of 2006 also draws on a similar type of language to introduce its strategic medium term emission target of 2020.

Table 8.1: Climate Policy Discourse in California: Climate Change Solutions as Win-Win

Governor Schwarzenegger's Executive Order (S-3-05)	**Assembly Bill 32 of 2006**
Solutions Evidence: Mitigation as a "Win-Win" Policy Choice	
California has taken a leadership role in reducing greenhouse gas emissions by: implementing the California Air Resources Board motor vehicle greenhouse gas emission reduction regulations; implementing the Renewable Portfolio Standard that the Governor accelerated; and implementing the most effective building and appliance efficiency standards in the world. *California-based companies and companies with significant activities in California have taken leadership roles by reducing greenhouse gas (GHG) emissions, including carbon dioxide, methane, nitrous oxide and hydrofluorocarbons, related to their operations and developing products that will reduce GHG emissions.* *Companies that have reduced GHG emissions by 25 percent to 70 percent have lowered operating costs and increased profits by Billions of dollars.* *Technologies that reduce greenhouse gas emissions are increasingly in demand in the worldwide marketplace, and California companies investing in these technologies are well-positioned to profit from this demand, thereby boosting California's economy, creating more jobs and providing increased tax revenue.* *Many of the technologies that reduce greenhouse gas emissions also generate operating cost savings to consumers who spend a portion of the savings across a variety of sectors of the economy; this increased spending creates jobs and an overall benefit to the state-wide economy.*	*…exercising a global leadership role, California will also position its economy, technology centers, financial institutions, and businesses to benefit from national and international efforts to reduce emissions of greenhouse gases.* *…investing in the development of innovative and pioneering technologies will assist California in achieving the 2020 state-wide limit on emissions of greenhouse gases established by this division and will provide an opportunity for the state to take a global economic and technological leadership role in reducing emissions of greenhouse gases.* *California has long been a national and international leader on energy conservation and environmental stewardship efforts, including the areas of air quality protections, energy efficiency requirements, renewable energy standards, natural resource conservation, and greenhouse gas emission standards for passenger vehicles. The program established by this division will continue this tradition of environmental leadership by placing California at the forefront of national and international efforts to reduce emissions of greenhouse gases.*

What is the structure of the argument for the framing of mitigation policy solutions as "win-win" with benefits for both the Californian environment and the economy? Since California alone

cannot deliver sufficient emission reductions to make a difference to the rate and magnitude of global warming, mitigation policy can only be argued to have benefits to the California economy if there are local (economic and non-climate environmental change) benefits stemming from GHG reductions. Elite policy actors recognise that mitigation action in California alone will not be sufficient to avoid the impacts of global warming. The key to the "win-win" argument is therefore to seek local economic competitiveness in new clean energy and other technology markets that emerge with the creation of GHG constraints. Gaining market share and position through early mitigation action is one of the principal arguments and thus is an aim of policy under this framing.

The evidence for this "win-win" framing is largely drawing on experiential knowledge from California's regulatory history, as traced in Chapters 5 and 6, on air pollution regulation of vehicles and energy efficiency regulation. The expectation embedded in this "win-win" policy argument for California is the historical ability to pull markets towards clean technology, growing the economy while improving air quality, energy efficiency and environmental performance in parallel. This vision of the future would include not only cleaner vehicle technologies but also future generations of cleaner power and other industrial technologies, more sustainable farming and forestry practices as well as commercial and residential energy use and consumer habits.

There is an inevitable economic bottom-line in California's official policy discourse. As Anne Baker, Deputy Secretary of CalEPA said: "We are a Republican administration. We are pro-jobs, pro-business. ...the Governor spends great time telling people we don't have to pick between the economy or the environmental protection. I give him credit for the places he goes and says that to the business community and others. ...I also believe there are a lot of people on both sides of that equation who believe they've had to pick politically... So it's hard ...to keep that discussion moving; ...we spend a lot of time talking with venture capitalists and other people here about how do you see this really providing incentives for jobs... that kind of thing." Yet the challenge of climate change is the breadth of change required in the economy to clean up the emission problem. Climate change is driven by a vast range of human and economic activities, from energy production and use to industry, forestry and farming practices. Addressing climate change in a meaningful way also requires global – not just national or regional – emission reductions. Can a regional (i.e. state) government, such as California, lead other parts of the US or of the world by demonstrating that a climate-friendly future is compatible with a healthy economy?

8.3. What are the win-win solutions for the environment and the economy?

If one accepts the "win-win" argument then key questions are: what types of policy solutions deliver these "win-win" benefits in the area of climate change? How will California deliver on its vision of a climate-friendly future and a strong economy? Interviews with elite policy actors indicated broad agreement on several strategic elements of the emerging policy framework in California, including clear greenhouse gas emission targets to guide further action. Strong, standardised monitoring and reporting protocols are also required to monitor progress by ensuring a consistent accounting of emissions across sources within the state and evaluation of progress with respect to the targets.

Mary Nichols, former head of the California Resources Agency,[119] explained why targets are needed: "… a target is essential if we're going to actually make any progress, …in the near term… the level of awareness and consensus, at least among people in leadership positions, that this is a genuine problem worthy of taking some serious measures to address is very widespread. And yet our emissions in California, in the country and in the world as a whole are going in the wrong direction. So when you search around for what to do to galvanize action the easiest way to think about it is to say, 'Okay. You know what's an acceptable level and what can we do starting now to get us towards that goal?'" In this view there is a need to outline the goals in a concrete way and to orient subsequent policy decisions to meet the overarching emission target.

In 2006 legislation – the Assembly Bill 32 – the state legislature accomplished just this. It codified a 2020 emission target for the State of California, requiring the California Air Resources Board (CARB) to oversee development of specific policies and regulation to implement the target according to an agreed timeframe (see Table 8.2). Consistent with this, the Act also sets out the requirement for monitoring and reporting of GHG emissions in the state. By January 2008, CARB was to establish a quantitative 1990 baseline for state-wide emissions so as to firmly establish the magnitude of the emission cap in 2020 and to allow monitoring of progress in this direction. It was also to adopt, for the first time, regulations for mandatory greenhouse gas emissions reporting by entities across the state.

Not all actors in the policy process, however, believe that California is on a "win-win" pathway to mitigate GHG emissions. K.C. Bishop the California lobbyist for Chevron corporation agreed that the way forward was through long-lived capital infrastructure and improving the environmental performance of these investments. K.C. Bishop questioned the "win-win" discourse when he said:

[119] Mary Nichols is currently Chairman of the California Air Resources Board in 2007 – see Chapter 5.

"If you put California in a deep recession that isn't going to be the kind of leadership the world is going to follow." Unlike many of the policy elite in California K.C. Bishop felt strongly that the technology pathway could not be forced by California acting in isolation of broader federal or worldwide action, or at least not without great risk of harm to the California economy.

Table 8.2: Timeline - California Assembly Bill 32 of 2006

By July 1, 2007: The State Air Resources Board (CARB) forms Environmental Justice and Economic & Technology Advancement advisory committees.
By July 1, 2007: CARB adopts list of discrete early action measures that can be adopted and implemented before January 1, 2010.
By Jan 1, 2008:[120] CARB adopts regulations for mandatory greenhouse gas (GHG) emissions reporting. ARB defines 1990 emissions baseline for California (including emissions from imported power) and adopts that as the 2020 state-wide cap.
By Jan 1, 2009: CARB adopts plan indicating how emission reductions will be achieved from significant sources of GHGs via regulations, market mechanisms and other actions. During 2009 ARB staff drafts rule language to implement its plan and holds a series of public workshop on each measure (including market mechanisms).
By Jan 1, 2010: Early action measures take effect. During 2010 ARB conducts series of rulemakings, after workshops and public hearings, to adopt GHG regulations including rules governing market mechanisms.
By Jan 1, 2011: CARB completes major rulemakings for reducing GHGs including market mechanisms. ARB may revise the rules and adopt new ones after 1/1/2011 in furtherance of the 2020 cap.
By Jan 1, 2012: GHG rules and market mechanisms adopted by ARB take effect and are legally enforceable.
Dec 31, 2020: Deadline for achieving 2020 GHG emissions cap.

Source: California Air Resources Board, 25 September 2006, available online [accessed 19 Jan 2008]: http://www.arb.ca.gov/cc/factsheets/ab32timeline.pdf

Yet the overwhelming view of California legislators, and apparently the Governor, was that it would be possible to reconcile economic growth and GHG mitigation in California. The passage of Assembly Bill 32 in 2006 provides ample evidence of belief in this view. Had legislators believed, to the contrary, that mitigation of GHG would cripple the economy, the legislation surely would have failed. That said, the true test will be whether the state government is able to successfully implement the targets. Early experience (see Chapter 6) suggests that implementation will be more difficult than was agreement on the goals.

[120] As noted in Chapter 6, this deadline was met; California has adopted mandatory regulations for GHG reporting.

8.4. Experiential knowledge, social learning & the win-win discourse

This strand of California's policy discourse is intimately intertwined with California's past efforts to address energy and environmental and air pollution policy issues. According to many observers, California's past leadership on environmental issues has led to cleaner technologies that raise the quality of life in the state and deliver a range of local economic benefits, while also changing the face of technology on a world-scale. As John White said: " It isn't just to manage our own emissions it's to transform global technology." In his view, California has already transformed the vehicle industry. He said: "…. if you look around the world, all of the stuff that we did in that 60s, 70s and 80s, all that technology transferred out. The Europeans followed us: they followed us on lead, they followed us on sulphur they followed us on [NOx control] catalysts and we've driven the whole global technology. So when people wonder about 'why are you guys doing climate change, you're only the 12th largest source?' and 'suppose California does stuff on climate change, it isn't going to make a bit of difference compared to China and India.' We forget the whole other part of the reason we're doing it."

This technical and policy competence in California is widely understood to convey an economic dynamic or force to orient California industry toward high-growth emerging markets worldwide for clean technology (Doerr 2007; Mullins 2008). As John White said: "It's to the point where if you talk to the executives of the auto industry in Germany and Japan as well as Detroit, they will tell you that the global pace for technology forcing regulations on clean air and clean fuel is still California." The argument that California has the potential to shape global markets is not new. In addressing a workshop in 2000, (then) Senator Byron Sher stated: "California already leads the country, and much of the rest of the world, in the development and use of renewable energy and energy efficient technologies. It also is an international leader in demanding the cleanest cars and fuel in the world" (Sher 2000). He concluded: "The bottom line is that California cannot afford to ignore global warming for the sake of its environment, and it should not ignore global warming from the standpoint of the economic opportunity it presents" (Sher 2000).

Beyond leadership through policy however, there is another dimension of California's leadership that underscores the "win-win" arguments of solutions to climate change. It is located in the venture capital industry in Silicon Valley, California. This branch of the California business community advocates the need for policy leadership at the state level (as well as nationally and worldwide). While on the one hand motivations are altruistic, generated by true concern about the problem, on the other hand this community of actors is positioning to profit from investing in

clean technology. Their explicit aim is to create and to exploit the commercial opportunities to be found in leading a wave of revolutionary change in the world energy market. As John Doerr, an influential California venture capitalist said: "Energy is a $6 trillion business worldwide. It is the mother of all markets… Remember the internet? Going green is bigger than the internet. It could be the biggest economic opportunity of the 21st century." He also recognised the need for a transformation in the way society approaches the issues when he said: "We've got to make this economic, so that all people and all nations make the right outcome the profitable outcome, and therefore the likely outcome" (Doerr 2007).

Mary Nichols also noted the potential to access and influence global markets for new technologies as well as other local benefits of aggressive action on climate change. She pointed to co-benefits of policies to address climate change, or those non-climate environmental and economic benefits of going green. She said: "It's just always a question of what are you getting for the money that you're spending … most people believe that measures that reduce greenhouse gas emissions have other benefits in terms of reduction in fossil fuels, pioneering of new technologies that are going to be useful on a global scale."

K.C. Bishop, Chevron's environmental lobbyist in Sacramento raised a more pessimistic counterpoint. As noted above, California's previous experience, particularly in the regulation of air pollution to achieve air quality goals, suggests that goal setting and regulation of industry can force technology (Carlson 2003; Taylor 2006; Taylor et al. 2006). On technology change, however, K.C. Bishop suggested that it was key to focus on the need for improvements in the power sector in places distant to California or the US. He said: "…China's out there building 1000 megawatts a week of coal-fired power plants at 25% efficiency because it costs too much to build the 40% efficiency plants. They got out of their natural gas contracts, basically because ...it was too expensive. Gas got expensive, so they went back to coal. So... if China keeps on that path there's nothing that we do that matters really."

Yet many of the policy elite, and at least a part of the business community, believe there will be industrial competitiveness and environmental benefits to be derived from early mitigation action in California and that these may eventually reach global markets. For example, Devra Wang said: "California has a little bit of a head start, because we've done a lot of these types of programs in the past, but we don't have enough of it to secure a leadership position in that marketplace. There are potential economic benefits to getting ahead of that market so … economic competitiveness is another problem that these [climate change] policies are looking to provide a solution for." Terry Tamminen also advanced a view about California's ability to drive new technologies into global markets. He cited several lines of evidence demonstrating how California has, in other areas,

helped to create markets for new, clean technology by being among the first to act on a sometimes controversial issue: "…air quality, water quality regulation. I mean, we're the first state in the nation to actively enforce the Clean Water Act provisions about storm water pollution. Looking at all kinds of different issues…technology, look at our stem cell initiative that, again, that came from citizens. It wasn't even the government, although our governor supported it. But it was citizens saying hey, you know, the federal government is behind the curve on this and we need to do this research. It can save lives. It can be great for the economy, you know, much like the high tech boom of the '80s and '90s. And so we're going to put $3 billion on the table of taxpayer money and find a way to spend it wisely and try to jump start this industry and these medical breakthroughs. California has always I think looked for ways to do that."

Despite a few pessimistic business voices, Californian decisionmakers have accumulated sufficient in a variety of areas and appear to have a cultural bias in favour of environmental action and, more specifically, in favour of technology-forcing regulatory action. John White referred to this when he said: "That's the other thing that we have is a cultural… we have a technological optimism that is based on years of experience. If we set a standard and we provide enough lead time and if we make it absolutely clear that the standards are going to take place then it was cause for technology to evolve to meet it." Even voices from the more "conservative" business community seem to agree, as Dominic Dimare of the California Chamber of Commerce said: "the principles that guide us are maintaining a balance between the economic vitality of the state and protecting the environment. And we don't think the two are mutually exclusive, and in fact we think they're inextricably entwined... we like to really throw a lot of protection around environmental resources and values here in California. The reason we can do that is because we have a very dynamic economy. That in a large part is predicated our on international trade and innovation and creativity. And so we can afford the environmental protection that we want because we have the economy that generates the economic wherewithal or wealth to do it." In this view, climate change policy is affordable if it builds on and adds to the trade opportunities to grow the economy.

Over and above the view that California might gain economically from early action on climate change, another view that is altruistic also emerges from key policymakers interviewed for this project. This perspective identifies Californian leadership on climate change as the "right" environmental policy course, especially given the strong preferences of Californians for environmental protection. Or as Michael Peevey, said: "it's a … very strong sentiment in this state to be environmentally attuned... Admittedly, it's a fiercer challenge than some of the other things that we've faced. And what California can do is relatively small given it's a worldwide

problem, but we can provide some leadership. And that's what we've tried to do at the [C]PUC and the Energy Commission, to provide some leadership and help others point the way while we're trying to work even beyond California with other western states and even with others. We've signed an agreement with a Province in China to help them with energy efficiency. All that concerns global warming, frankly, and just more efficient use of resources."

California's leadership, internationally and domestically, is a key element of the "win-win" policy discourse. If California, as an economic powerhouse, can promote new GHG regulatory approaches elsewhere in the world, it will also enhance the size and pace of growth of clean energy markets. In turn this may favour California businesses, which are already servicing emerging markets in state and to provide innovative clean technology and know-how for similar markets elsewhere. The CPUC memorandum of understanding with Jiangsu Province in China, and a recent initiative of cooperation amongst western states in the US are examples of how California is collaborating with other regions to share its experience and knowledge (CPUC 2005; WRCAI 2007). The influence of successful policy experiments can escalate quickly in a world where markets for clean technology and expertise in this area are increasingly open and linked through global trade (Vogel 1995). But what evidence exists for business success from past California regulations?

In recent reviews, both Roland-Holst (2008) and Taylor *et al.* (2006) draw on ex post assessments to conclude that California's technology forcing environmental policies have positioned it to reap market gains. Taylor cautions that it is difficult to disentangle the innovation effects of environmental policies in part because there are two market failures co-mingling – environmental externalities and the tendency for firms to under-invest in technology innovation (Taylor 2008; Taylor et al. 2005). However in a series of interdisciplinary case studies including assessment of patent data against policy action, construction of technology learning curves and interviews among market participants, Taylor et al. (2006) also show that where California has had front-runner regulatory policy, it has captured a significantly higher share of intellectual property rights than on average across the patent system as a whole (Taylor et al. 2006). She also finds that contrary to standard economic analysis, regulations may have stronger innovation effects than do cap and trade and that regulatory policies can have dynamic innovation effects if they are regularly updated (Taylor et al. 2006).

There is also some evidence that in the context of global markets, national regulations – and in this case regional regulations – establish a "race to the top" where regions and nations aim to lead the way to greater environmental and economic performance, creating market pull for new, clean technologies through clear regulatory policies (Vogel 1995; Vogel 2003; Vogel *et al.* 2006). This

counters the view that environmental regulations harm business competitiveness creating incentives for a "race to the bottom" where policies that are intentionally weak to attract more business investment. Indeed, historical evidence, as documented by Dr. Vogel, at UC Berkeley, shows a "California effect" where California environmental regulations have led the way for national policy and transformed the regulatory landscape for markets far beyond California's borders. However the broader value of environmental innovation found in federalism, where much of the regulatory power may be decentralized, derives from an uptake of more stringent standards by central government. In a comparison of EU and US environmental regulatory trends he notes that individual states (US states and EU nation-states) can be an important source of innovation that drives change elsewhere, however this is only the case if the state regulations are more broadly diffused. He concludes: "the most important role played by state standards is to prompt more stringent central ones. Unless this dynamic comes into play, the effectiveness of state environmental regulations remains limited" (Vogel et al. 2006: 273). As noted in Chapter 5, in the notable cases of vehicle air pollution regulation and of appliance energy efficiency standards, California has effectively led the way to stronger regulations at national level.

8.5. Climate change risk as financial risk: a business perspective

Another interesting development in California's policy discourse is the recognition of climate change as a source of financial or regulatory risk for companies and their shareholders. The argument goes that climate change is an inevitable part of the regulatory landscape of the future. Even though today there are few if any regulations in the United States that constrain markets in a carbon-friendly way, if one assumes that regulations are forthcoming, carbon and other greenhouse gas emissions will eventually carry a real cost this should affect business decisions given the implications for future earnings and profitability. Thus the recognition of climate change as a public policy issue requires recognition of climate change as a source of financial risk for business operation.

In California, "climate change as financial risk" is one of the principal arguments used in the regulation of publicly owned utility companies by the CPUC. In 2005, the CPUC established a "greenhouse gas adder" requiring public utilities to add a cost of carbon into analyses of the costs of power for the purpose of evaluating cost-effectiveness of alternative power supply investments (CPUC 2005a; CPUC 2005b) (see also Chapter 5). Devra Wang of NRDC noted that the CPUC's "GHG adder" reflects the cost of GHG regulation for utilities: "[it] was one cost that they had not been forecasting… this [adder] now requires that they do forecasts. So…it makes carbon-intensive resources look less attractive and cleaner resources look more attractive." Prior

to the CPUC decision, the NRDC had partnered with PG&E and others to document this financial risk and how it is being dealt with by companies and in other state jurisdictions (Bokenkamp *et al.* 2005). Devra Wang noted: "It's something that a number of utilities have done on their own without regulatory direction in the U.S. because it's a huge risk for them. … the federal discussions around climate policy, certainty this is one of the primary reasons that the utilities companies have come out now in favour of the cap …they're saying: 'how the heck can we make investments when we don't know what you're planning to do?' And these investments are going to last for so long. So we've seen it from a number of utilities … because they recognize that it's prudent. Then we've also seen it from a number of regulators who are requiring their utilities to do it to protect their customers." From this perspective, the use of a financial adder to account for the future regulatory risk of carbon-intensive investments is simply prudent business practice.

The use of the GHG adder to account for financial risk of climate change in the power sector also aims to protect the long-term interests of those who have to pay the cost of power, the ratepayer. As Lainie Motamedi of the CPUC staff said: "…we're not looking at it as environmental regulation per se, but we're looking at overall financial health … and risk as well as upholding the tradition of environmental mandates in the state. We're looking at overall efficiencies and balancing of risk on behalf of the ratepayers." Given the mandate of the CPUC [and CEC] to deliver reliable, affordable and environmentally sound energy to Californians, the GHG adder is one means to deliver on these goals. As noted in Chapter 5, one important effect of the adder is to dampen investment in conventional coal power generation technologies.

Shannon Eddy, special advisor to the CPUC, highlighted that prior to the adder policy, plans were emerging to build new transmission capacity from the coal state of Wyoming to supply power to California. Known as the "Frontier Line" such a project would have most likely increased the amount of coal-fired power being brought to California and thus the greenhouse gas footprint of the state in the western US region. Shannon Eddy said: "People were very nervous about that. They're nervous from several perspectives. You can look at it from the climate perspective… You can look at it from the whole idea of California exporting its criteria pollutants, which is also problematic. But I think if we look at it simply from the perspective of economic risk that's where these guys were coming from. You've got a situation where California and the nation [are] …looking down the barrel of climate regs [regulations] of some level." This view reiterates the notion that climate change carries significant financial risk due to future regulatory changes. Future dependence on coal-fired power through infrastructure projects (e.g. transmission lines and power plants) built today carries financial risk associated with a carbon-constrained world of the future. By taking policy action today to regulate GHG, California has begun to explicitly limit the

investment risks of its companies and begun to construct the markets of the future that will deliver clean coal and other clean energy technologies.

Another example of the understanding of climate change as "financial risk" is found in a series of actions taken by the California institutions established to manage the retirement funds of the large number of state government employees and public sector school employees and teachers. These institutions are the California Public Employees' Retirement System (CalPERS) and the California State Teachers' Retirement System (CalSTRS). As of 10 January 2008, CalPERS' annual institutional investment was estimated to have a total market value of $247.5 billion, while as of November 30, 2007, CalSTRS' assets were valued at $174.2 billion.[121] The thrust of their action to favour environmental protection and investments is captured in what was originally called the "Green Wave Initiative" and begun in 2004 by former California Treasurer and gubernatorial candidate Phil Angelides. The Green Wave Initiative includes action in three distinct areas: 1) to invest roughly half a billion dollars in cutting-edge technologies and another billion dollars in environmentally responsible companies; 2) to work through shareholder initiatives to prod companies in which the two funds invest to address the financial risks posed by environmental liabilities and global warming, and to disclose these liabilities through public reporting; and 3) to reduce energy consumption in their massive real estate holdings (CST 2005). An initial assessment of the CalPERS initiative suggests that this move, which represents only a very minor share of the total investment portfolio, has increased rather than decreased the market value of invested sums compared to the conventional investment strategy (Barber 2006).

Former Secretary of California EPA and real estate investment advisor, Winston Hickox, explained that Treasurer Angelides' decision to launch the initiative and the support from the CalPERS board was facilitated by off and on interactions between financial and climate change experts on the one hand, and decision-makers on the other. Winston Hickox facilitated some of these encounters, first as CalEPA Secretary and later in his role as an investment advisor to CalPERS. For example, in November 2004, he organised a workshop for CalPERS Board members, the aim of which was to brief key decision-makers about the nature of financial risks associated with climate change from a business perspective. The November 2004 workshop featured interventions from Dr. Stephen Schneider and Peter Schwartz, the leader of the

[121] See CalPERS website:

http://www.calpers.ca.gov/index.jsp?bc=/investments/assets/mvs.xml and CalSTRS website at: http://www.calstrs.com/Investments/index.aspx [both last accessed 13 January 2008]. Note that one study estimated that in 2005, CalPERS owned approximately 0.5% of all outstanding US equity. See (Barber 2006).

progressive business organisation Global Business Network.[122] Winston Hickox described the effect of the Schneider and Schwarz expert presentations on the CalPERS Board: "…they put the fear in them that, in fact, these forces creating climate change were of such a size and magnitude that it would, ...over time ...make winners and losers out of countries and companies and therefore investors." Winston Hickox underscored the argument that climate change was linked to the core mandates of the CalPERS and CalSTRS; he described the bottom line as: "… it's our fiduciary responsibility to better understand these forces that are going to create risk and change. The world that lies ahead is highly likely to be very different from the world we see in the rear view mirror." In this view, climate change is increasingly a financial liability and forward looking companies and investors will be recognizing, quantifying and actively managing these liabilities.[123]

8.6. Expert evidence: economic modelling and analysis

Economic analysis is an important source of expert knowledge that could be used to assess and construct evidence for a preferred mitigation strategy, for example through the economic modelling of alternative mitigation strategies. Presumably if mitigation policies were "win-win," economic modelling would show economic benefits deriving from emission reduction strategies over time. Yet California's climate policy process to date lacks examples of rigorous ex ante economic analysis in the evaluation of policy options. However there are some examples of ex post analysis entering the policy debate to support the "recommended" policy package. Instead "economic" arguments for (or against) a particular set of policies appear to rely as much on local and experiential knowledge as on formal economic analysis. Experiential knowledge stems from the large array of energy and environmental and air pollution policies already in place in California. This type of knowledge appears to have been more influential than formal economic analysis in influencing the climate policy discourse throughout 2006.

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[122] Note Stephen Schneider was interviewed for this research and he also mentioned the CalPERS workshop as an important event, reaching an important and influential audience in terms of business investment for climate-friendly outcomes (Schneider 2006i). As for Peter Schwartz, beyond advocating attention to climate change from a business perspective, he was the lead author of an influential report to the US Pentagon on the links between climate change and national security. See: (Schwartz and Randall 2003). This report received significant media attention at the time, *e.g.* (Townsend and Harris 2004).

[123] Increasingly the business case to identify and manage financial risk associated with carbon liabilities is being made by Ceres which is "a national coalition of investors, environmental groups and other public interest organizations working with companies to address sustainability challenges such as global climate change. Ceres also directs the Investor Network on Climate Risk, a group of more than 50 institutional investors managing $3.7 trillion in assets" (Gardiner 2007). See also Cogan 2006.

A historical example can be found in knowledge of costs and economic performance under past regulatory decisions relating to energy efficiency versus investment in new electricity generation capacity (see Chapters 4 and 5). In this case, analysis at the time (Roe 1984) showed that investment in energy efficiency and conservation was economically advantageous compared to new supply-side energy investment. This was originally a contentious argument and contested by companies who had a vested interest under the existing regulatory regime to increase investment in capital equipment and thus boost rates and revenues. Policymakers ultimately chose to alter the regulatory framework to establish incentives to both demand-side and supply-side investment, with the resulting outcome being higher investment in energy efficiency (demand-side actions) displacing otherwise expensive additions to power and natural gas supply infrastructure with lower cost investments in energy efficiency. Although the exact form of the policy has shifted over time, the intent of the policy framework has largely remained stable and has been shown to deliver long-lived economic and environmental benefits (CEC 2005a). Financial and economic analysis was the basis for the strong regulatory approach taken in California to establish these incentives for energy efficiency.

There is now also substantial local experience and knowledge of the cost-effectiveness of investment in energy efficiency as a means to displace investment in more expensive energy supply options. Beyond extensive *ex ante* and *ex post* assessments in the state's "grey literature" on the performance of energy efficiency standards and investments (e.g. see CPUC 2005a; Chang 2006a), relatively fewer studies attempt to assess these savings in a macro-economic framework. However two studies stand apart and are worth mention here. First, a study by RAND (Bernstein et al. 2000) reviews energy efficiency programmes across the state and reports results along three different dimensions of policy benefits: economic performance, air pollution and distributional effects on low-income households. The authors estimate the economic gain from investments in energy efficiency in the state of California since 1977 to be about 3% in 1995 ranging from $875 to $1300 per capita, with a cumulative return on investment that ranges from 80 to 170 percent. They also conclude that over the nearly twenty year period of study (1977 to 1995) the strong energy efficiency performance of the state reduced air pollution from stationary sources by about 40% and produced a range of other benefits for consumers in the form of lower energy bills and lower energy prices, both of which benefited poor households relatively more than others.

Second is a more recent study by Roland-Holst at UC Berkeley (Roland-Holst 2008). This study builds on the Bernstein et al among other studies, using a computable general-equilibrium model for California to consider the impact of past policies on employment and more generally the economy. Roland-Holst's analysis concludes that household efficiency measures since 1972 have

led to the creation of nearly 1.5 million new jobs with $45 billion in payroll. This is because consumers save money and spend it on less carbon intensive sectors, which in turn are more employment intensive than those that loose from these policies. Overall Roland-Holst (2008) estimates that the energy savings since 1972 to 2005 have resulted in more than $56 billion in household savings and avoided the construction of 24 power plants. Both of these studies present clear evidence of win-win investment in energy efficiency in California as a result of regulatory policy.

Climate change as an issue is more comprehensive and far-reaching across the economy than previous energy and environmental policy issues. For this reason alone, it could be said to warrant thorough economic assessment prior to target-setting, or at a minimum prior to the implementation of new policies to achieve a given emission target (Anon3 2006i). Within state institutions there is an ongoing faith in the value of economic analysis to guide decision-making. For example, when asked about whether economic arguments are driving climate policy decisions in California, Nancy Ryan, a PhD economist and chief energy advisor to Michael Peevey of the CPUC, said: "…there are instances where it is driving the policy. ...For example with the work the Commission is doing on energy efficiency, even to a large extent on the Renewable Portfolio Standard…. If you look at the energy efficiency programs here, they pass rigorous cost-benefit tests. I think if you conduct thoughtful cost-benefit analysis that takes into account pricing the risk associated with fossil fuels, that the RPS Program is going to pencil out, so that's attractive to me [as an economist]. My impression based on a short record [at the CPUC] is that it's not inconsistent in its application of those principles, but it is very much a part of how this organization does business; it's very focused on cost-benefit principles." Despite this belief in the value of economic analysis from inside a key state institution, there is little evidence to date of a strong influence of ex ante analysis on climate change policy.

When asked about how economic analysis is integrated in the policy process, Nancy Ryan responded: "There is almost a religious, faith on the part of the people who believe in the things we're doing that if you look carefully at economics in the right way, they will pencil out. Therefore the bold policy initiative comes first, and the studies come later. The risk is that the studies are done to justify the policy, that was chosen." Nancy Ryan elaborated on the nature of that risk, when she said: "I mean my own view is that it's got to be the case that there's an upwards sloping supply curve for carbon reductions and that it would be nice to understand what that is and so we focus on - walking up that instead of selectively grabbing things along it. And it's not clear to me that that's what the approach is. Or even that that mindset is forming [in] how they're approaching it."

A similar story emerges from Michael Hanemann, who is a professor of economics and public policy at University of California at Berkeley (UCB) and also a prominent international expert on environmental and resource economics. Michael Hanemann explained that the role of macroeconomic modelling of mitigation climate policy options, with particular reference to the possible role of cap and trading systems, was first discussed within a UCB circle of experts in 2003. He said: "We were developing a CGE [computable general equilibrium] model and we were interested in policy debate, you know, participating in the policy debate on cap and trade in some way. The problem was there wasn't a policy debate yet or people who were thinking about it weren't interested in talking to us, so we were kind of all dressed up, but nobody was inviting us out." Michael Hanemann explained: "…when the Governor's announcement came along [in 2005]… I saw that part of it had to do with policy including a report about cap and trade. I hoped and, I guess, assumed that we might be involved in that. I don't mean, you know, exclusively, but a bunch of economists and others around campus had sort of thought about that and so, but that didn't happen. I made offers and suggestions." But apparently CalEPA, which was running the policy process kicked off by the Governor's announcement, expressed little early interest in this type of comprehensive economic modelling of the policy packages.

The earliest trace of formal economic analysis to inform climate policy decisions appears in the summer of 2004. The Energy Foundation had assisted the western states to move towards a declaration on climate policy by funding Tellus Institute to assess the mitigation potential and cost of various options to reduce emissions in California, Oregon and Washington as part of a West coast Governors' initiative (Bailie *et al.* 2004). This work was eventually deepened to look in-depth at California alone and it was this study that appears to have provided a key expert input in the lead up to the Governor's announcement in 2005 (Bailie and Lazarus 2005) (referred to below as the "Tellus study").[124] Michael Hanemann noted that the Tellus study had been reviewed by University of California at Berkeley economists on behalf of the Energy Commission. He noted concern that the analysis was overly simplistic when he said: "...and so actually a memo was sent." Yet the government was relying upon this single study claiming that climate policy would boost the California economy and create jobs (Bailie and Lazarus 2005).[125]

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[124] Personal communication with Michael Lazarus of the Tellus Institute (co-author of the 2005 study), 11 January 2006. Also the final CAT recommendations (see below) contains reference to the important role of the Tellus report, stating: "*CalEPA worked with the ARB, CEC and Tellus, a technical contractor, to develop the targets in the 2010 and 2020 timeframes"* (CAT 2006:18).

[125] Note that as far as this author is aware, this study was never formally released although it was developed in consultation with and for the California state agencies that were eventually tasked with

Tracing the origin of the first set of policy recommendations from the Climate Action Team in early 2006 under the Governor's Executive Order provides an example of the limited role of economic analysis in the initial policy process. By December 2005, a draft set of policy recommendations had been released by CAT (CAT 2005); in parallel the draft Tellus study had been used to provide initial economic analysis of near-term policy options in the policy process leading up to the release of these draft recommendations including public briefings. The Tellus report highlighted small economic benefits that would result from the recommended mitigation policy package (Bailie and Lazarus 2005).[126] However the Tellus report fell far short of a full macro-economic policy analysis, which some of the experts and the business community believed was warranted. Some recognition of the need for more thorough analysis emerged in this period, as rather than presenting the partial or "bottom up" technical economic estimates that had been reported by Tellus and influential in the initial identification of mitigation options (Bailie and Lazarus 2005), the CAT reported: "Preliminary economic analyses are underway for inclusion in the report to the Governor and Legislature" (CAT 2005: 11). By choosing not to present the Tellus results, the state government had begun to distance itself from the partial economic analysis that it contained.

Meanwhile Michael Hanemann, had been pressing CalEPA to fund a more thorough analysis of policy options and by late 2005 they had agreed. Michael Hanemann remembers meeting Cal EPA Deputy Secretary Anne Baker for the first time in September 2004. He recalled: "…I had sent her an e-mail, kind of warning her, although, not in very blunt terms, that the Tellus report was not the greatest thing since sliced bread and offering to help, if they wanted. We were developing a CGE [computable general equilibrium] model and we could do a better analysis." According to Michael Hanemann: "…there was never any response." However delayed, a response did come about a year later when he finally received a request to contribute such an analysis in early September 2005. Pressure for comprehensive economic analysis had eventually come from the "consumers" of climate policy, that is, those who would be directly affected by the

implementation of Assembly Bill 32 of 2006 and comprising the core of the California Climate Action Team. It was originally posted to the Climate Action Team website as part of the documentation for a 28 July 2005 Stakeholder Briefing meeting. At this meeting a presentation was made on the results of the study by David Wooley of Tellus Institute. Although background documentation is no longer posted, the agenda for this meeting can be found on the internet at: http://www.climatechange.ca.gov/notices/2005-07-28_meeting.html [last accessed 20 January 2008].

[126] Ealier drafts of the study had been available to CalEPA as indicated by the dates on the cover (December 2004; revised July 2005) but this was the first formal draft to have been posted on the CAT public website. The study has since been removed from the website and thus never finalised as far as this author knows.

policy in the business sector. Michael Hanemann said that in early September 2005: "…the Director of the Chamber of Commerce in Sacramento had gone around to Anne Baker and had told her that a nationally known consulting company had been asked by them to analyze the Governor's emission targets and had concluded that they would destroy 300,000 jobs a year in California. The Chamber of Commerce would release this report shortly." The California Chamber of Commerce had thus forced the economic arguments forward as a means to challenge the Governor's aggressive climate mitigation goals. In turn, CalEPA's response was to fund work required to bolster economic analysis of the CAT policy package recommendations that were to be made to the Governor.

Working under an extremely short deadline, the UC Berkeley team set out to apply the CGE model (BEAR) that they had been building to the question of how the California economy would fare with mitigation policies. Michael Hanemann commented on the team's ambition for the work: "…it wasn't just going to be the BEAR model because what I was interested in were flaws in the conventional economic analysis, both the market's impact, but also of the cost of emissions reduction. Because the point of our CGE model, the point about any model, but particularly CGE models is that they have a representative firm. They don't have heterogeneity. The heterogeneity creates gains from trade within a sector, …so you can't use the CGE model to analyze within sector trades because there's just a representative firm. The whole business of technical change, induced technical change, behavioural change in demand or any of these, …none of these things are in the CGE models. …They have a huge influence on the conclusions of these models and so there are real issues …about model specification."

In January 2006, the macro-economic analysis of the UC Berkeley team was released but it was not part of the officially sanctioned set of reports from the Government that had been designed to provide evidence and support for the proposed policy recommendations.[127] CalEPA and the UC Berkeley team had had a falling out and the UCB report was released only as an independent study (Roland-Holst 2006) rather than as an integral part of the state commissioned documentation on the risks of climate change and analysis of the proposed policy response (CAT 2006). Instead, CalEPA had worked with its own technical regulatory agency, the staff of the California Air Resources Board, to quickly develop its own economic analysis of the policy package being recommended to the Governor by the Climate Action Team (CAT 2006). This analysis used an older version of the UC Berkeley CGE model called EDRAM.

[127] This policy package was targeting implementation of the Governor's Executive Order focused on the 2010 mitigation targets.

Although in the end a compromise was reached, there had been a major divide in the lead up to the release of the state funded macro-economic analysis reports.[128] As Michael Hanemann recalled: "…this then morphed into a turf war between EDRAM and BEAR. …We had 3/10ths of a percent increase in employment in 2020 and EDRAM had 5/10ths of an increase, and 5 is bigger than 3. But this was, you know, like Holy war; three has to be wrong, five has to be right. Tenths of a percent." Michael Hanemann said that CalEPA was eventually persuaded because: "…it was actually in their interest to have two reports reaching similar conclusions and so we were allowed to release the report." Thus both reports were released but by separate institutions. As anticipated by the UC Berkeley team, this was viewed by the press as adding credibility to the common finding between the two studies that despite the differences in specific numbers and differences in scope of the modelling, greenhouse gas abatement would lead to net gains for the California economy (McFarling 2006).[129]

Michael Hanemann elaborated on the role of experts and the need for corroborating evidence in constructing policy arguments. He said: "The point is this is contentious …it's like litigation. … The point about litigation is, unfortunately…people want to destroy your reputation. It's not just that they want to destroy your numbers, but they want to show that you are an idiot or an incompetent, who doesn't, you know, and they'll do that using unfair means, you know. They'll do anything and you play into this if you're not [ready analytically]." Dr. Nancy Ryan, an economist working within the policy process as a chief energy advisor to Michael Peevey, had high expectations for the UCB study. She said: "I have enormous respect for Michael [Hanemann] and his colleagues. And so I'm optimistic that this is going to be a rigorous case. This is an all star cast of people who looked at this, but it was definitely after the fact."

In the end, time limited the scope of the UC Berkeley study such that it only took a rigorous look at a sub-set of the full set of proposed policies. Perhaps the partial nature of the analysis is what drove Cal EPA to distance itself from the work. It may also have been that the team of researchers were late in delivering the report, which had been commissioned with an extremely short lead-time, or perhaps that they were drawing different types of key conclusions from those of the policy community for whom they were working. Even if the reasons for this conflict

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[128] One of the outcomes of this conflict appears to have been a suspension for some period of time of funding originally slated to go to UC Berkeley to support its participation and contributions as part of the California Climate Change Centre. Clearly sensitive at the time the research was being conducted, none of those interviewed were willing to discuss this in any detail.

[129] Despite the apparent consensus, it is interesting to note that conclusions of these studies were eventually challenged in the academic literature (Stavins *et al.* 2007).

between state government and expert researchers are more complex (as they certainly are), the difficulty encountered may be indicative of the challenge of trying to bring state-of-the-art expert analysis to bear in a timely and effective manner in a high-profile and contentious policy process. The process, at least at this stage, was about constructing arguments and evidence to sell the need for mitigation policy in California. It was not about a search for "truth" or even common views amongst experts. It was largely a political process, constructing arguments and evidence to support the Governor's (pre-determined) mitigation targets. It was also focused on assessment of the (now also pre-selected) set of policies recommended as part of the package to meet those targets.

Many of the actors in the process also recognized that this debate was a prelude to a more serious debate about the pros and cons of adoption of legally-binding mitigation targets in the form of a new law. The counter-arguments for this type of climate policy were widely known amongst the policy elite. Nancy Ryan said: "…their argument is not so much the science isn't there, but more like its not cost effective to do this at the state level. I mean the debate is just kind of conducted in a different way in this state, than it is at the federal level." And this difference between the need for state level versus federal level action was the principal argument that would be advanced by a part of the business community in California as the legislative debate over "AB 32" advanced in 2006.

K.C. Bishop of Chevron echoed the view of the conservative business community when he said: "...all of the economists that have ever done studies, except for the Climate Action Team in California, even the people that, you know, that are very 'pro' doing something immediate and dramatic will say that it costs some percentage of your GDP ... it's just not free and it gets more expensive the more energy efficient you are." He continued: "If you can make sure that everybody has all the goods and services they have now and you say that it costs them less and you plug that into a model. … Yes, sure enough, the economy does better because people have money to spend because they have all the stuff they had before plus extra money. … What they're essentially saying is that there are $20 bills laying on the ground that anybody just needs to pick them up and once we tell everybody to pick them up they'll be better off and, if that's true, they're right." Yet California's past experience with air pollution abatement and energy efficiency investments fundamentally challenges the notion that environmental performance is at odds with economic performance (Bernstein et al. 2000; Taylor et al. 2006; Sanstad et al. 2006; Roland-Holst 2008). And local knowledge from this experience appears to create a strong bipartisan base of political support for action in California on climate change (see Chapter 7).

There are two key issues that arise from the literature in this area on economics of climate policy and its interaction with technology change. First is the cost of policy – what does it cost over time and how can these costs be kept to a minimum for a given set of climate change goals? Second is the role of technology and its influence on the cost of policy. Regarding the first, there is a wide range of estimates in the literature reflecting uncertainty about the dynamics of how policy interacts with the economy as well as a variety of different assumptions and parameters that drive results. There is some convergence that moving emissions onto pathways consistent with ambitious long-term climate policy goals can be achieved for a few percent of GDP in 2050, and less in 2030, and that this is a small cost relative to the expected growth of the world economy between now and then (Barker *et al.* 2007; Fisher *et al.* 2007). However, a key parameter is the "without policy" baseline which determines the emission reductions required to achieve a given climate goal; a higher baseline will result in higher costs and vice versa (Barker *et al.* 2007). Regarding the second issue, a recent review suggests strong empirical evidence that innovation in the energy sector (and elsewhere) responds to policy incentives and most notably to changes in energy prices (Pizer and Popp 2007). This finding challenges macro-economic simulations that ignore induced technology change. It also suggests that technology change and thus the dynamics of the costs of mitigation vary between scenarios with and without policy (Pizer and Popp 2007).

The California approach to endorse early action is aligned with a growing economics literature that suggests that early and clear mitigation policies to "put a price" on GHG emissions is necessary to stimulate technical innovation needed to address climate change in the long-term. (Barker *et al.* 2007; Barker *et al.* 2006; Edenhofer *et al.* 2006; Grubb *et al.* 1995; Grubb *et al.* 2002; Sijm 2004). These should be complemented by but cannot be replaced by research and development policies (R&D). Low cost (or negative cost) innovation is expected to come from removing market barriers to more efficient use of energy or of materials (IEA 2006b; Levine *et al.* 1995), to the more efficient allocation of resources to technology related investments more generally (Barker and Ekins 2004; Edenhofer *et al.* 2006) and from internalisation of incentives to induce technology change over time (Barker *et al.* 2006; Edenhofer *et al.* 2006; Grubb *et al.* 2002). Treatment of technology change as endogenous rather than exogenous to economic growth appears to lower mitigation costs over time and suggests the need for early action (Ekins 2000; Sijm 2004; Edenhofer *et al.* 2006; Fisher *et al.* 2007). The ability of endogenous technological change to lower costs hinges on both international knowledge spillovers and on the extent of crowding out effects (or opportunity costs, which pull in the opposite direction) for R&D that is stimulated by policy and price changes (Pizer and Popp 2007). The treatment of endogenous

technological change in macro-economic simulations is still limited and where it exists, remains opaque and somewhat ad-hoc, although there is growing evidence for its inclusion.

There is nevertheless ongoing debate and limited empirical evidence, at best, about whether near-term mitigation to achieve deep long-term targets rather than more gradual ramping up of policy and less ambitious long-term goals is sensible from an economic perspective (Hammitt 2007; Kelly and Kolstad 1999; Nordhaus 2007; Nordhaus 2006; Stern 2007; Weyant 2004). To a great extent this debate revolves around questions about economic "optimality" (and whether such a paradigm is appropriate) (Ekins 2000). Within this there are important questions and a range of legitimate views about controversial costing and treatment of climate damages given their uncertainty through time in assessment models (Weitzman 2007), and about the use of discounting to value distant damages compared to near-term consumption losses due to mitigation (Nordhaus 2007). If however, a long- or medium term climate target is taken as given (i.e. a political or ethical judgement is made about how much climate change is acceptable and how much is too much), the economics paradigm becomes less technically complex and less politically contentious as an approach, focusing not on how much to mitigate in a given time period but on cost-effectiveness, i.e. on how to minimise the costs of achieving a given target.

In California, debate about economic optimality of the state's GHG targets is largely absent. Instead the focus is on how to cost-effectively implement the targets and early evidence compiled under the Governor's Executive Order eventually became part of the compilation of evidence and argumentation for the 2006 legislative proposal of AB 32. In this exchange, the green business community partnered with environmental and environment justice non-governmental organisations to argue in favour of strong and early emission targets to achieve local economic, clean technology and environmental benefits in parallel with greenhouse gas emission reductions and longer term (avoided) climate change benefits (for example see Hoerner 2006). The influential and progressive economic voice within California – from the green business community to that representing environmental justice -- has argued since the late 1990s that there would be economic benefits from aggressive GHG emission reduction at state level, driven by clear legislated targets (CEC 1999a). The main lines of the argument revolve around a technological optimism and an economy within the state that generates innovation for better environmental outcomes while also generating new jobs and economic growth (CEC 1999a; E2

and Progress 2004). [130] These endorsements are however more cautious and less united when it comes to commenting on how to achieve mitigation goals, with some stakeholders strongly advocating cap and trade approaches (Michelson 2005), others advocating cap and trade with auctioning to generate revenues that can be used to further fund technology development (Hoerner 2006), and still others advocating more prescriptive approaches such as regulatory approaches that offer more certainty about the types of markets for new technology (SVLG 2006) (see also Box 6.4).

In the end, economic models and expertise can only be seen as tools for policy that provide inputs to help to guide policy decisions by highlighting the relationship between key factors, such as how policies are designed, the pace and magnitude of change in response to such policy and their costs. Insights from economic modelling can complement but will not replace experiential knowledge from real-world experience with environmental policy, its influence on technical change and cost. Indeed, though it is limited, some evidence exists that ex ante analysis typically overestimates the regulatory costs of environmental policies (Harrington *et al.* 2000). As noted above, this may be in part because of the difficulty to quantitatively estimate the dynamics of endogenous technology change that stem from the policy action (Pizer and Popp 2007).

In the case of California, it seems that macro-economic models are only just now starting to treat the question of endogenous technology change as a serious driver of change and determinant of GHG mitigation cost. Yet past experience in California, drawing on over 30 years of pollution control regulatory action, suggests that strong economic growth can accompany stringent environmental policies (e.g. Bachman 2007). Such lessons from the past augur optimistically for the future of GHG mitigation, implying that relatively large emission reductions can be achieved with manageable costs for society (IPCC 2007c; IPCC 2007d; OECD 2008 and 2008b) (CAT-ES 2007). In the words of a Californian expert, David Roland-Holst (Roland-Holst 2007) economic Professor at UC Berkeley: "…even modest assumptions about innovation show it has significant potential to make climate action a dynamic growth experience for the state economy."[131]

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[130] It is interesting to note that despite the apparent consensus in the 2004-2007 economic analyses commissioned by the state about "win-win" nature of mitigation policy, the conclusions of these studies were eventually challenged in the academic literature (Stavins *et al.* 2007).

[131] Note that interestingly, California state government issued an updated version of the macro-economic analysis of the climate action plan in 2007. This quote is taken from this updated report which brings together in a more conclusive report the macroeconomic analyses from the state government (EDRAM) and the UC Berkelely (BEAR) modelling efforts. As noted above the differences between these results had previously been a point of controversy in the policy debate whereas in 2007 they appear to be the source for a consensus view that the costs of achieving the 2020 emission reduction targets of the state are

Another view in the win-win policy discourse emerging from experiential knowledge in California is that significant financial risk, particularly in the energy sector, derives from not taking climate change into account in today's financial decisions. If one assumes that climate change will be regulated in the future, taking into account liabilities associated with greenhouse gas emissions today is sound financial decision-making. As Michael Peevey, Chairman of the CPUC, said: "One has to have perspective here. When we started down this road in California forty or more years ago, concerned about the land and natural resources and air quality and all, the state was less than half the size it is today. California demonstrated clearly to me, that this kind of simplistic notion that the energy bill has to go hand in hand, lockstep, with economic growth, is just not true. You can have a vital and vigorous growing economy and keep energy use constant on a per capita basis although admittedly they'll go up, or even hopefully reduce it on a per capita basis by some margin. … We have huge opportunities in the transportation field if we would just get our act together and move more dramatically in that at the federal level with CAFE standards and other things. So, I don't know what the risk is. .... It's fair to say, though, that for the Midwest United States, which is largely dependent on coal, you're going to take a little different view of this."

At least in an economic and geographic context of California, where the economy is service-oriented and the energy system is coal-free, past evidence suggests that strong environmental policy will strengthen rather than hurt the economy. Although some would argue that carbon is different (Anon3 2006i), in the recent round of climate change policymaking in California, elite actors have constructed the arguments around these views, collectively referred to here as the "win-win" policy discourse.

8.7. Conclusion

The "win-win" framing of climate mitigation policy is constructed in a much different way from that of "environmental risk." Rather than drawing largely on expert knowledge, it derives from past success of environmental policy in California and has its roots in local experience with relevant policies in the area of air pollution and energy. This framing seeks to avoid the difficult problem of what is economically optimal in terms of level of effort, or what effect California's efforts will have on the global problem. As Chuck Shulock, a CalEPA regulator confirmed: "What you do in California isn't going to solve the problem." Instead the "win-win" framing

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either slightly favourable or slightly negative. In the worst case, mtigation costs are small but clearly manageable.

argues that preventing or limiting dangerous climate change at global scale is only one of the (many) benefits of mitigation action in California. It argues that California leadership can mobilise change in the global (market) context, especially given the size of its economy and its past history of leadership in related policy arenas: by stimulating innovation and new markets locally, strong mitigation policy in California will benefit the economy, the environment and human well-being thus leading to "win-win" outcomes in the state. It is argued that it will also become a motor of technological change and that, through increasingly global markets, technological breakthroughs in California will diffuse more broadly in the US and beyond.

Formal economic policy analysis has played a relatively small role in the construction of this policy frame. Indeed, the policy process in California has been criticised by some experts and business partners alike as not sufficiently taking into account comprehensive assessment the economics of mitigation policy. The case study shows that formal economic analysis is belated and used to a great extent to confirm policy choices. With respect to its role in the 2005-06 "goal-setting" phase for California policy, economic assessments are commissioned in part to support prior decisions (thus ex post) rather than being used to assess options in advance of decision-making. Given wide uncertainty about the macro-economic costs of mitigation, even a robust and complete set of ex ante economic analyses could not have been expected to point to a single way forward. However formal economic analysis, across a range of different models could be expected to show a range of legitimate outcomes depending on assumptions about key drivers (e.g. structural change, oil prices and population growth) in the absence of policy. In any comprehensive model and scenario analysis exercise to assess the 2020 targets, estimated cost outcomes would undoubtedly vary along a continuum ranging from those that are disastrous or too high to bear, to those that are affordable, or 'win-win'.

Yet somewhat surprisingly, the California policy process through 2006 demonstrates only a marginal role of formal expert knowledge on the economics of climate change. It relies instead to a greater extent on a "belief" that derives from experiential knowledge that environmental protection is an integral part of delivering sustainable economic development in California. While there is some evidence to anchor this "belief" in win-win outcomes (see above), deeper mitigation efforts would be expected to be more costly (e.g. IPCC 2007c; OECD 2008b)[132] and could therefore be expected to call for more careful economic assessment.

[132] There is some evidence that policy leads to greater technological change in a given period, however, there are likely to be limits to the pace of innovation that can occur in a given time frame to lower the costs of mitigation.

The dominance of the 'win-win' discourse in California demonstrates a co-mingling of "facts" and "values" in the policy process in California, which in turn supports a co-constructionist explanation of policy change. An outstanding question raised in the introduction to this chapter is who stands to benefit from the win-win policy frame and the pursuit of aggressive mitigation in California. Some policy elites argue that it is Californians who will benefit and this may turn out to be true. However, it is also true that those venture capitalists and other green business actors who have invested heavily in green technology and energy services (e.g. energy efficiency suppliers) may be amongst the frontrunners of those who gain from this policy. As noted in Chapters 6 and 7, the poorest of California's citizens may not gain from the strong mitigation emphasis in the emerging climate policy framework, particularly if it detracts from the other equally urgent part of the agenda, adaptation. Broad understanding of this is one of the reasons that the voice of the environmental justice community is expected to significantly influence implementation decisions for AB 32 (see Chapter 6) and to steer adaptation to the forefront of the next round of policy in California (see Chapter 7). As we will see in the next chapter, the dominance of this policy frame emerges in part through support from a strong coalition of different types of actors, not only from the green business community but also from well-resourced environmental non-governmental actors.

Part III: Concluding Chapters

9. WHY CALIFORNIA? WHY NOW?

9.1. Introduction

California's regional (sub-national) scale presents a range of opportunities and constraints for climate policy at this level of governance. The issue of scale shapes both the motivations of state policymakers and their fears, depending upon the framing of this issue it can constrain or enable action. The leadership of individuals in key institutions is also determining the how and the why of action on climate change in California. This chapter explores the questions: Why California and why now? It identifies the interconnections between scales of action, interaction between different types of actors and individual and institutional leadership as features of multilevel governance that at least partially explain action and its timing in California

9.2. Push and pull between federal and state level action

The void in federal policy presents the opportunity to demonstrate leadership that may in turn influence other states in their efforts to deal with climate change in a bottom-up manner. Wendy Pulling of PG&E said of the climate policy process in California: "…the pulse of California has really increased, and since the activity on the Federal level has subsided, it's shifted the activity to the states. California is one of them, New England, Northeast states are the others." Thus the void of activity at national level has created a new type of pressure for the states to act in the absence of national level leadership. In the US system of decentralised governance, it is possible for them to act independently on a wide range of policy issues (e.g. energy and environmental policies) and to align themselves with their voters' preferences when they call for leadership to address climate change.

There are both problems and opportunities associated with the lack of policy at the federal level. Pierre duVair of the CEC noted this influence: "Everyone recognizes that climate change is a national and international issue. Whereas you need action at the state level… you need policies that are set at the national and international level. So many of the big players don't want to support state efforts because they don't want fifty different sets of regulations… You can't have fifty different ways of doing things. But you can have a couple of states [moving ahead] – you often hear the federal agencies say that the states are your proving grounds for experimentation.

Before you have to jump into it at the Federal level, let the states see what works and doesn't work."

Tackling climate change at sub-national scale also has some advantages over decision-making at larger scales of management, sometimes making the barriers to policy more tractable. As John White said: "… the NGO community at the national level has been paralyzed because of the Congress and the President. … What do you do? Just fight and resist and lose. Whereas at the state level it's a much more open game." On the role of environmental NGOs, and in particular the philanthropic foundations that often support their efforts, Eric Heitz – President of Energy Foundation, said: "It might not need to be as big a role if the federal government wasn't so reluctant. But …we have such a long way to go. While it's promising to see California and other states do exciting things, those are baby steps compared to where we need to go. So I think there will be a role for this element of the civil society ...going forward."

Within the US, California is ahead of the curve on mitigation policy action. This position is due in large part due to the leadership coming out of core state institutions in the energy and air pollution areas as well as to the leadership of Governor Schwarzenegger and the legislature. Deputy Secretary of Cal EPA Anne Baker, noted: "We've had some aggressive efforts in the regulatory areas, the Public Utilities Commission and the Energy Commission, on energy efficiency. When people ask are we really doing it in California, what we've done on energy efficiency and Renewable Portfolio Standard, even before you get to Pavley, if you take just those together, the rest of the country, if they did the same thing, would meet the Kyoto standards."

Of course scale can, and has, been used as an argument against unilateral state action especially on the global environmental issue of climate change…. K.C. Bishop, environmental lobbyist in Sacramento for Chevron Corporation said: "we don't think that doing a California only thing makes …much sense. In fact, we think it makes very little sense. ... We don't think putting a cap on California's emissions would be the right thing to do and I think all of the industry actually feels that way.... We think there ought to be a federal system. .... If nothing else and if you have that it really needs to be part of a bigger worldwide system..." This view was also dominant amongst the policy elite, or at least in the Governor's Office, prior to the passage of the Pavley Bill (2002) and to Governor Schwarzenegger's election (Boyd 2006i).

Another example of scale as an argument against action can be seen within the government under past California leadership. California Energy Commissioner Boyd explained how a multi-year, multi-agency collaborative effort culminated in a set of policy recommendations at the end of 2001 in the effort to place climate change on the state policy agenda in 2002. Commissioner Boyd

said: "we gave the then Governor in December 2001 a stack of work; we called it the Climate Initiative, a proposal, for a lot of initiatives within state government. Actually, this was …a not for publication recommendation of things that then Governor Davis might utilize in his 2002 state [State of the State] address. In other words, we were trying to get California government to overtly… move into the climate change arena. …We'd spent a couple of years working the subject amongst the many state agencies, and the major agencies." Despite the careful preparation of these recommendations, Governor Davis rebuffed the recommendations and the report was shelved.

According to California Energy Commissioner Boyd part of the challenge was to show that action on climate change could be effective at a scale other than the federal level. Governor Davis [a Democrat] was waiting for the federal government to act. In many ways the policy ideas and recommendations that emerged from these early consultations on climate change were ahead of their time. Having emerged from policy elites within state government, many of the ideas from the "Climate Initiative" are relevant to today's debate (e.g. how to more aggressively promote energy efficiency where regulatory authority already exists) and some are still to emerge but will undoubtedly be important with time (e.g. adaptation). The Climate Initiative placed significantly more emphasis on the role of adaptation than what is found in the policy process today (Joint-Agency-Climate-Team 2001) and recommended a comparatively cautious approach to mitigate (see Chapter 6). This may have been because of the close relationship between the CEC and the energy sector, combined with a general acceptance of the view that climate policy was necessarily an issue requiring a federal approach rather than a more fragmented state-by-state approach.

California's early action on climate policy raises a complex set of questions about how best to construct steps at the state-level to fit with inevitable, yet unknown dimensions of national policy on this issue. Mary Nichols highlighted: "… [The] biggest challenge is the fact that our national government doesn't have any overarching policies in this area, so the state has had to strike out on its own and try to do things that we hope would make sense when there is a national policy and that would be good models for the national government to use. But even a state with as large an economy and as independent in outlook as California still has some major challenges in taking action on its own on a global issue. … The whole question of whether this is an area that a state, even a state that's allowed to set its own air standards, can embark on…. I think that hasn't deterred California from moving forward anyway, but it's made it much more difficult than it would have been otherwise." More specifically, with respect to the legislative process in California, Mary Nichols said: "…it's pretty clear that legislation will pass this year… How they

will craft it at the end of the day so …it does something but at the same time doesn't bring down the whole world on California's shoulders is going to be an interesting feat."

By September 2006, state-wide legislation requiring greenhouse gas emission reductions had passed and, along with other companion legislation, this has extended the legal framework in California to address climate change. In at least one instance, the new legislation targeting greenhouse gas emissions specifically acknowledged the likelihood of overlapping federal legislation on climate change. For example, in the Perata Bill establishing a GHG emissions performance standard in the power sector, the likelihood of federal legislation on this issue in the coming decade is presented as evidence of a "potential financial risk to California consumers for future pollution-control costs" (CA-Code 2006b; SB 1368, p. 4). The standard is thus presented as a means to internalise such costs and reduce financial risks to consumers in a timely manner and therefore to position California favourably once such regulation comes (see also Chapter 7). Some of those interviewed suggested that the distant 2020 target codified in state legislation was explicit recognition that federal legislation might emerge in parallel and require adjustment of state-wide implementation plans for mitigation policy.

Increasingly there will be an interest in linking California's mitigation actions through carbon markets with markets in other parts of the US or internationally. For example in the New England region, RGGI is moving forward with a cap and trade programme covering only the power sector. Anne Baker noted the relevance to next steps in California: "...people have been contrasting us with the RGGI system in New England and saying ...the tons they're going after there are much less [costly]; they're going after tons for energy efficiency and renewables that we've [already] gotten through regulation. So if we're going to ratchet down the next level, at what point… are those funds better spent somewhere else?" While not questioning California's commitment to lower GHG emissions, Anne Baker noted that in implementing its mitigation policy, California might want to target policy for economic reasons on achieving reductions also outside of the state's boundaries. She said: "We've been proceeding so far like this is another environmental reg [i.e. regulation]. But as we look to ratcheting down across the less traditional sources and people raise the issue of market based and cap and trade and those kinds of issues, how we fit into the national/international stage… [This] is a fair question. If it costs a huge amount of money to get the next level here, are we better creating a fund that does technology in China? …At what point do you, …[and] where do you decide that issue?" These statements underscore the economic considerations and industrial competitiveness issues that inevitably will play a role in the decisions to come on how to implement the recently legislated GHG emission targets in California.

9.2.1. California as a nation-state?

The large scale of California's economy is a reason that its leadership can potentially make a difference to national and international policy in this area. It represents 10% or more of the U.S. economy and market for vehicles and other goods and thus creates a large territory for experimentation. As Commissioner Boyd said: "Sometimes I start speeches out with a 1500s representation of the United States, which has California an island, and I say: 'sometimes we wish we were….' But I talk about the nation-state of California, [the] fifth largest economy,[133] fifth largest user of energy in the world, second largest consumer of gasoline and diesel fuel.... So having established that framework … why should we act on climate change? …We're such a big market for so many things; it gave us the opportunity to do things that other states [cannot do on their own]. All the Northeast states have to band together to have equivalent clout. …When we join with them, which is what we've been doing the last decade or more on various issues, it begins to mean something."

Successful environmental policies, or those that stimulate technical innovation in California, have made a difference to global technology markets in the past and are expected to continue doing so on GHG mitigation technical innovations. This "can-do", technologically optimistic, attitude derives in large part from the evidence of past success in the area of air pollution policy and vehicle regulations, where aggressive standards have shaped industry innovation and technologies in the vehicles markets (Carlson 2003).

The "can do" attitude is not isolated but seems to permeate views across a variety of different actors in the California policy process, ranging from technical experts to political advisors to business leaders to environmental activists and lay-persons. John White explains: "…it's sort of a conceit of ours that we just do it better, we do it sooner than the federal government and if we were to wait for them it would take forever and then they wouldn't even do it right. …We're big enough to be influential and yet small enough to be experimental. … 10% of the vehicles [nationwide]. That's a huge platform, a huge number, a huge amount of money – [but] it's still something that can be flexible." Thus the California experience is important in part because it is small enough for experimentation but large enough to have influence should that experimentation succeed.

[133] California is no longer the 5th largest economy in the world but estimated to be the 8th largest (2006 comparison), with the variation largely due to fluctuation in exchange rates. See Chapter 4.

Jeffrey Callison, a public radio talk-show host, made a similar comment: "…Californians see themselves as important ...as somewhat different from the rest of America. They're very aware of their demographic and economic power and their ability to actually make things happen, even if the federal government doesn't want something to happen. California, because of its own powers and because of its constitutional powers and because of its economic power is actually able to do a lot. …[It would be] easier if California was just a small place and they would just throw their hands up in the air and go 'I wish things were different in Washington; there's nothing we can do about it.' Here, California can say 'you know what? We're going to do something about it, because we can.'"

But not everyone in the United States agrees on the need to have California lead the way. As Steve Schiller also said: "there is certainly an attitude in California, which you might be familiar with, of you know, the nation-state of California?" In talking with people from out-of-state, Steve Schiller recalled the response: 'God, you know, you people have an attitude issue.' Yet he still thought there was value in the state's leadership on the climate change issue. Regarding the balance between state and federal action he said: "yes, we need a national plan. But how long do you wait? … And California has a history of having leadership role in environmental regulation and this will just be another example… We can't keep waiting for the Feds, …its irresponsible to keep waiting for them." Interestingly Steve Schiller also saw a direct connection between what was happening in California and what would happen at the federal level. He said: "… our job is to continue to keep pressure on the federal government to do something. Because if California huge economy - if California says we're doing something then at some point …through businesses, through politics, various things, it's going to continue to put pressure on the Feds to finally do the federal program."

9.2.2. Large enough to be influential, small enough to be experimental

Terry Tamminen, former Secretary of EPA and now energy and environmental advisor to the Governor in Sacramento, agreed that significant national, and possibly global, benefits might derive from experimentation with new policy approaches in California. He said: "We felt that by addressing this on the world stage we could highlight the fact that ...this was like many other things with respect to the environment in California. It's about not only California doing the right thing and contributing its share, but setting standards that might lead the world, because with our Air Board, with our unique regulatory structure, we can do things that very soon become standard throughout the country, and then hopefully around the world. So whether it's on auto emissions or whether it's on energy efficiency, or you know, different renewable portfolio standards with

energy or other things, we hope that this could be the laboratory where the United States would change first and that hopefully would help the rest of the world." Thus, Terry Tamminen underscored this experimentation and leadership, where others would necessarily follow, as among the major benefits of California's climate policy initiative.

In this view, the uniquely large size of California's economy was combining with its strong political will to move on GHG mitigation to create a "living laboratory" for change. Terry Tamminen elaborated: "…hopefully, …California becomes more of a magnet, more of a place… a living laboratory. …Having a state this big, you know, with 36 million people and kind of a world class research, education system, and having all the high tech innovation of Silicon Valley and the environmental innovation that we've had over the years. When you put all that together, it makes this the logical place to be that living laboratory." Some evidence exists that such experimentation, for example in the motor vehicles sector and as well as in stationary source air pollution control technology, has led to a vibrant business sector centring on clean technology.[134] This experimentation appears to be at the heart of California's approach to climate change policy.

As one of the chief architects of the Schwarzenegger policy on climate change, Terry Tamminen was well-placed to comment on how the issue of scale plays into the politics of the issue, and naturally provides a window of opportunity for the Governor (and California) to make a difference on a world scale. He referred to the California delegation's participation in the Montreal (2005) Conference of the Parties on the UN FCCC,[135] noting that: "… people of course always focus on the absence of the United States and the policies of the Bush administration. The next point is always then: 'okay, but what's happening in the United States despite the federal government, the various states are doing things?' And they frequently then quote Governor Schwarzenegger saying while there's others who want to continue to debate the science, you now have this leading voice who's looked at the science and says no, no, no, debate's over. Let's get on with the solutions." He underscored the global significance of California's action when he said: "…I mean, anyone can reduce greenhouse gases, but [the challenge is to do it] in some way that actually will make a difference, both in California and worldwide."

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[134] For example, see Carlson 2003 on motor vehicles and Taylor et al. 2006 on stationary sources among other examples. Carlson attributes catalytic converters and hybrid vehicles as among the technological innovations that have been brought about by aggressive air pollution regulations in California.

[135] California has continued to lead delegations to subsequent COPs, also joined by representatives from other state governments.

There was much agreement amongst those interviewed on the potential for California to influence worldwide trends through these early actions on climate change. For example, Jeffrey Callison, noted: "And so California tries to do what it can to mitigate climate change. Of course to a certain extent it's symbolic because there's only so much the state of California can do to mitigate global warming. But nevertheless with California being as large as it is, and …having such a huge economy and so much industry in California, that nevertheless it is substantial..." Ralph Cavanagh, of NRDC, also noted the conscious effort of California policymakers to affect action across multiple scales: "California leaders on this issue are without doubt trying to influence national action." At a minimum, California's leadership sends a market signal that a significant global economic power is taking serious action to address climate change. This marks the beginning of a new regulatory era where emitting carbon or other GHG carries a price tag.

There remains a question about whether it is possible to take ideas or policies successfully demonstrated at a smaller scale in California and reproduce them across the US or elsewhere. John White asked a question about whether this would be possible given the scale differences involved, when he said: "And yet the scale of it to me is still [a problem], the question is whether we can actually take states' action and replicate it." There is a view held among at least some central participants that California's leadership on climate change is valuable because it can (and likely will) have influence beyond the borders of California, through a "demonstration effect."[136] While the extent to which California actions are directly replicable beyond its borders remains in question, there is no question that what California has done in the past on energy and environmental as well as on air pollution issues has led the way for action in other states (Carlson 2003; Vogel 1995; Vogel *et al.* 2006; see also Chapters 5 & 6). Nevertheless an open question remains whether GHG policy experiments begun today will be successful and further whether they provide models or lead to technological innovation that can be "exported" beyond state boundaries.

9.3. Who is making policy happen in California?

A key driver of politics of climate change is who is advocating and who is opposing policy and how different interest groups and actors are combining forces to support (or oppose) policy. Bringing the solutions forward in policy decisions requires a broad base of political support and a narrowed base for naysayers who would choose either to ignore the problem or to define it as a national or international issue to be tackled only on a grander scale. Several different groups of

[136] David Vogel has described this as "the California effect" (Vogel 1995).

actors are relevant in the climate policy arena in California and each of these are outlined briefly here: non-governmental actors, most notably the environmental advocacy community and the business community; governmental actors and their political leadership, most importantly from the Governor himself but also from state legislators and, from within the state bureaucracy, high-level political appointees representing various state institutions with responsibilities for implementing policies in areas relevant to climate change.

9.3.1. The unique role of Governor Schwarzenegger

The Governor's 2005 announcement of GHG emission reduction targets was anxiously awaited by environmental advocates and was seen by many as a "turning point" for climate change policy in California. Many of those interviewed point to the Governor's leadership as the driver that moved climate change from the back burner to the front of the State's policy agenda. Adrienne Alvord confirmed that Assemblywoman Pavley, already a champion of climate change policy in California, was among those awaiting the Governor's leadership. She said that in 2004: "…Fran decided to introduce AB32 as kind of a 'spot' Bill on climate and move it along and see where Schwarzenegger got to, because she felt it was important to have somebody of his stature do something positive, everybody said he was going to." As Shannon Eddy, of the CPUC, said: "What the Governor did was monumental in terms of setting policy and setting the agenda. Not just for California, but putting California on the map nationally and even globally." At least one person interviewed had a more cynical view of the Governor's leadership on the issue, suggesting that it was politically motivated. Referring to other contentious policy reforms that Schwarzenegger had advanced in this period, Norm Miller said: "…the Schwarzenegger thing is a political issue. ...Schwarzenegger has made a shift from being an aggressor against certain aspects of the non-business sector of the state so he can get re-elected."

This suggests that Schwarzenegger may have used climate change to position politically on a highly visible environmental issue. Vic Weisser, President of the California Council for Environmental and Economic Balance – a not-for-profit business organisation – said: "…he is your classic West coast L.A. Republican. You know, liberal on social issues, liberal on the environment, conservative fiscally. … I think it's very important to him to differentiate… politically to differentiate himself from Bush to win in California. This is a perfect issue for him." Another interviewee also suggested at least some level of political motivations in saying: "I mean it's also true that he's always looking for the next blockbuster movie he can star in. Like millions and millions of dollars of levee restoration or, you know, blowing up boxes" (Anon2 2006). But

is Governor Schwarzenegger advancing the climate change issue only because it is a vote winning move?

Most of those interviewed considered the Governor's leadership to be founded in his own beliefs about climate change as a serious environmental problem and one that merits policy attention. Assistant Secretary of California EPA - Eileen Tutt[137] - said: "...what motivated him was the science, was looking at what was going to happen to this state. And even if we took actions and the whole world joined us, we're still going to have to adapt to the impacts that we've already created or brought upon ourselves for the next 100 years. So it's just a matter of how bad are you going to let it get? And that really motivated him."

Most of the interviewees believed that Schwarzenegger's stance on climate change was not politically motivated, but was instead driven by genuine concern about the issue. This was the case for Dr. Nancy Ryan, who moved from a position as an environmental advocate at NRDC to become a civil servant and the personal advisor of CPUC President Michael Peevey. She said: "I don't believe it's a political ploy. …When he came in, he kept the people in place, and the ball rolling. He did that despite what the Chamber of Commerce has had to say about it. So, I'm a Democrat, worked in an environmental organization, I have no problem, no discomfort about working in this administration, because I don't think I'm participating in window dressing." An independent expert who is active in California energy policy circles, Steve Schiller said of the Governor's interest: "…his advisors [tell me] …his eyes light up, he gets excited and he's really interested in dealing with climate change." Finally, Michael Peevey, President of the California Public Utilities Commission, stated: "Schwarzenegger became Governor and took an interest in this topic, where[as] before there hadn't been any interest in the Executive branch of government, other than in the regulatory bodies like the PUC and the California Energy Commission." Michael Peevey also noted that the Governor is not originally from the United States and that this may have influenced his views: "…the fact that he grew up in Austria, …suggests in many respects he has a European attitude, more, more sensitive on environmental issues than some would expect."

A pragmatic explanation of the Governor's leadership links to California's cultural bias to favour environmental protection through policy and broad bipartisan support for action on climate change (see above). When asked why California was moving ahead on climate policy, Chuck Shulock of Cal EPA said: "the real driver was almost the citizens' and the leaders' view of what

[137] Since the time of the interview, Eileen Tutt has been promoted to the position of Deputy Secretary of Cal EPA.

California's about from environmental protection. You know, we're a world leader, we're always out there on the cutting edge, and it just kind of seemed like well, this was the next frontier, and so of course, California needs to move into that policy space." Others reinforced this idea. Steve Schiller, said: "…there are people who are really proud that we're a leader. The Governor has said that. Says you know, we're a leader, we're not a follower, we're a leader. We're going to show how this is done. And so …that attitude I think is part of it"

The Governor's leadership position on climate change has most certainly also been influenced by his political advisors. A prominent figure in this respect is Terry Tamminen, former Secretary of the California Environmental Protection Agency and now chief energy and environmental advisor to the Governor. Several of those interviewed linked the Governor's position on the issue to Terry. For example, Amy Luers of UCS stated: "The role of Terry Tamminen is huge and incredibly central to this being an issue." Having been with the Governor at the outset of his political career, Terry Tamminen designed the environmental platform used by Arnold Schwarzenegger during his election campaign and has worked hard to position the Governor for leadership on this issue. He is also a personal friend of the Governor's and has been influential in his thinking on this issue (Tutt 2006i). Initially in the position of Secretary of CalEPA and later in the position of energy and environmental advisor for the Governor, working in the Governor's inner office, Terry Tamminen continued to influence the Governor's position on the issue of climate change throughout 2006.

The Governor and Terry Tamminen also have close ties to Bobby Kennedy, Jr. who is known in US circles as an environmental leader (Hertsgaard 2004). Shannon Eddy, the CPUC advisor who works directly for the Governor's Office, said of the Governor: "He's got a personal commitment. It doesn't hurt that his wife is a pretty liberal democrat..." His wife is also Bobby Kennedy Jr.'s first cousin and so part of the well-known liberal Democrat Kennedy clan. According to Shannon Eddy, the Governor aspires to be: "… the most environmental Governor this state has ever seen."

Leadership from the governor on the difficult issue of climate change may have come at the expense of dialogue and consultation around the issue, at least in the early days of setting the initial state-wide policy goals. As Dominic Dimare of the California Chamber of Commerce said: "…he announced these goals without really consulting anyone from the general business community." But political leadership does not occur in a political vacuum; it is also linked to public opinion. As noted above, public opinion research in California indicates that environmental issues generally matter to the public and, since 2000, there appears to have been bipartisan support for action to address climate change and this in many ways empowered the Governor.

California's leadership on climate change is thus driven in part by its cultural preference to protect the environment. California's socio-environmental history has contributed a strong base of experiential knowledge to help shape this cultural preference for environmental protection into what appears to be a strong social norm to support political action on climate change today. Whether or not the Governor is seriously committed to the issue of climate change is perhaps less important in the long run than whether he enables and supports state institutions to effectively implement Assembly Bill 32 and to set in place a framework for action over time.

9.3.2. State institutions and their leaders: Commissioners Boyd and Peevey

Governor Schwarzenegger's climate policy initiative reframed the debate about climate change in California. Under the Governor's leadership, the debate shifted away from the view that global climate change is not an issue for state action. Instead, his starting point is one that highlights past strengths of California's leadership in key areas of related policy, positioning California to gain economically from leadership on this issue.

Politically savvy leaders on the climate change issue can be found in different parts of the government. Although Governor Schwarzenegger's leadership propelled climate change to the top of the policy agenda, California's actions on climate change pre-dates Governor Schwarzenegger's initiative (Chapter 5). Initial attention to climate change began in the state legislature, led first by State Senator Byron Sher from 1988 on, and then later by Assemblywoman Fran Pavley with the landmark vehicle legislation in 2002. Similarly state government leadership on the climate issues emerged in the interim in the Resources Agency through former Resources Secretary Mary Nichols, and deputy Secretary James Boyd, and in CalEPA through Winston Hickox, in their efforts to raise awareness about the climate change problem across state government. The first formal inter-agency task force on climate change began in the late 1990s and was led by the CEC.

James Boyd became Energy Commissioner in February 2002[138] and he has provided essential leadership for the early inter-agency climate change consultative process within the state as well as for a consultative stakeholder process on climate policy. Ultimately, both processes ceased to operate so as to make "room" for the new inter-agency Climate Action Team established by Governor Schwarzenegger in 2005. However the CEC led early consultative process clearly laid the ground for decision-makers, promoting understanding of the problem of climate change in a

[138] Governor Schwarzenegger reappointed James Boyd for a second five-year term in February 2007.

California context and a range of possible solutions even before the business of climate change policymaking began in earnest (see Chapter 6).

California's attempt to deregulate electricity and the crisis of 2000-2001 was a turning point for energy policy in the state. In energy policies to follow, attention to climate change and other environmental issues grew. The state government reasserted itself as a champion of resource efficiency policy through collaborative action across state institutions that regulate the energy sector. The CEC, through the leadership of Commissioner Boyd, brought attention to climate change as a key challenge in the energy sector in the period from 2002 on. Collaborative activity among the state's energy agencies increased at this time resulting in increasingly clear guidance on climate and energy issues through the Energy Action Plans I and II (California 2003; California 2005e).

Also by 2004 or before, the CPUC had become a central actor to contribute to the emerging policy and regulatory framework for GHG mitigation in the investor-owned utility sector (both electricity and natural gas). As Julie Fitch, a Director of Strategic Planning at the CPUC, pointed out, there is individual leadership on climate change at the level of the Commissioners within the CPUC. She said: "I would say ...the reason we're here is mainly due to the personal interest of the Commissioners. …if there is one, I'd say it is President Peevey, who's been the biggest driver, but certainly supported by others." Shannon Eddy, special advisor in the CPUC reporting to the Governor's office agreed with this view, when she told the story about the GHG performance standard or cap policy for the power sector. She said: "[Commissioner] Mike Peevey is very interested in climate change. [Commissioner] Dian Grueneich is very committed to climate change. They actually went forth with the greenhouse performance standard against the protest, to a certain degree, of the [Schwarzenegger] Administration." Thus under the leadership of the President of the CPUC Michael Peevey[139], the CPUC has set out bold new policies and strengthened the regulatory framework for the state's energy and environmental policy under the banner of climate change.

Lainie Motamedi, Senior Policy Analyst of the CPUC Strategic Planning Division, explained how climate change emerged as an issue in the CPUC. She dates some of the initial thinking on the issue back to mid-February 2004. She explained how the dialogue began with analysis of the issue in the California context: "...we talked about this issue and decided to pitch it as a White

[139] Michael Peevey was appointed to the CPUC by Governor Gray Davis in March 2002 and appointed President of the Commission in December of that year. See: http://www.cpuc.ca.gov/static/aboutcpuc/commissioners/01peevey/bio.htm.

Paper to President Peevey… knowing that he personally has an interest in environmental forward thinking …and might be receptive to us… to [the] Strategic Planning [Division] doing a little bit of work to figure out how we fit into the California context." Lainie Motamedi continued to highlight the timing of this work on the first CPUC White Paper on climate change: "I was writing the paper and working with him on this ...when Kyoto went into effect. Russia finally ratified[140] and so ...it kicked off that whole process …you know, 'Oh, wow. Okay. There's even greater reason why, as a regulatory agency we should be aware of what's happening on the international landscape.' …that paper was really just to say generally what is climate change, what does the scientific community say about it, what are the emissions in the state of California and, what's the intersection between the California Public Utilities Commission and emissions for California." This White Paper became the basis for a public workshop in early 2005 and exchange on the issue of climate change, the first in the nation for a state-level public utilities regulatory commission (Motamedi 2005).

This is an example where relevant institutions in California were aligning to lead the early charge to organise a coherent response to climate change, even prior to the Governor's Executive Order and the legislature's leadership to pass AB32. Lainie Motamedi of the CPUC, noted that their February 2005 "en banc" workshop was particularly novel. She said: "[It was] the first PUC type meeting in the country, where PUC said, 'We care about climate change and we're going to be [addressing this] in our regulated utilities -- to put them on notice that they need to start planning for these types of issues, specifically related to financial risk as well as sound environmental policy going forward and developing strategies to reduce their emissions.'" She continued: "…there was a whole lot of energy that came out of that in '05 and especially because there … were so many agencies that came to preside over that meeting. It wasn't just a PUC thing." The 2005 en banc workshop appears to have been a turning point for many government and energy sector decisionmakers, making clear that climate change was to become a regulatory issue in California.

In March 2005, a follow up workshop continued the policy discussions on climate change (CPUC 2005e). Lainie Motamedi explained it was: "…specific to the regulated utilities, …talking about the concept of an emissions cap. …a really, really good discussion about …what was totally unworkable, what might be more workable and developed a framework for policy direction on that issue." So the CPUC call to action had gained the attention of policy makers throughout the

[140] Kyoto Protocol entered into force in 16 February 2005, however Russia's ratification was in November 2004.

state and begun to focus the policy debate on concrete questions of implementation of climate policies, even prior to the Governor's bold announcement in June of the same year.

In Lainie Motamedi's view, the Governor's announcement provided a platform for even stronger action at the CPUC on climate change. She said: "all said, all these different pieces coming together ...have really opened up an opportunity for the PUC to push probably harder than we ever would have thought because having the Executive Order was hugely significant." Shannon Eddy seemed to agree with this view. When asked whether state policy to address climate change would have moved ahead in the absence of Governor's Schwarzenegger's initiative, Shannon Eddy said: "…what the Governor did was light a fire under people." More specifically Shannon Eddy noted that the Governor was not alone, that each of the different agencies and the legislature had important roles to play in moving the climate issue ahead: "The PUC, I know, …will continue to move forward regardless of what's happening in the [Governor's] Administration. Obviously, the Air Resources Board here in California is working on moving forward with the Pavley reg [regulation] and the Legislature's very interested in climate and has been moving forward."

9.3.3. Other leadership across state institutions

On the air pollution side, the largest and most experimental centre of technical innovation and expertise in the state is based in the South Coast Air Quality Management District (SCAQM). A number of individuals with leadership roles in the SCAQM District have gone on to provide state-level leadership on climate change and related issues. In particular, Jim Lentz and Alan Lloyd were two prominent leaders of the regional regulatory institution. Jim Lentz is currently a member of the Board of the Energy Foundation, a prominent philanthropic organisation supporting energy and environmental initiatives at state level across the US, as well as in China. Alan Lloyd went on to become CALEPA Secretary under Governor Schwarzenegger where he led the state Climate Action Team until his retirement in early 2006.

The role of CARB is also one of leadership on the climate change issue. Historically its role on climate change was confined to the legislative mandate emerging from the Pavley legislation that required it to regulate vehicle CO_2 emissions. More recently, the CARB has been charged with implementation of Assembly Bill 32 (see Chapter 5). Prior to that and throughout the battle over the Pavley vehicle regulations, the CARB has been unwavering as the chief regulator for air pollution from vehicles, often in the face of strong industry opposition. Following a long history of adversarial regulatory relationships, the vehicle industry is currently contesting the legal authority of the state of California to regulate CO_2 from vehicles (see Chapter 5).

The story about leadership would not be complete without a mention of the role of the state legislators to address the issue of climate change. In a prescient manner, Senator Byron Sher was the first to put the climate change issue on the map of environmental laws in the state, with his landmark legislative actions of 1988 and later. The Registry Bills came next (2000/01) and this was followed by the Pavley Bill targeting vehicle CO_2 emissions and championed by Senator Fran Pavley of Santa Monica. More recently Senators Nuñez and Pavley worked together to pass a mandatory cap on state-wide emissions for the year 2020 (AB-32), and Senators Perata and Levine led efforts to extend the coverage of CPUC regulatory measures on GHG emissions and energy efficiency in the power and natural gas sectors to municipal utilities. Combined these measures demonstrate that leadership on the climate change issue spans now roughly two decades and emerges from actions from a number of individuals across a range of legislative and government institutions. It is the alignment of the leadership with relatively independent authority across these institutions that has helped to propel climate change into the public sphere and to the top of the policy agenda in California (see also Chapter 6).

9.3.4. Coordination between large institutional players

An ongoing challenge for the state in developing climate change policy is ensuring that all state institutions and agencies move in the same direction, or while not necessarily at the same pace, at least in harmonious directions. This challenge is evident in the effort to design concrete measures to implement the Assembly Bill 32. As British Petroleum (BP) environmental affairs manager in the western US, Denise Michelson, said in 2006: "…coordination between all the agencies is another issue that I see [that] potentially jeopardizes a well-designed program. …So you have one agency stepping out in front of another agency and there seems to be lack of coordination when it comes to a cohesive program…." Denise Michelson was particularly concerned about the cap and trade rules that might emerge in California, and the risk of CPUC policy preceding a more broad-based trading rule that could emerge across multiple sources in the state. BP has argued that a cap and trade system is the most economically efficient way to proceed with the implementation of the state's aggressive mitigation targets (Michelson 2005). In its original 2005 policy statement laying out the intent to cap GHG emissions in the power sector, the CPUC had stated its intention to move towards an offsets or cap and trade system in this sector (CPUC 2005f), a policy that is technically possible because the CPUC regulates investments made by investor-owned utilities (see Chapters 4 & 5). The CPUC policy statement preceded the broad debate at state level that accompanied passage of the 2006 legislation and was clearly making some large industry players nervous about pre-empting a larger, better coordinated effort.

It is interesting to note the origins of the independence of CPUC and hence its authority to move ahead on an issue such as climate change, even if other parts of state government are not entirely in agreement or moving at the same pace. The CPUC is an independent body, led by a Commission of five people appointed by the Governor and confirmed by the legislature. It is one of the few state agencies that is constitutionally created and therefore functionally independent of the Governor's office, once appointed. As Julie Fitch, a manager at the CPUC, explained: "We're separate …the obvious reason for that is because no Governor wants to be too closely associated with ratemaking, you know, raising electricity rates or gas or water, so that's the answer to structure. It started out as the Railroad Commission..." Now the focus of the Commission's work is the regulated investor owned utilities, spanning telecommunications, natural gas and the power sector in California.

Shannon Eddy, special CPUC advisor to the Governor's Office, explained that the CPUC is often out in front and noted the challenge to keep its policies aligned with others in the state. She said: "There are some cases where the PUC maybe moving a little faster than others feel comfortable with, but I think that's just the nature of even working in teams. You've got to negotiate things. I mean you've got to work with people and different people's goals and drivers." However it is most likely a healthy state of affairs to have some "competition" amongst state institutions and leadership on issues and some moving faster than others. After all, some of the good ideas for new policy often originate at a smaller scale, i.e. within a particular agency, and are then more widely legislated throughout the state. This was certainly the case for the GHG standard in the power sector, which was originally advocated within the policy discourse of the state's energy agencies (CEC 2003b; CEC 2005b), then targeted and eventually mandated by the CPUC across the investor-owned utility sector in the period 2004-2006, and finally legislated with full coverage of the utility sector, including municipal utilities, through the Perata Bill in 2006 (see Chapter 5).

9.3.5. Non-governmental participation and the California climate policy process

There is both a vibrant environmental activist community in California and a strong business sector, and both are active in climate policy decision-making. With the economy and population growing far above national averages, pressure on the environment and natural resources is omni-present. California is also politically pro-business and interested to attract ongoing business investments to continue to generate new wealth and jobs across the state.

Notable in the California policy debate is the active engagement of a core of articulate scientific experts and more generally the careful construction of scientific evidence about the risks of climate change in the California context. In the case of the environmental risk frame, this reflects

a deliberative-analytic or science for policy circuit of power and influence. The legitimacy of this argument for policy is based in scientific information and understanding but the production and communication of science has been shaped by the demand from the policy community and the nature of the debate within that community.

Often filtered through the media and other boundary objects or organisations (e.g. outreach materials from UCS), this information has shaped perceptions of the California policy elite such that climate change is perceived to present a threat to the health and well-being of California's citizens, to its economy and to its natural systems. Broad understanding amongst these actors that California is particularly vulnerable to climate change has provided a main source of argument to promote pro-active responses in the form of aggressive mitigation. In the words of one NGO participant, this argument is about "let's motivate mitigation" and it has permeated all of the debate to date that led up to and accompanied passage of the state-wide mitigation targets in 2020.

As noted in Chapter 7, interpretation of the regional science is emerging through an epistemic network of academic scientists working in tandem with state government to shape evidence about the effects that climate change will have in California. California regional science assessments, funded by both the state but building on a base of support from the federal government, are designed to be policy-relevant and timely to support debate.

This orchestration of the science demonstrates the active co-construction of knowledge in the climate policy process in California, where the environmental risk argument is constructed through an active interaction between this epistemic network of scientific researchers, environmental advocacy non-governmental organisations with the policy community. Combined their efforts have solidified understanding of the principal ways in which (unabated) climate change could affect California and Californians: e.g. through increased temperatures, fire risk, poorer air quality and coastal zone erosion and heightened flood risk. Yet while the regional science of climate change is essential to propel climate change onto an overcrowded policy agenda, it is not sufficient on its own to garner policy attention and to generate action on the issue.

Many non-governmental organisations are well-organised and resourced to influence policy decisions. Environmental non-governmental organisations (ENGOs) are particularly influential in the legislative arenas as well as other policy and regulatory policy processes (e.g. in the CPUC regulatory hearings and decision-making). One reason for their influence is their strong technical and legal expertise and technical credibility with the policy community. Another reason is the routine access that they have to policy decisions, especially through regulatory arenas where their

presence is permitted through clear institutional rules to allow non-governmental participants to be part of the policy process.

In the climate change and energy area, the largest and most prominent of the ENGOs include those that have national operations and satellite offices in California; these include Natural Resources Defense Council (NRDC) and Environmental Defense Fund (EDF) as well as Union of Concerned Scientists (UCS). A number of other local organisations also play a prominent role such as Center for Energy Efficiency and Renewable Technologies (CEERT). As Shannon Eddy, Special Advisor to the CPUC, said: "The Enviros are very strong in California on many issues and particularly on climate..."

The influence of the ENGO community is woven into the legislative and regulatory history of California on energy and environmental issues. This influence is evident from policy decisions in the late 1970s to place investments in energy efficiency on an equal footing as a supply option to be considered alongside of other energy supply investments (e.g. nuclear, coal or natural gas) (see Chapter 5). It was also evident in the passage of the more recent Pavley (vehicle) Bill in 2004 and the 2006 legislation (Hall and Taplin 2007; see also Chapters 5 & 7).

The ENGO community is also active in bringing scientific and technical information to bear on the policy debate through the interaction with the news media and the internet. This interaction is documented in the case of UCS (Cole and Watrous 2007), but the same is also true of the other major ENGOs. Chapter 7 highlights the science-policy interface or boundary organisation role that UCS has played on climate change to popularise regional climate change impact science in California. The existence of this boundary function in turn renders information about impacts in a California context more accessible to the media, to the public and to policy-makers alike. However there was also a strong base of context specific scientific research upon which they could draw and without this crucial ingredient any media campaign or outreach effort would inevitably have failed.

The ENGO community also plays an important "watchdog" role in environmental policy processes (Brown Weiss and Jacobsen 1998). Shannon Eddy saw this role as intertwined with media coverage of the climate change issue. She said: "I think the media's watching to see if this is real and so are the 'Enviros'. They're certainly watching the Administration to see if words will be met with commensurate action. …in a lot of ways the media is fuelled by the Enviros… I mean you'll see close linkages between the leaders of the environmental community and the writers [in the media]. …if there is an alarming burst of activity on this issue then it's reasonable

to think that leaders in the environmental community will pick up the phone and call their liaisons or their contacts in the media and say, 'Look. You should follow up on some of this.'"

Vic Weisser, of the non-profit business organisation known as the California Council for Environmental and Economic Balance (CCEEB) and California Environmental Dialogue (CED), highlighted that the media role was particularly important in the early days when climate change was just moving into the public sphere. He said: "the debate was initially brought to light by scientists and naturalists observing funny things happening, and that was reported and picked up by the environmental community who … I think very thoughtfully and successfully engaged the media." Thus the environmental community is widely recognised to work closely and effectively with the media on the issue of climate change, a strategy that appears to have helped to build political support for action. He continued: "Once the media became engaged, some politicians embraced the issue as one that they felt might have legs both in terms of the potentially disastrous consequences and in terms of their own political career." In the end, Vic Weisser concluded that: "…[it was] a combination of … both elected officials and appointed officials seeing the potential negative consequences of climate change as a real threat and a real political opportunity."

Business organisations appear, as compared to environmental organisations, to be less homogeneous in their interests and less effective in their influence on the directions and the shape of climate policy. Vic Weisser stated this outright when he said: "The environmental lobbyists are better than business lobbyists. They're more effective than the business… on this issue and by and large on all issues, environmental issues." When asked why, Vic Weisser elaborated: "They're more credible, they have much more effective grass roots operations, they're what politicians see as golden for campaigns, they're credible in the media and to the public far more than any business lobbyists are. … I think the environmental advocates in Sacramento run circles around the business community."

When Shannon Eddy was asked whether business actors were equally well organised as ENGOs, she responded: "No. But I think they're probably getting there. They're in a reactive state where the Enviros are working on an agenda that they've had for a long time, so I think the business interests are more reacting to what they're hearing." For example, there was active opposition from certain elements of business in California to the 2006 legislative initiative as well as to the Pavley Bill in 2004. Leading the charge of opposition to climate change legislation was the California Chamber of Commerce. They were joined by the conservative oil industry group, Western States Petroleum Association (WSPA). Umbrella groups for industry, organisations like WSPA are typically very conservative, more conservative than individual membership. Minnie Tsunezimi of Shell Company summed up the general view of this community when she described

the main challenges for climate policy in the state: "…it relates back to the fact that it is a one state only policy versus a global policy or even a national policy. I think that creates a challenge in terms of how do you do this so that you don't have disparate economic problems in California. How do you do it so that you don't end up having leakages[141] in California so that people move out of California?"

Vic Weisser pointed out that the business community was late in coming to recognise climate change as an issue. He said: "…climate change to many of the businesses in California years ago… four, five years ago… was an issue they wished would just go away. We don't want to deal with it -- make it go away." But over time, according to Vic Weisser, they are moving ahead: "…in fits and starts …to first, understand, 'oh God,' it's not going away. Second, [to] understand we're going to be part of the solution…" Over time, Vic Weisser suggested that if we are to limit and reverse climate change, this is about changing the "business model … because virtually every business, just like every person, is going to be affected directly by climate change and [by] the programs and policies that are put in place to deal with the underlying causes, the human causes of the climate."

Denise Michelson of British Petroleum, USA, further explained the mainstream view of the business community and the divide amongst businesses: "There is a huge divide between the business community and the environmental community …here in California the business community is staunchly opposed to any mandatory type programs around climate change. They feel that energy efficiency and voluntary programs can help get us there." Of course BP itself has not aligned itself with this more conservative business community, but instead has "…taken voluntary actions and precautionary actions because we feel that government and business should work together in order to address the climate change issue" (Michelson 2006i). In other words, BP was initially in front of the legislative wave and pressing for change, against the mainstream view of the business community.

Referring to climate change policy generally but also to the debate about Assembly Bill 32 (prior to its passage), Denise Michelson confided: "I think that BP has been swimming upstream on this issue …from mandatory reporting, which has always been our position, [to] cap and trade. Our pro-activeness has helped ...with access to the policymakers, but our pro-activeness has not made us friends in the industry." Nancy Ryan also highlighted BP's pro-active role when she said: "BP,

[141] Leakages in economic terms refers to activity changing location, in this case economic and GHG emitting activity such as business operations, due to differentials in cost or desirability of one location over another.

they're the only oil company that's actually joined the Registry. They positioned themselves, their whole beyond petroleum advertising campaign, so they've positioned themselves as being, for lack of a better word, green." However, in the end, BP did not support Assembly Bill 32 because it did not feature a strong requirement for emission trading (see Chapter 6).

The public utility companies are on the front line of the regulatory policy on climate change in California and as a result are very concerned. Shannon Eddy noted: "…they have a lot of concerns about ratepayer impacts of the greenhouse gas performance standard and really of all the, of those load cap issues that are being discussed at the PUC. I mean that's something that they're definitely concerned about." Yet even amongst the utility companies, there are important divisions on the issue of climate change policy. For example, Nancy Ryan of the CPUC pointed out the differences between southern California Edison (Edison) and Pacific Gas and Electric (PG&E) when she said: "I don't think that Edison is in the same league as PG&E on this. I mean PG&E is really much more interested in being proactive." Indeed, some of those interviewed cited Edison as one of the only companies actively questioning the scientific basis of climate change in the policy circles and debates. These differences reflect different business approaches or corporate cultures, which inevitably influence whether companies are leaders or laggards with respect to environmental performance.

Interestingly, Minnie Tsunezimi also cited wealth and business prosperity as one of the reasons California was able to tackle climate change. She said: "California is prosperous enough to be able to be talking about these issues. I think that if California were less prosperous and had more immediate pressing issues, then they would not have the opportunity to be talking about greenhouse gas as a priority issue." Yet, the long history of aggressive air pollution, and energy and environmental policy has not crippled California's current economy. To the contrary, California's economy is one of the fastest growing in the US and this phenomenal growth has occurred despite the strong environmental laws and policies at state level, sometimes far exceeding those required at national level (see Chapters 4, 5 & 8).

9.3.6. Progressive business intertwines with "enviros"

Importantly, California is home to some powerful green business lobbies, which tend to partner with the ENGOs to move policy towards greener outcomes than would otherwise be the case. Green business lobbies in California have generally favoured aggressive action on climate change (Doerr 2007; E2 and Progress 2004; SVLG 2006).

Progressive business interests therefore have intertwined with the "enviro" voice to press for common mitigation policy reforms in California. Nancy Ryan of the CPUC commented on this

when she said: "Progressive companies have actually been thinking about what this means for their business and - viewing it as an opportunity or something …[where] they have to manage the risk proactively, as opposed to try to eliminate the source of the risk. Organizations like Silicon Valley Leadership Group,[142] I think they represent a really different part of the business community. …the Silicon Valley Leadership Group, represents - a different slice of California that's very vocal and influential. And there is so much money down there. …. The big guys of all those companies …running the venture capital firms and the private equity funds. Those people are major campaign donors and they're very influential. A lot of them are more Libertarian in their perspective, but they also think if you don't address something like this, it's going to come back and get us, one way or another. We dealt with them a lot in my old job. Those are the kind of people who are heavily represented among funders, certainly for Environmental Defense, but I think also probably for the other major non-profits in the area." Thus at least in financial terms there is an intertwining of funding from green businesses or from new technology and knowledge economy firms and that of the environmental community in California, to support ENGO activities in the policy arena. Such a coalition is also consistent with the Baptist and bootlegger alliances that have been shown to be influential in both domestic and international environmental policy arenas (Vogel 1995; see also Chapter 3).

Julie Fitch of the CPUC also noted the strong support of the local green business community on the recent California Solar Initiative. She said: " 'New Voice of Business' is a group of business folks from San Francisco that are supportive and signed hundreds of letters of support on the Solar Initiative… the other one is the Bay Area Economic Forum, [they] actually came out in support of the Solar Initiative, too, which I was actually surprised at both of those." Combining the strong support of the green business community with that of the ENGOs has helped climate change or climate-related policies to emerge even in the face of some opposition from much of the mainstream business community. As Nancy Ryan said: "I don't think the Chamber represents the whole business community. But they're - more like the old fashioned, business community." Interestingly, there is not a formal alternative to the Chamber of Commerce for green businesses

[142] The Silicon Valley Leadership Group represents a significant slice of California's economy; the Group's website describes their membership of more than 200 companies as employing more than 250,000 people, constituting ¼ of the private sector workforce in the region, and "contributing more than $1 trillion to the global economy." The group was founded in 1977 by David Packard; its mission is to cooperate with local, regional, state and federal government to address major public policy issues (SVLG 2008).

but there is at least one organisation – the CEERT – that is a lobbying group for energy efficiency and renewable technology companies.[143]

Box 9.1: Non-governmental participation and CPUC decision-making: an example

Non-governmental organisations are active in the CPUC regulatory process and a recent innovation is to try to open elements of the policy implementation process more generally. These range from environmental groups to other specialised organisations with the social aim of protecting ratepayers and poor communities and companies. Devra Wang highlighted the energy efficiency goals set by the CPUC for the electric utilities and said: "*…that's something that I worked on with my colleagues here quite extensively."* Analytical inputs are also gathered and evidence presented through the regulatory process on different aspects of these issues and these inputs shape the final administration rulings.[144]

However the deliberative process for decision-making in this regulatory setting is also constrained by the legalistic nature of the process. While access is not formally limited, the technical and legal aspects of the regulatory system effectively limit participation to only technical experts and lawyers. Participants in these proceedings are largely large environmental non-governmental organisations or consumer interest groups or business organisations.

One interesting example of a non-technical participatory mechanism is the establishment of advisory bodies to guide utility decision-making and provide oversight to energy efficiency investments (CPUC 2005a). These Energy Efficiency Advisory Groups have been established for each individual investor-owned utility in California. In principle such a mechanism offers a less technical and therefore more accessible means of participation to knowledgeable and interested individuals or businesses. However, a prominent expert working in the field, Jeanne Clinton, expressed concern that even these mechanisms remain inaccessible to those who might be well-placed to advise for a variety of reasons. She said: "*who has the time and resources to participate in the public advisory groups? No one is paid. So they either have to come from organizations who are doing it pro bono and they have other resources to be able to afford to do this, or they're good citizens who .. have time and ability to [participate]. ... But you won't find businesses represented there, because businesses don't have time for this. And you won't find business associations there, because they want to influence the rules, but they're not going to sit around and help design programs or figure out what the strategies should be."* This highlights the difficulties of any mechanism attempting to "democratise" oversight and governance of these specialised regulatory programmes.

The opportunities for dialogue between non-governmental actors and policymakers do not always have to be formal to be influential (see Box 9.1 and also discussion Chapter 6). One example of deliberative process is found in the early CEC led intergovernmental consultative process that began through dialogue to develop understanding about climate change among the individuals responsible for environmental issues throughout the large state government bureaucracy. Another example, though less well documented, was the California Environmental Dialogue,

[143] For example, CEERT was a sponsor of the "Coal Shadow" report discussed in Chapter 5.

[144] While technically these are not "public" hearings, they are open to non-governmental organisations choosing to register and then participate. Effective participation does require significant resources and expertise as the issues are often complex and legalistic as well as lengthy, running sometimes for a year or more.

which took place through the California Council for Environmental and Economic Balance (CCEEB) (Weisser 2006i; Ryan 2006i). The CCEEB brought key business and environmental stakeholders together with policymakers in informal exchanges about how to shape climate policy responses.

In both of these examples, i.e. that of CCEEB (California Environmental Dialogue) and that of the CEC led consultative process, off the record exchanges of views on policy options and strategies among elite actors appear to have helped to consolidate a sense of the importance of climate change as a public policy issue and to lay the ground work for the more focused policy action to come. Both processes were off the record exchanges and emanated from leadership or one or several individuals rather than being central to any formal policy process.

9.4. Conclusion

The research has explored broad questions of sources of legitimacy in decision-making in the case of regional climate policy in California and attempts to identify and to understand drivers of policy and social change. In a public policy context, Habermasian discourse theory of democracy highlights the power of communicative rationality, where legitimacy is derived from the circuits of power and influence that flow from the periphery of the decision-making process to the core and back again (see Chapter 2). This provides a theoretical framework for understanding interactions between "suppliers" of change on the one hand, and "customers" for change on the other (see Figure 3.3; Chapter 3). This theoretical structure provides a means to assess California's policy processes and identify more practical lessons for climate policy across two main themes: i) the nature and extent of communicative action as a driver of change; ii) the implications of this model for social learning and the evolution of policy.

California's experience leading up to the passage of the Global Warming Solutions Act in 2006 demonstrates a strong influence of an epistemic community, made up largely of non-state actors including local researchers, academics and NGO experts. It also shows an intertwining of interests from green businesses (ranging from technology and knowledge economy firms to venture capital firms) and that of the environmental community in California, to support pro-climate policy lobbying activities and participation in the policy process. Such a coalition is a type of "Baptist and bootlegger" alliance where groups with fundamentally different interests align to support a comment cause or environmental policy endpoint (Vogel 1995; see also Chapter 3). Combined these different networks of actors and organisations, working from the outer-periphery of the policy process, have been instrumental in putting the issue of climate change on the policy

agenda, to generate and promote new ideas and approaches in policymaking, and to keep the issue of climate change in the public sphere within the state.

It is thus possible to identify layers of actors that have been influential in driving change (see Table 9.1). In the core area, we find those in the government administration and with formal climate policy decision-making powers in California. This is a limited number of people and institutions, from the Governor and his office to the California state legislature. Going on to the next layer of the inner-periphery, we find a large number of semi-autonomous, issue-based institutions with broad authority to design and implement policy within the confines of their legal mandates and responsibility. These actors range from the Energy Commissions (CEC) to the Department of Forestry and Fire Prevention (see Chapter 6, Box 6.2). An important sub-set of these institutions played an active and important role in setting out climate policies and priorities prior to the 2006 passage of the Global Warming Solutions Act. Most important were the California Energy Commission (CEC) and the California Public Utilities Commission (CPUC) in the establishment of energy related climate change policies, and of course the CARB with their responsibility for the design (and eventually implementation) of the Pavley Bill regulations on CO_2 from motor vehicles.

Combined, this broad array of different types of actors and organisations and their formal and informal interaction with the California policy process have provided a rich variety of information, perspectives, evidence and arguments to support decision-making. Deliberative interactions amongst governmental and non-governmental actors in each of these core and inner-periphery policy processes have nourished new ideas and helped to shape outcomes that led up to and eventually culminated in the broad political support for climate policy and passage of the AB 32 in 2006.

Taking advantage of the change in direction, these "suppliers" of change have contributed to the active re-framing the issue of climate change (Kingdon 1984; Grindle and Thomas 1991; Schön and Rein 1994) under Schwarzenegger's leadership, presenting it as a "win-win" policy for the environment and the economy in the California context. The problem was at this point no longer framed as a global problem that could only be effectively tackled through national policy but it became a priority policy issue at state level. This breakthrough was made possible not just by the Governor's shift in position or in the more local framing of the issue, but by the bottom-up engagement of non-governmental actors in the outer and inner-peripheries of decision-making. The Governor, building on earlier efforts of select legislators and leaders within semi-autonomous state institutions, worked with non-governmental "suppliers" of ideas to replace "conventional" understanding with a new vision of the future. Collectively, they have re-framed the issues to

move policy ahead and to begin to move down the pathway of delivering this low-emission future.

Table 9.1 Habermas: Circulation of Power for Public Decision-making

Centre-Periphery Axis	Actors and circulation of power	California examples – leadership across the circle of power
Core area	Government administration, judicial system, parliamentary bodies: formal decision-making powers. Capacity to act varies with organisational complexity.	Governor's office (from 2005) Legislature: Sher legislation (1988 & 2000); Pavley Bill (2002); Global Warming Solutions Act (2006).
Inner-periphery	Various institutions equipped with rights and self-governance delegated by the state (*i.e.* universities, public insurance systems, professional agencies and associations, charitable organisations and foundations): informal decision-making powers, significant autonomy	California Air Resources Board; California Energy Commission; California Public Utilities Commission; CalPERS
Outer-periphery	Suppliers of ideas and customers and decisions: this includes experts, businesses, and consumers as well as the media; it is the civil-social infrastructure of the public sphere.	Academia, epistemic network on the impacts and science of climate change. Environmental advocacy: Environmental Defense; National Resources Defense Council; Union of Concerned Scientists. Business advocacy (green): Silicon Valley Leadership Group; E2; Center for Energy Efficiency and Renewable Technologies. Environmental justice, social justice (pro-poor): Redefining Progress Business advocacy (conventional): California Chamber of Commerce; Western Petroleum Association; California Council for Environmental and Economic Balance (CCEEB) and California Environmental Dialogue (CED).

10. CONCLUSIONS

10.1. Introduction

This concluding chapter aims to summarise both pragmatic and theoretical insights from the research, pulling out general conclusions. It returns to the key research questions and the working hypothesis set out in Chapter 1 (Box 10.1) to comment on the lessons learnt, putting them into conceptual context. The chapter is largely structured according to these research questions.

Box 10.1: Key research questions and working hypothesis

Overarching questions:

- What triggers policy action on global climate change at regional scale?
- What are the principal arguments, lines of evidence underlying the regional decisions to act on climate change?
- How do the "winning" arguments gain salience? What kind of decision-making process facilitates closure and action at local scale, when science and economic evidence is ambiguous, and politics high?
- How might regional action affect climate policy discourse nationally or internationally?

Cross-cutting themes:

- Regional risk characterisation of climate change and the science-policy interface: framing or "sensemaking" of climate change in a regional context;
- Issue-linkages: how do climate policies build on, fit or interact with other policy issues at this scale;
- Scale-linkages: how does governance of climate change at regional scales interact with national and global scale policy developments?

The working hypothesis of the research is: *the growing scope and capacity to act on climate change at regional levels of governance have potential to exert a "bottom-up" influence on national and international action.*

Beyond addressing each of these questions, the chapter also comments on the usefulness of the thesis methodology and on outcomes of the research in a more personal context, that is what I learned as a policy practitioner in undertaking this research project. Finally chapter returns to the main hypothesis of work to conclude on the last overarching research question: Does local action on climate change make a difference to action at broader scales and if so how? This last section of the chapter also highlights a number of emerging research themes that could usefully be investigated further.

10.2. What triggers policy action on global climate change at regional scale?

The initial research question is what triggers action on climate change at sub-national or regional scale. The question is meant to ask quite simply why? Given the broad economic and scientific understanding of climate change as a global environmental issue, requiring global co-operation for effective policy solutions, no nation-state or sub-national government could be expected to gain directly from unilateral action to mitigate emissions (see Chapter 2). Why would a state government, even if large, voluntarily choose to mitigate?

In tracing recent key developments in California on climate change the research has shown that the answer to this question may be found at least in part in California's pro-environmental regulatory history. A story emerges about how and why climate policy could move quickly in the absence of Federal action. It is a story that connects climate policy developments to California's past experience and institutional competence in related policy areas. This interpretation derives from looking "inside-out" at the policy process. It originates from the perceptions and recollections of actors that are directly engaged in climate policy decision-making in California today, one that sees climate change policy as a natural evolution of previous action in related areas, notably, as an extension of air pollution regulation and energy and environmental policies. As Hall (1993) suggests, it demonstrates social learning that builds on past experience to derive lessons for the future to shape policies on the relatively new yet related issue of climate change.

The historical timeline in each of these areas in California shows that the action was in part in response to scientific discoveries and events beyond California's boundaries or direct experience. For example, the discovery in the late 1940s of the harmful effects of indirect air pollutions from vehicles leading to the view that regulations were needed, and later in the 1970s, general concern about energy security and the spread of nuclear power which in turn focused attention in the US and in California on the need for energy efficiency. While federal attention also turned to regulatory solutions, the timelines show that action in California was generally swifter and more aggressive, eventually leading the nation's efforts in both areas. This past experience has in turn emboldened California's leaders of today to move forward quickly on the issue of climate change.

The case study shows that historical development of policies in areas related to climate change – notably to control air pollution and to boost clean energy – can be usefully situated in a conceptual framework for multilevel and social-practice governance (Hooghe and Marks 2003; Young 2002). Multilevel governance exists where authority to legislate and regulate is nested and hierarchical as well as polycentric in nature (i.e. organised around issues). The history of developments in California's regulatory institutions to address air pollution and energy policy was

originally driven by "grassroots" or "bottom up" action from a variety of non-state actors, notably affected stakeholders, policy entrepreneurial experts and environmental non-governmental organisations. Furthermore, this multilevel governance framework suggests that the scale of governance can be an important driver of change. While regional sub-national authority to make policy decisions is necessarily nested in national authority and policy frameworks (Dietz et al 2003; Hooghe and Marks 2003), powerful and large state governments, such as California's, expect to lead change and directly influence federal decisions if the opportunity arises.

Consistent with the social practice model of governance, the case study shows the social and political environment in California has shaped decision-making through institutions and policy elites within these to mould new rules, conventions and beliefs. In particular, California has shaped regulatory institutions to deliver on the promise of clean air and clean energy. This has occurred to a great extent through a polycentric network of devolved institutional authority (Foster 1997; Hooghe and Marks 2003), a governance framework that in turn has delivered a powerful force of innovation to deal with issues related to climate change. As Starr (2005) highlights, California has had a tendency to devolve authority and to govern through the establishment of issue- or location-specific boards and commissions (Chapter 4). The institutions relevant to climate policy include the CARB and its regulatory authority over air pollution, which has shaped the Pavley regulations of CO_2 from motor vehicles. They also include the CEC and the CPUC in the area of energy and environmental policies, working through regulation of public utilities for electricity and natural gas to bring forward energy efficiency and other clean energy solutions.

While authority is overlapping (i.e. for energy policy between the CEC and the CPUC), it has also been relatively independent. A more centralised state-wide political process on climate change, such as was launched under AB 32, is necessarily more complex and slower to act. In spite of the lack of a formal policy framework at the centre of state or federal government, the relative independence of these institutions in the middle of the decade helped to create a window of opportunity for their leaders to move climate policy forward. Furthermore, past regulatory achievements to curb air pollution, enhance energy efficiency and boost clean energy in California have created a sense of technological optimism and understanding that environmental performance can go hand-in-hand with a strong economy (Bernstein et al. 2000; Sanstad et al. 2006; Taylor et al. 2006; Roland-Holst 2008).

California institutions are not fixed in time but rapidly evolving in an iterative manner along with the discourse that they help to shape. As the state has exercised decentralised authority in these climate-relevant policy arenas, it has begun to gain experience that is empowering a network of

actors and interests to support strengthened and more focused action on climate change. Actions within individual state institutions on particular pieces of the climate change problem significantly pre-date the more recent movement in 2005-06 to create a comprehensive state-wide climate policy framework for mitigation. Specifically, early has grown in an organic manner from pre-existing institutional authority in related areas, in part due to the influence and leadership of individuals within these institutions to create "policy spaces" to bring change forward (Grindle and Thomas 1991). Notable in this respect is the leadership found in the CEC through Commissioner Boyd and the CPUC through President Peevey, both working together to lead early energy policy reforms, from 2003 on, that integrate concern about climate change. This experience underscores not just the role of the devolved institutional structure but also the role of individual leadership to bring about change in a way that integrates the new issue of climate change into existing policy frameworks.

10.3. What arguments and lines of evidence underlie the policy discourse at regional scale?

A second question for the research is: What are the principal arguments, lines of evidence and interests underlying the decision in California to act on climate change, to move climate change to a priority place on the policy agenda? The thesis uses the notion of policy frames to explore these questions where these are broadly defined, after Miller (2000: 211) as "perceptual lenses, worldviews or underlying assumptions that guide communal interpretation and definition of particular issues."

The California case clearly demonstrates the power of shifts in policy frames as a means to re-focus argument and interpret facts to support and enable policy decisions on contested issues such as climate change (Majone 1989; Schön and Rein 1994), where active frame construction was central to climate policymaking in California in the period 2004-2006. Consistent with earlier work on other topics (Miller 2000; Schön and Rein 1994), the California case study documents how the use of policy frames in the climate policy process evolves, both interacting with and affecting the interests of different stakeholder groups over time. Two dominant frames are identified in the climate policy discourse in this period and a third master frame, or meta-narrative, emerges when looking across these two. The first presents climate change as long-term problem of regional environmental risk in California, and thus a policy problem requiring urgent attention. The second presents climate change policy solutions as a set of "win-win" opportunities that benefit both the economy and the environment. These two policy frames intertwine and are complementary. Each focuses on a different part of the policy discourse, dealing with a different aspect of the policy challenge. One seeks to establish a

common understanding of the environmental problem to be addressed through policy, and the other focuses on the nature of the solutions to be advanced. When combined, these frames lead to a master frame, or meta-narrative that argues that regional action on global climate change matters and that it is imperative to act at the regional scale, especially in the face of inaction elsewhere.

There are of course competing narratives or policy frames and no single, correct interpretation of the "facts" (Majone 1984; Hawkesworth 1988; Schön and Rein 1994). These frames co-exist and necessarily compete over time, confirming findings from other interpretive policy analysis (Miller and Edwards 2001a; Schön and Rein 1994; Yanow 2000). These range from presenting climate change as a problem of global environmental degradation, where the world is broadly at risk from human activities, to one of local disaster management where solutions are largely through local adaptation (Miller 2000). Another possible frame is to define climate change as an energy problem where technological management is a key to resolving it (Miller 2000; Lindseth 2004). Given the multilevel governance dimensions of climate change, a central research challenge is to understand how tension is resolved over contested meanings and frames for interpretation in any decision-making context (within and across scales) across a wide range of relevant actors and organisations. In other words part of the analysis attempts to understand how these policy frames have come to dominate.

The case study shows a change in dominant policy frames in California, where prior to 2002 climate change was presented largely as a global issue to be dealt with principally through national policy. By 2005, clear shifts in dominant policy frames had occurred, which combined to present climate change as an urgent issue for regional policy action. This suggests that there is power in the ability to construct and shift policy frames through persuasive arguments in a regional context. The dominance of the policy frames 'climate change as regional environmental risk' and mitigation policy as 'win-win' in California demonstrates a co-mingling of "facts" and "values" in the policy process in California, and an intertwining of expert and local knowledge, which in turn supports a co-constructionist explanation of policy change. Further the construction of these policy frames interacts with and affects the interests of different stakeholder groups at regional scale, demonstrating a social-practice model of environmental governance.

10.3.1. Climate change as regional environmental risk

A first dominant policy frame for climate change in California is to present it as a problem of local environmental risk. This policy frame is built upon evidence from regional assessments of climate scenarios and of predicted impacts and appears in recent legislative and administrative action on climate change in California (2004-2006). In this framing, Californians are seen as

particularly exposed to even small changes in the climate, where impacts are expected to be particularly compelling and extraordinary. The dominant discourse advances action to protect the global climate as a moral imperative, calling on the state and its citizens to lead the nation and even internationally in the fight against climate change. In parallel, there is clear recognition that California on its own would not alter local impacts of climate change. This policy frame nevertheless establishes action on climate change as a logical extension of the long history of Californian leadership on environmental issues, and calls for targets and timetables to make similar progress on the issue of climate change. It thus interacts with the second dominant policy frame, which advances climate policy as win-win to deliver benefits for both the environment and the economy (see below).

This regional environmental risk policy frame is unusual because it is used to frame mitigation policy (rather than adaptation policy). It becomes the explanation for why climate change is a problem that requires attention from regional policymakers. It is the answer to the question: *Why do we need to mitigate?* The use of this policy frame therefore becomes a means to shape social norms and understanding about what the problem of climate change means in the California regional context.

Adaptation and environmental risk are also typically coupled in climate policy discussions at national and international scales, where it is rare to find mitigation coupled with environmental risk. For example, California's use of regional environmental risk as a policy frame for mitigation also varies significantly from the approach that has been institutionalised by the IPCC. Since 2001, the IPCC's comprehensive assessment of the climate change literature has been structured in three separate volumes: science; impacts, vulnerability and adaptation; and mitigation (e.g. IPCC 2007a, b, and c). This frame structures the environmental risk or impact and vulnerability dimensions of the climate change problem alongside of an adaptation policy solution set, treating mitigation policy largely as a technical and economic set of challenges to limit emissions cost-effectively. Such an approach functionally separates mitigation from the environmental risk outcomes that derive from choices in this area. Further, the separation of impacts information from discussion of mitigation policy runs the risk of weakening the argument for action. It does not answer the question: *why should we mitigate?* The California policy elites appear to have anticipated this problem and structured their arguments to pro-actively respond to this seemingly simple question, effectively helping to shift the debate. In the words of one policymaker: "…you've got to tell people why you should care about this" (Tamminen 2006i). Thus the California mitigation policy frame, presenting climate change as problem of regional environmental risk, is unusual but perhaps essential in a regional context. Without such a framing

to contextualise climate change it is difficult to derive meaning for the issue to support policymaking.

The regional environmental risk policy frame relies to a great extent upon expert knowledge, in particular upon regional climate impact science. As a result, an active science-policy exchange is a central part of the discourse in California and, in this context, science-policy "boundary organisations" and "boundary objects" serve an essential function (Gieryn 1999; Gieryn 1983b; Jasanoff 1990). The boundary functions serve to popularise and communicate research findings, in part through the use of 'availability heuristics' including images and metaphors that resonate in the California context. Indeed, research has shown that the persuasiveness of climate change science depends in part on its representation in the popular media and on the use of metaphors that easily resonate with the local cultural experience, communicated in part through affect imagery (Leiserowitz 2006).

An active epistemic network exists in California to support a science-policy exchange on climate change. This network, in turn, it has contributed evidence to support the dominant 'regional environmental risk' policy frame. Comprised of representatives of the scientific research community and of non-governmental organisations, the network has helped to shape understanding of climate change in the California context. To some extent, the epistemic network has been facilitated by the state's active research programme on climate impacts in California; however on-going federal research funding on regional climate science provides another stable source of financial support to keep researchers engaged in state-of-the-art regional scientific assessment. The non-governmental community is directly engaged, working with scientists to package scientific findings for communication to a lay audience, including the policy elite. One environmental non-governmental organisation (ENGO) in particular, the Union of Concerned Scientists, has usefully played a "boundary" organisation role, working to bridge the boundaries between science and policy. However having an ENGO play this role is not without controversy; the affiliation with an advocacy organisation is seen by some scientists to potentially taint the credibility and usefulness of their research findings. In several instances, scientists have played policy entrepreneurial roles to directly communicate scientific findings to lay audiences through the use of the media and through face-to-face exchanges with policy makers (including those organised by UCS). UCS outreach activities have, in any case, systematically served to enhance dialogue between policy elites and the scientific community at critical junctures in the policy process thus strengthening understanding of climate change science and solidifying the general policy rationale for action to protect the climate.

The cultural context for decision-making on climate change is also important. Public opinion polls in California suggest that some of the explanation for policy change may lie in the cultural beliefs of Californians, who enjoy a particular respect for the environment and support strong environmental action (Baldassare 2000-2006). This typically translates into bipartisan support for environmental policy. There are nevertheless multitudes of contradictions and contrasts embedded within the pro-environmental cultural bias found in California. These range from the strongly pro-growth policies of the current government to the issue of unfettered individual consumption with little attention to the link to environmental outcomes. One example is the explosive growth in vehicle use in the state, where increases in the volume of vehicles miles travelled offset important gains from ongoing investments to limit the emission intensity of vehicle use.

A base of regional climate science is an essential ingredient, but science alone is not sufficient to advance policy arguments for action. The State's particular vulnerability to climate change in areas that are emblematic or that have strong cultural as well as economic value is present in the minds of the policy elite. Further, both the state government and the ENGO community have actively used photography and other visual media (i.e. film and internet) to communicate the meaning of climate change risk to lay audiences. Typical environmental cultural metaphors, such as snow pack in the sierra and water, have become central in efforts to communicate climate change in the California context. In addition, California's long-standing vulnerability to fires, heat waves and water shortages, which will only worsen with climate change. These are a filter through which ordinary people and policymakers alike have come to "make sense" of the climate change problem and to relate it to their own experience. This understanding has been shaped in part by the popularisation of climate change impact science, which in turn is shown to be undertaken by politically-savvy ENGOs and, increasingly, by the state government itself. These metaphors and imagery have also served to heighten public awareness in the already "green" cultural context found in California. California's use of the local environmental risk policy frame supports a public perception of climate change as an "environmental bad" and may also have helped to align strong bipartisan political support for aggressive mitigation action.

In summary, the regional environmental risk argument was constructed through interaction between an epistemic network of scientific researchers and representatives of the ENGO community working with policy elites to solidify understanding of the principal ways in which climate change would affect California and Californians. Broad understanding amongst these actors that California is particularly vulnerable to climate change has, in turn, provided a main source of argument to promote pro-active responses on mitigation goal-setting and policy implementation. In the words of one ENGO participant, this argument is about "let's motivate

mitigation" and it permeated all aspects of the debate that led up to and accompanied passage of AB-32, the legislation that codified state-wide, medium term mitigation targets (i.e. for 2020).[145]

10.3.2. Regional climate change mitigation as 'win-win'

The second dominant policy frame presents mitigation policy as a 'win-win' option for California. It argues that California leadership can mobilise change in the global (market) context for clean technology, especially given the size of its economy and its past history of leadership in this area. It is argued that by stimulating innovation and new markets in California, strong mitigation policy will benefit the local economy, local environments and human well-being thus leading to "win-win" outcomes. Such policy is expected, in this view, to become a motor of technological change, which will diffuse more broadly in the US and beyond through increasingly global markets. Contrary to the environmental risk policy frame, this frame does not rely upon formal expert knowledge but to a great extent on knowledge from past regulatory experience.

Predictably, the policy process in California has been criticised as not sufficiently considering comprehensive assessment the economics of mitigation policy. The policy process through 2006 demonstrates only a marginal role of formal expert knowledge on the economics of climate change, relying instead to a greater extent on a "belief" that derives from experiential knowledge that environmental protection is an integral part of delivering sustainable economic development in California. While formal economic analysis is available today, and is increasingly used to support arguments in the policy process, much of the most relevant analysis was commissioned ex post in part to support prior decisions rather than being used to assess options in advance of decision-making.

With respect to expert economic arguments for (or against) climate change action, it appears that a serious knowledge gap existed in 2005 when Schwarzenegger announced the new policy, and that to some extent this gap persists today. While initial expert analysis provided some evidence about the costs of mitigation measures in the California context suggesting that there would be net economic gains from mitigation action rather than net costs (Bailie and Lazarus 2005). Later studies provided more comprehensive and formalised macro-economic assessments but

[145] The special vulnerability of the state to climate change impacts also emerged as one of the key legal arguments in the state's defence of its right to regulate CO_2 *e.g.* in the legal battle over the Pavley vehicle regulations (California 2008c; California 2008b).

confirmed the basic conclusion (CAT-ES 2007; Roland-Holst 2007).[146] In spite of strengthening the "official" macro-economic analysis over the period 2005-6 (and beyond), it is clear that the state government used economic analysis largely to bolster political argumentation for decisions already taken, i.e. on greenhouse gas reduction targets and on preferred policy approaches to meet them. As such, expert knowledge was not the most important source of evidence used to support the decision on aggressive mitigation policy.

A main source of argument in favour of mitigation is past experience in the business, regulatory, and political arenas from dealing with environmental issues. This experience appears to have brought about a sense of technological and economic optimism, arguing that it is possible to push the technological frontier forward over time. It experience has also shaped norms and beliefs that environmental performance improves with technological progress and that the costs are non-existent or at worst, affordable given the wealth of the state. Notably, California's experience is based on past adversarial politics on energy and environmental issues, where regulators have challenged vested industry interests that fight against change.

In an analytically objective context, it would be necessary to highlight that macro-economic evidence, which is ambiguous at best with respect to the potential for "win-win" outcomes. Some evidence exists to show that California's economy has benefited from past actions to invest heavily in energy efficiency and air pollution control technologies, with a range of promising benefits: cleaner cities and healthier environments for people; lower energy bills for the poor relative to the wealthy; and a vibrant, high-growth economy including a range of high technology industry and research clusters throughout the state (Bernstein et al. 2000; Roland-Holst 2008; Sanstad et al. 2006; Taylor et al. 2006). This optimistic picture must be countered however with economic modelling of GHG mitigation that typically predicts some slow-down of the economy with imposition of significant emission constraints (Barker et al. 2007; IPCC 2007c; OECD 2008b).[147] While some of California's own modelling studies show "win-win" outcomes for the 2020 target (e.g. Roland-Holst 2008), these results rely on expectations about endogenous technical change for which empirical evidence is still thin (Pizer and Popp 2007). It is therefore equally possible to design studies to show the opposite (e.g. Stavins et al. 2007). Interestingly, the California policy process has managed to largely by-pass the "duelling models" discussion on the

[146] Despite the apparent consensus, it is interesting to note that conclusions of these studies were eventually challenged in the academic literature (Stavins *et al.* 2007).

[147] Even if a policy scenario leads to greater technological change in a given period, there are likely to be limits to the pace of innovation that can occur in a given time frame to lower the costs of mitigation.

cost of GHG mitigation. In the regional political context, California decisionmakers have relied instead on more anecdotal evidence from past action in related regulatory arenas, building on local knowledge and "belief" about the benefits of pro-environmental policy to build persuasive arguments for mitigation policy.

To some extent, the limited role to date of formal economic analysis and information in the policy process may be attributed to the early stage of policy development. California is in the earliest stages of climate policymaking, where the key first step is problem recognition (Lasswell 1971), or in Kingdon's terms agenda-setting. Of course, there will be winners and losers in any shift away from business-as-usual and identifying these becomes a critical part of policy design and implementation, where alternative policy instruments and options are considered. Ideas on alternative policy solutions have not been absent from the discourse to date but they have not been the main area of action either. Other than specific actions through existing regulatory authority, as noted above, the main climate policy discourse in the period 2004 - 2006 focused on establishing a role for state policy and on goal-setting. Once the mitigation goal of policy is agreed, as it is now, economic analysis can help to identify least-cost pathways, for the given set of environmental objectives, identify the winners and losers of various implementation approaches and thus help to design policies to deal with the losers in a transition to a new future. In this phase of policymaking, California has begun to grapple with macro-economic questions and it is here that such model-based analysis of the planned policy action may become more central in the policy debate (CAT-ES 2007; Roland-Holst 2007). As the policy process begins to focus on design and implementation stages of policymaking, it would seem to be an opportune moment to invest in such information. However it remains to be seen whether actors will align in the future to further develop and move to the forefront expert information on the economics of mitigation as a main line of argument for policy decisions.

The use of local, experiential knowledge in the 'win-win' policy discourse in California is a demonstration of social learning, where past experience informs current action (Hall 1993), where paradigm shifts are possible and dependent a range of non-governmental actors bringing in new ideas, different types of experience and knowledge to the policy debate. Clearly some of the explanation for strong political support for action on climate change comes from the existence of an influential green business community that has profited from past action in related energy and environmental policy arenas. In particular, environmental and green business advocates partnered to construct arguments about the potential economic gains of early action on climate change. Combined these actors used anecdotal evidence for the win-win policy frame to support the notion that climate change mitigation policy would bring aggregate benefits rather than costs for

the California economy over the long term. A more objective, analytically-based assessment of aggressive mitigation goals adopted in California under AB 32 may have presented outcomes as "affordable," given expectations for on-going growth in wealth and cultural bias in California for pro-environmental action. However clearly the 'win-win' argument was simpler to communicate in a political context and one that resonated with some notion of technological optimism and a coalition of influential actors that have grown out of past experience on energy and environmental issues.

10.3.3. Climate change as a regional policy issue

A meta-narrative or master policy frame emerges from the two other dominant frames and argues that it is imperative for California to act, especially given the vacuum of leadership at the national level in the United States. It argues that regional policy action will lead to an economic win for the State of California and, through positive technology and knowledge spillovers, other states or nations may learn from and possibly follow California's lead to significantly reduce greenhouse gas emissions. This argument rests upon a view of the "nation-state" of California, where its lack of nation-state powers does not hinder its economic power to influence the market for clean technology and the political landscape of action on climate change. Building on past successes in other areas, and in particular on its successes in leading US policy initiatives towards cleaner air and more efficient use of energy, the policy discourse portrays California as having a unique opportunity and responsibility to take leadership to mitigate climate change. The argument continues that lack of (mitigative) action, or delayed action in California could slow national and international mitigation efforts, which in turn will aggravate the environmental risks and climate change and their economic impacts.

From the late 1980s until the election of Governor Schwarzenegger in late 2003, the dominant climate policy frame in California was to characterise climate change as a global and national policy problem that could not be usefully addressed at sub-national or state scale. For example, under the administration of California's Governor Gray Davis (1999-2003), global climate change was a seemingly intractable problem for state government. This policy frame was challenged while Governor Davis was still in office by the California legislature, in 2002, when they passed the Pavley Bill to regulate vehicle emissions of CO_2 in California (CA-Code 2006a). Following on from this landmark development, the Schwarzenegger administration took office and actively re-framed global climate change as an issue of regional environmental risk with local win-win solutions.

The evidence used to construct this argument is essentially a combination of that used to support the other two parallel policy frames. Per above, the environmental risk policy frame captivates media and public attention, eventually helping to establish climate change as a regional issue and mobilise support for policy action. Similarly the win-win policy frame could be said to do the same, focusing on the solutions rather than the definition of the problem. Each of these policy frames (risk and win-win) build on and further expand pre-existing networks of actors in support of change.

Following Majone (1989) and Hawkesworth (1988), this meta-narrative demonstrates the intertwining of "fact" and "value" in the policy process, where the policy process necessarily helps to shape the normative values upon which policy is eventually built. A back and forth interaction, where reflection about the meaning of climate change in socio-political contexts, is easier done at regional or national scale than at international scales of governance. This is because it is possible to draw on and relate climate change to common experience through history and cultural identity of people and businesses in a particular location.

Framing climate policy as a regional issue can be said to represent a shift in policy paradigm (Hall 1993; Roe 1994) from past approaches. This shift is driven by the "anomaly" in the climate policy process at federal level that broke down the previous master frame – that of climate change as a uniquely global and national policy issue. In this case the Bush administration had pulled out of its Kyoto obligations to create a void of federal action on climate change. In turn, the shift in policy paradigm permits a fundamental change in the way climate change policy is approached and acted upon in California and in other states in the US. This paradigm shift coalesced through the leadership of Governor Schwarzenegger, even though many other "visible participants" or members of the policy elite within the state government laid the groundwork for this to happen.

In Kingdon's terms (1984), Governor Schwarzenegger's election in 2003 combined with the national void of leadership during the Bush administration (2001 – 2008) to open a policy window that facilitated a major shift in policy – a change in policy paradigm. Coincidentally this void in federal leadership occurred at a time of political turmoil and transition in California, culminating in the recall election in 2003 due in part to the electricity crisis (2000-01). These events created a unique "policy window" for action on climate change at state level in the US.

Within this multilevel governance master policy frame, a number of key actors facilitated this interpretation of the policy imperative for action in California. Among these is the role of non-governmental organisations and foundations (e.g. the Energy Foundation) as well as state legislators who have identified the void in federal policy as an opportunity to move California into

a leadership role among states in the US context. Legislators have seized upon the "California effect" of leadership on past environmental issues (Vogel 1995b) to argue that similar leadership is possible and called for on climate change. Through issue-based institutional authority, government leadership is also actively developing and exploiting this master frame. Beyond advancing state regulatory decisions on climate change through existing authority, this leadership extends also to international scale action through agreements to partner with and exchange experience internationally on energy efficiency and other clean technology and mitigation efforts, working through local counterparts in other countries (i.e. the agreements with Sao Paulo and with Jiangsu Province, China) and with like-minded nations such as the UK (California 2006a; CPUC 2005; Reid *et al.* 2005) (see Chapter 2).

This master frame for state action may not have emerged had there been active leadership at federal level in the US to move state level actions forward in unison. Indeed the Bush administrations' withdrawal from the Kyoto Protocol in 2001, combined with the ongoing effort of the international community to strengthen collaborative action – as evidenced by the entry into force of the Kyoto Protocol in 2005 – may have created a unique window of opportunity for California and other state level actions to gain prominence in the US. The California recall election also offered a unique opportunity for the new governor to "fill the gap" that had been left at federal level, and for the California legislature to consolidate this leadership through law that would ensure action, regardless of the inevitable waxing and waning of state executive leadership on the climate change issue.

The breakdown in the previous "global" and "national" narrative framings for climate change cannot be attributed to a single event or a single person's leadership (or lack of federal leadership). Rather it derives from a confluence of socio-political forces in the 2002-2006 period – starting with the Pavley legislation and finishing with the passage of AB 32 – that came together to bring about the paradigm shift. Included in this suite of events is the international context where nation-states have become deadlocked in negotiations about the timing and the responsibility of individual nation-states to mitigate climate change. This is also a time when the United States – the world's largest emitter and largest economic power – withdrew from the Kyoto Protocol. Further, there is no international agreement in sight on the key policy challenges presented by climate change. In this broader international political context, solutions being sought and brought to the table via non-state actors, such as state and local governments, are particularly visible and have the potential to wield even greater influence than if they were in advancing in parallel, or in competition with, significant national policy action in the US or internationally.

10.4 How do "winning" arguments gain salience?

Another set of questions concern how "winning" arguments or policy frames gain salience at regional scale. Of particular interest is the decision-making process: is it possible to identify certain types of decision-making processes that facilitate closure and action at regional scale, particularly when science and economic evidence is ambiguous and politics are high? This set of questions concerns not only policy process and the types of knowledge that support it, but also issues about agency, representation or participation and reconciliation of different interests in the policy process.

10.4.1. What types of knowledge matter?

The foregoing analysis of policy frames, and the evidence and argument used to construct them, is situated in a co-constructionist conceptual framework that combines the strengths of realist, scientific discovery on one hand with contextual insights and lay knowledge on the other. In this conceptual framework, social processes mediate meanings of global warming to interpret scientific and expert knowledge in a political context for decision-making (Jasanoff 1990; Jasanoff and Wynne 1998; Woodgate and Redclift 1998). The California case study confirms that this occurs in culturally specific ways to shape understandings of climate change in the policy process (Douglas and Wildavsky 1982).

Evidence to support the framings for climate policy had to be constructed and interpreted from available facts and information about climate change. In some instances, the policy process called for and generated new information to bolster policy arguments. The environmental risk and win-win policy frames for climate change are anchored in both expert and local knowledge. Two types of expert knowledge that are essential to these arguments: scientific and economic knowledge. This is a familiar pattern in environmental policy where technocratic policy advice is often dominant, and scientists and economists have privileged access and influence in the policy process (Layzer 2006). Local knowledge, on the other hand, derives from experience and public perceptions about the policy issues, which are in turn driven by local business and environmental social movements, by media and 'availability' heuristics than formal analysis. Combined this forms a broad base of local or experiential knowledge to bolster the case for climate policy.

The policy frame examples demonstrate the difference between knowledge and information (Herrick 2004; Majone 1989). At its best, information takes the form of incontestable facts, whereas knowledge comes from the creation of common frames of reference and understanding of those facts in a particular context (Herrick 2004). For knowledge to emerge, local context and

experience intertwine with facts or information to shape understanding. In the California case, local knowledge provided an essential foundation for the advancement of climate policy. Across this entire period when climate policy began to emerge (i.e. from the late 1980s), the basic "facts" about climate change remained the same. The main difference across time was how those facts were interpreted, framed and presented in argument to support state policy action. This is not to say that scientific and expert knowledge did not provide an important and increasingly influential base or set of "facts" supporting a common technical understanding about climate change and policy alternatives. They did. However the key change that enabled action on climate change in California was not what these "facts" were, but how they were interpreted in particular by "visible participants" or leaders in the policy process (Grindle and Thomas 1991; Herrick 2004; Kingdon 1984; Majone 1989).

10.4.2. What types of decision-making processes bring closure?

On the types of decision-processes that facilitate action, given the broad uncertainty and high decisions stakes on issues like climate change, many authors have argued that procedural legitimacy is as much or more a determinant of success as the substantive content of the decisions themselves (Dietz *et al.* 2003; Dietz 2003b; Hajer and Wagenaar 2003). Majone (1989) argues that the function of argument in the policy process is to shift the boundaries of what is possible, shaping values and attitudes about what is fair and acceptable (Majone 1989). Further, what is fair or acceptable is shaped by people's attitudes and these attitudes are likely to shift based on dialogue, policy analysis and evidence over time.

The California case study underscores the value of deliberative policy process in the agenda formation stage of climate policymaking and, within this, value in deliberative-analytic exchange around the science of climate change. Early in the policy process there was recognition from leaders within state institutions of the need to create a "policy space" for active learning on climate change as an emerging policy issue. In particular, a few key members of the policy elite enabled deliberative exchange between the scientific expert community and policy decision-makers (e.g. from the late 1990s on Mary Nichols, James Boyd and Winston Hickox – under the Davis administration, and later Terry Tamminen). The exchange extended beyond policymakers, to reach other stakeholders and decision-makers were also relevant in the policy process, including business and other social communities e.g. church organisations. Active and dialogue oriented, these deliberative spaces or outreach efforts appear to have promoted a common understanding about climate change as an issue of environmental risk, an understanding

that eventually became one of two main anchors in the climate policy discourse as it moved front and centre on the policy agenda in 2005-6.

Several other examples exist of deliberative policy processes each with a slightly different format, some formal, others informal. This suggests that there was a role for policy entrepreneurs to use such activity to quietly shape common understandings among elite actors of how to address climate change. This is found, in the early CEC led intra-governmental consultative process and the California Environmental Dialogue, which was led through the California Council for Environmental and Economic Balance (CCEEB) (Chapter 8). Both processes were off the record exchanges and emanated from leadership by one or several individuals rather than being central to any formal policy process.

The California case thus shows that there is value to an open dialectic process, however it also demonstrates a need to close in the process to advance policy decisions. A demonstration of such a "closing-in" came in 2005 when the Governor's Executive Order formalised an intra-governmental coordination process to work through a newly formed "Climate Action Team." This change in the decision process institutionalised and centralised several of the more informal settings for dialogue, focusing attention on a series of public hearings and workshops intended to lead to concrete outcomes. While these events allowed public space for the sharing of different views on policy issues, they were mostly characterised by formal statements to establish a "public record" of various views, rather than by open exchange and discussion of the substantive issues. More informal exchanges, such as one led by the CEC, were suppressed so as to avoid overlap and ensure that there was a single focussed policy process engaging all key stakeholders and decision-makers. Although this "closing in" of the policy process had the effect of suppressing more open-ended forums for exchange of earlier days, it may have been an inevitable stage in the policy process. Indeed a "closing-in" of the debate may have been necessary to allow policy decisions to emerge in a timely manner. Only time will tell if it leads to "good" outcomes that have lasting influence both in procedural and substantive terms.

One important force of change in California is an active array of non-governmental, social movement organisations operating in the outer-periphery of the policy process. When combined with a relatively open process, this has generated a variety of timely ideas for policy responses, some of which were taken up and used in the formal policy process. Examples include the "coal shadow" notion of California taking responsibility to regulate emissions from imported power (Milford *et al.* 2005), which eventually became an argument for a shift in policy. Another example came in the 1970s with presentation of energy efficiency investment as a replacement for energy supply investment (Roe 1994; Chapter 5). More recently the framing of climate change as

a problem of regional environmental risk can be linked to ongoing efforts in the research community and with non-governmental actors to present the issues in such a manner (Hayhoe *et al.* 2004; Field et al. 1999).

The generation and uptake of ideas between the core (formal governmental policymaking powers) and the periphery of non-governmental and (semi-autonomous) institutional partners, is clearly two-directional, demonstrating the openness of the decision-making process (Chapter 9). California policy decisions were influenced by different kinds of agents, from individual leaders at the top of state government, to activism based in well-organised non-governmental organisations, to green business alliances and an epistemic network of academic researchers and experts engaged on policy issues.

The California case also demonstrates the potential for an important back-and-forth in federalist systems between institutional innovations at lower scales of governance and broader national trends. In itself, this has been shown to be a powerful force for change in the area of environmental policy, with innovations diffusing in part to broader scales through the pressure of increasingly inter-linked markets for technology and business pressure to harmonise regulations (Vogel et al. 2006). The strength of early action in such a model is demonstrated only if and when regional action by states is adopted at federal scale. While it is too soon to comment on whether this will occur in the case of California, this is clearly one of the drivers of change that emerges in discussing with the policy elite what motivations exist for early climate action at state level.

10.4.3. What actors have influence and how are diverse interests represented?

In 2006, a variety of well-organised (and resourced) advocacy organisations, including an influential "green" business community, directly shaped the policy proposals and the outcomes. For example, central actors in construction of the win-win argument appear to have been an alliance between "green" business and environmental advocacy organisations in the outer-periphery of the policy process operating through what has been called "Baptist and bootlegger" coalitions (see Chapter 9). While joined in a common discourse these different actors have different motivations (Yandle 1982 and Vogel 1995; Chapter 3); the environmentalists (the "Baptists") are motivated to save the Earth and society from the perils of climate change whereas the green business communities (the "bootleggers") has an overarching interest to create markets and profit from new, clean technologies (Doerr 2007). Environmental advocacy organisations relay experience from the past based on their "watchdog" role, actively documenting past experience and following new developments with significant expertise in

related areas. The green business community is central to the political dynamics, representing not just financial backing for politicians (which should not be underestimated) but also a vision of the future that combines strong economic growth with environmental performance. Both have been key forces in legitimising and advancing the win-win storyline in arguments, working along side of green business participants, in favour of aggressive mitigation action.

The question of in whose interest is the push for mitigation policy raises some difficult issues, including questions about why adaptation was largely missing from the debate in the 2005-06 period. Indeed, the California policy process sidelines adaptation in this period, despite the large and growing body of research on climate change impacts. This goes against a general trend observed in climate policy where there is growing attention to the critical role of adaptation in the policy mix at national scales (Gagnon-Lebrun and Agrawala 2008). Instead there appears to be a need to maintain a central focus on mitigation to the detriment of attention to adaptation. Although adaptation has since been taken up, it was not a central issue in the initial push for policy, demonstrating a notable lack of leadership in this area.[148] One possible reason for this could be that the political interests driving mitigation are more powerful than those supporting adaptation or that potential adaptation advocates are relatively unorganised or unaware. This may be part of a generic problem with adaptation, where those who stand to gain the most may be amongst the poorest and least politically powerful. As noted in Chapters 6 and 7, the poorest of California's citizens may not gain from the strong mitigation emphasis in the emerging climate policy framework, particularly if it detracts from the other equally urgent part of the agenda, adaptation. Broad understanding of this is one of the reasons that the voice of the environmental justice community is expected to significantly influence implementation decisions for AB 32 and to steer adaptation to the forefront of the next round of policy in California. By contrast, the champions for mitigation policies include an increasingly powerful green business lobby working in tandem with well-resourced and knowledgeable ENGOs. In particular, venture capitalists that have invested heavily in green technology may be amongst the frontrunners of those who gain from aggressive mitigation policy.

A number of authors have also pointed to the importance of individuals, in shaping the policy process and its outcomes such that they are widely accepted and viable over time (Kingdon 1984;

[148] This appears to be the case today. On 14 November 2008, the Governor issued an Executive Order calling for preparation of a: "statewide climate change adaptation strategy that will assess the state's expected climate change impacts, identify where California is most vulnerable and recommend climate adaptation policies by early 2009." See California (2008) and the Governor's Press Release: http://gov.ca.gov/press-release/11035/ [last accessed 16 December 2008].

Grindle and Thomas 1991). As noted above, in the case of California this is can be related to the polycentric, issue-based structure of institutions and policy decision-making more generally (see section 10.2).

10.5. Cross-cutting themes of investigation

10.5.1. Regional risk characterisation of climate change

This research raises the question of whether environmental risk framings of climate change in policy discourse can bring meaning to climate change on national, regional (sub-national) and local geographic scales (Lindseth 2004) and support political action at this scale of governance. Global-local linkages in governance are inevitable, since both the impacts and solutions to such problems are regional and local in nature (Bulkeley and Betsill 2005; Dietz *et al.* 2003; Fairhead and Leach 2003; Jasanoff and Martello 2004a; Young 2002). Earlier work on this issue suggests that establishing an understanding of climate change risk at regional scale may provide a means for "localizing" climate change to establish a rationale for policy action (Brunner 1996; Harris 2001). It could thus be argued that creating such an information base is a central task of regional climate policy processes.

The California case supports the conclusion that regionalising climate science has made a positive difference to the policy process in California. It provides evidence from which to contextualise the climate change problem and to bring it down to a scale that is politically relevant (Brunner 1996; Harris 2001). But critical support for policy action also derives from the learning and interpretation that has developed over time, for example, through regular face-to-face interactions between an epistemic network of researchers and academics on the one hand, and elite policy actors on the other.

This research demonstrates that opportunities exist at the regional level for meaningful characterisation of climate change as a regional environmental risk issue. This opportunity stems in part from the ability (and obligation) for regional decision-makers to interact directly with affected stakeholders in the formulation of framings of the climate change problem and possible policy responses. While framing climate change from an environmental risk perspective raises both adaptation and mitigation as part of any comprehensive policy response (Corfee Morlot and Höhne 2003; Corfee-Morlot *et al.* 2005), motivating political support for adaptation at the same time as for mitigation remains problematic at regional scale. Inevitably, adaptation is set aside to focus on the challenge of "motivating mitigation" as a first order problem in the governance of climate change. Of course the danger in sidelining adaptation to a "mitigation only" approach to

climate policy is that early actions to adapt cost-effectively may be overlooked, ultimately leaving vulnerable populations and locations unnecessarily exposed to inevitable climate changes.

The California case shows that regionalisation of the climate change has helped to strengthen understanding of the issue and through this it has strengthened bipartisan support for action. Regional climate science has provided inputs for communication about the issue of climate change in ways that are meaningful to local actors and in local contexts. Broadening understanding about the impacts of climate change is linked to 'availability heuristics' (i.e. metaphors and images) through which the science is understood by laypersons (Leiserowitz 2005). In providing a locally relevant basis for understanding global climate change, regional science assessment has became an important boundary object that serves to mediate between science activity on one side and the policy discourse on the other. While not sufficient on its own to motivate policy action, regional science assessment has become part of the basis for interpretive understanding of the problem and therefore an important driver of policy change.

The California policy case is also characterised by extensive efforts by expert and non-governmental (environmental advocacy) communities to work together discursive communication effort to strengthen common understanding of the issues amongst the lay public and to policy elites. Media attention is an important vehicle to diffuse information and garner attention to the issues. Overall the case study points to the co-construction of climate as regional environmental risk as a successful argument to 'motivate' mitigation action, in part through the use of an analytic-deliberative process (Stern and Fineberg 1996) supported by non-governmental actors working carefully with experts.

10.5.2. Issue linkages in the policy process

Climate change is a multi-faceted problem where policy responses can be linked to a number of other sectoral policy issues. As noted above, the California policy process for addressing climate change built upon at least two other well-established policy platforms – air pollution regulatory policy and energy and environmental policy, including energy efficiency programs. The research confirms that the linkage of climate change to pre-existing policy issues and agendas can be a means to accelerate action. The integration of climate change into the domains of air pollution control and energy and environmental policy in California avoided the creation of new self-standing institutional mechanisms, allowing early policy action to grow out of pre-existing policy authority and priorities e.g. efficient energy use as an alternative to new, more expensive and polluting supply investments as well as to advance clean vehicle technologies to limit air pollution. Such an integrated approach offered efficiencies in carrying out new policy functions to

deal with climate change (Warrick and Riebsame 1983; Young 2002), for example, building monitoring for CO_2 into pre-existing performance monitoring responsibilities for energy efficiency or air pollution policies within the CEC and the CARB respectively. In this way, global climate change has become interconnected to the other state policy priorities in related areas, joining the global to regional and local concerns.

In the California case, issue linkage thus became a means to create and extend networks for action on climate change. For example, "green business networks" which had emerged partly in response to past energy efficiency and environmental policy action eventually became one of the main constituencies calling for climate policy action. Better integration of climate change into mainstream policies has also offered a mechanism to build concern for this issue into other high priority policy areas and this quickly raised the profile of climate change. This observation is consistent with some of the findings of literature on opportunities for "mainstreaming" climate change into other policy areas (Agrawala 2004; Beg *et al.* 2002; Heller and Shukla 2003). Yet as the profile and level of ambition on climate change policy grows, treatment of climate change as part and parcel of other policy issues necessarily complicates action, requiring more extensive consultation and coordination across many different institutions and actors with different and sometimes conflicting policy agendas. This is because mitigation is not a discrete set of actions on its own (Barker *et al.* 2007) but part and parcel of economic development pathways. An example of such a challenge is the slowing of the CPUC load-based cap on greenhouse gas emissions due to broader efforts to policies under the Global Warming Solutions Act of 2006 (AB 32). The governance challenges of harmonising the integration of climate change across a large set of regional scale policy issues and institutions are part of the implementation agenda, which California is now starting to grapple with.

Although adaptation is also an essential part of climate policy, attention to it is still nascent in California. This research has not investigated adaptation in any depth, in part because of the lack of attention to it in California's formal policy process for climate change through 2006.[149] Despite the lack of formal policy attention, there is some indication that adaptation is being integrated into key areas such as water resources management policy from the "bottom up." This recognition and effort to mainstream adaptation is due to the policy entrepreneurship of key individuals within the state government. It is also due to the risk of inaction and opportunities inherent in early action to

[149] The issue of adaptation has since been taken up as a statewide policy initiative. For discussion, see Chapter 7 and California (2008) and the Governor's Press Release: http://gov.ca.gov/press-release/11035/ [last accessed 16 December 2008].

avoid building long-lived infrastructure that is quickly obsolete due to a changing climate. In spite of the void of official state policy in this area, government experts working in affected areas, such as water, agriculture and forestry management, have already begun to plan for a future that differs from the past due to climate change.

10.6. Reflections on the methodology

As outlined in Chapter 1, the thesis was developed through the use of ethnographic methods and "thick" description of contextual factors shaping change in California on the policy front. Thus the core of the empirical data in the thesis is collected through interviews with about fifty different elite actors active in the climate policy process (see Chapter 1 and Appendix for details of the methodology).

My own professional experience is largely in the international climate policy arena; it places me within an international "elite" group of policy actors on climate change, a position that inevitably facilitated my access to decision-makers in California. I also actively engaged in conversations with interviewees and inevitably "heard" more than was explicitly "said" in any particular statement or conversation. Yet throughout this research project, I have listened to the stories about the California climate policy process and through analysis of the interviews and other related source materials, I have related these stories climate policy developments in national and international policy contexts.

The thesis centres on how climate change emerges in a local policy context and on the challenge of understanding how this change occurs and why in California. I have asked: *How did California come to prioritise climate change on an inevitably over-crowded policy agenda? And why did this occur?* These are very broad questions about social change and society's interaction with a complex global environmental issue at local scale. As such, the research project has challenged me to leave the more familiar domain of technical (or largely economic) policy analysis and enter a new area that frames the questions and the policy problems in an entirely different way.

Rather than focusing on what expert knowledge and information has to offer in the way of advice about preferred policy alternatives, this research has addressed the question of how such expert knowledge interacts with other forms of knowledge to influence policy decisions and change. It has started from a notion of human wellbeing that includes, but is not limited to, economic wealth and individual utility and preferences for wealth, thus going beyond conventional notions of welfare economics. The research is designed to explore changing social norms and attitudes

about global environmental change in local economic, cultural and political contexts (Golding 1992; Martello and Jasanoff 2004; Miller and Edwards 2001b; North 2005; Young 2002).

Using a social practice model to think about these issues has changed the way that I have come to understand policy processes and their outcomes. This model challenges us to think beyond quantitative assessments to factor in the importance of qualitative understanding. In this model, "culture, norms and habits" are sources of behaviour and they are also forces for social change. Fortunately each of these sources of change will evolve with time through discursive exchange to build knowledge and understanding, thus we are not necessarily wedded to "bad" habits of the past.

Interpretive and qualitative in design, the research provides a means to situate change in local and regional understandings of climate change in a broader context of social practice in California. At the outset, I occasionally questioned the need to focus on understanding why change was happening, wanting very much to have conclusions and findings from the research that would be "policy relevant" and speak to how to close the "policy gap" that exists on climate change. As the research project evolved, I began to realise that understanding how change occurs is a first step to affecting change.

This type of research raises awareness of the power of language, argument, and dialogue, working in combination with expert inputs, to shape social norms and beliefs about what is possible and what is desirable in terms of policy end-points. When combined with individual leadership and good institutional design to include regular interaction with non-governmental actors, and good media access to information, it can then help to bring about policy change. The research findings also points to the strength and influence of expert knowledge especially when it is designed to interact and resonate with core policy questions as well as local knowledge and experience. Focusing on how decisions are made in parallel with what decisions are made provides insights into how to improve climate policymaking processes. Key process conclusions are on the need to offer opportunities for early and open exchange between expert and non-expert decision-makers. The experience of conducting this research has fundamentally changed my own views on the role of expert knowledge in the policy process, situating it as one amongst other important inputs.

10.7. Summary: does regional action make a difference to broader scale climate policy?

Starting with a broad conceptual framing for decision-making on climate change, this research has focused to a great extent on questions related to the scale of the climate policy process: How do regional scales of decision-making and debate emerge, what are regional framings for climate policy, why do they emerge and how do they lead to action? Finally and more generally is the

question do regional policy processes matter? Thus the research investigates the (re)framing of global climate change as a state and local policy issue. Creating regional policy frames for climate change is shown to be part of a process of social learning where global climate change is interpreted in new ways to build on local knowledge and a regionally specific cultural context. As noted above, shifting the policy discourse to focus on regional environmental risk is facilitated by the use of metaphors that translate complex issues to everyday life and experience (Harrison and Burgess 1994; Leiserowitz 2006; Ungar 2000), thus helping to shift beliefs and perceptions about the need for action at regional scale.

The California case demonstrates several different scale-based drivers of change. The first is the dynamic interaction in the United States between scales of decision-making, in particular between state level action and federal policymaking on environmental issues. Second, California's sheer economic prowess in a federalist system provides it with the market power to potentially influence national and international technology developments and innovation. Third California is large enough to be influential and small enough to be experimental. These three "scale" factors appear to have combined to empower state level leadership in California and to promote action on prominent environmental issues over time.

The California case also confirms the importance of coalitions of non-governmental actors that cut across conventional groupings to work towards common endpoints based on common discourses or framings and interpretations of the climate change problem. The case shows how experts within environmental advocacy organisations interacted closely with green business interests to promote the dominant win-win framing for mitigation policy. These networks of non-governmental social and corporate actors suggest an influential sub-politics of climate change. As noted in Chapter 3, this influence is labelled "sub-political" because it is not necessarily formally operating in the public sphere but rather circulating in private sphere networks that interact with and influence public policy decisions.

Yet inevitably, California's actions are necessarily nested within a larger network of partners within the multilevel governance regime that exists for climate change, where nation-states are formally committed to work together and, individually to advance national policy agendas. Within this responsibility is the expectation that national policy will emerge out of a back and forth with regional, local or other non-state partners. There is thus a natural push and pull or tension between nation-states and their sub-national governments. However if and when there is a void of national leadership, as was the case in the US from 2001 to 2008 on climate policy, then there is opportunity and indeed some pressure for local and regional (sub-national) governments to seek and promote their own, locally adapted solutions to global change problems.

The California experience shows that the political barriers to climate policy may become more manageable at sub-national scale than at national or international scales. The case reveals an active environmental and progressive business community combined with a long-standing environmentally progressive voice of government; this coalition of actors and interests has emerged in part from the governments own past efforts to advance technical and policy solutions to air pollution and to advance energy efficiency. The coalition in turn has played a large role in shaping early action on climate change out of these same policy arenas. This socio-environmental history provides a base of evidence, knowledge, and belief that a clean environment can accompany a strong economy. Combined this experience has creates "circuits of power" where ideas and common interpretations of possible policy solutions move from the outer- to the inner-periphery of decision-making and back again, where non-governmental actors from the green business community align with environmental non-governmental organisations to fight for change. This in turn, has strengthened bipartisan political support to encourage leadership to emerge on the issue of climate change at state level in California.

Some of the argument for regional action is based upon the notion that early action at the level of state government will set an example and provide legal precedent to influence federal action when it eventually comes. For example, if and when California is able to achieve greenhouse gas emission reductions through new or ongoing policy initiatives, through firm-level and household responses to state policy initiatives, it will be in a position to contribute new information and knowledge about the cost and means to mitigate GHG emissions. Since there is little experience to date with mitigation policy, there is even less data and understanding about how to go about it and what it will actually cost (Dowlatabadi *et al.* 2004). Assuming that early actions are limited to relatively small-scale experiments, where the intent is to learn about costs and alternatives for mitigation, and adjust policies based on this learning, there may be little down-side risk to early action, as long as it is modest in scope and iterative (i.e. designed to feed lessons learnt in through regular adjustments). Furthermore, those who have first hand experience with mitigation action will inevitably have influence to shape broader policy efforts.

Taking regional differences into account – in this case "California differences" - is an integral part of any regional climate policy discourse. For example, Californians are proud of their heritage of environmental activism and largely tackle environmental protection as a bipartisan issue. In addition, the policy discourse argues that California is different from an institutional, technological and economic point of view. The large scale of California's economy, combined with decentralised authority and polycentric institutions allows the policy elite to champion change and to move ahead relatively independently to reduce GHG emissions. Working largely

through regulatory authority, standards and other policies that force technological innovations are able to come about faster than would be the case in a different institutional context. At the same time, there is a belief and some evidence that technical innovations have led the way to better economic performance in the state. Moreover, given its large size, California's strategies affect not only local markets and performance but also global technological and environmental trends.

An important observation in the policy process is that there is a commonly held "belief" among California decision-makers that "California is different." California has historically had considerable success in driving the (national) environmental agenda, forcing technological change while also maintaining a healthy and vibrant economy. This understanding of the California "difference" has become a rationale for climate change decisions across government: from the executive branch to the legislature, as well as within the powerful bureaucracies of the state government, which are responsible for regulating industry. Connecting climate change policy to this local history and base of experiential combined with its willingness to experiment, has helped to make the issue of climate change politically tractable and has facilitated action. Localising the discourse on climate change has provided a source of empowerment and ownership for regional actions, indeed to help shift the discourse such that state-level action on climate change is imperative, particularly in the face of a void of federal action.

How the policy process is designed institutionally will determine the possibility for local knowledge to emerge on climate change and to influence decision-making. An open process that facilitates participation of a wide range of non-governmental elite actors and organisations raises the possibility for innovative ideas to come from the outer periphery to influence decisions on policy. Designing the policy process to allow for an active analytic-deliberative exchange amongst non-governmental actors at the periphery, and governmental decision-makers in the centre of power is an important part of any local policy process. Such a process encourages debate about competing interpretations amongst elite actors and ultimately increases the number of ideas for policy circulating at any one time. Moving from debate to action is of course also an essential step and this step necessarily requires a "closing-in" of the policy process; it also requires leadership to steer the process to useful conclusions about policy.

The research brings attention to interpretive framings of the science and the policy problem to demonstrate that a number of viable framings exist and necessarily compete over time (Miller 2001). It confirms previous research findings that seemingly intractable policy controversies can be addressed by structuring decision-making to re-frame issues in a new way (Schön and Rein 1994; Yanow 2000). Consistent with the "argumentative turn" in policy analysis, the research thus highlights the role of interpretation and human experience in that interpretation, and raises

questions about the ability or even the desirability to separate "facts" and "values" in the policy process (Fischer 2003; Fischer and Forester 1993; Hawkesworth 1988).

In conclusion, localising a global environmental problem or situating it as a problem of regional environmental risk provides a key to motivating meaningful mitigation action with potential to unlock regional solutions that could make a difference at broader scale. Situating climate change as regional environmental risk brings the problem down to a meaningful scale and facilitates decision-making on how to address at this scale. The science-policy interface is important and boundary work provides a valuable input to regional policy processes on climate change to blur the distinction between science and interpretation for local decision-making. Winning arguments for climate change action are shaped and gain salience when local knowledge joins formal expert knowledge in a local decision-making process. Thus empowering regional policy processes on climate change not only has the potential to increase experimentation given the smaller scale of action, it also has the potential to accelerate technical and social learning to provide invaluable lessons for decision-making at broader scale. This is certain to be the case in a location such as California given large size of its market economy and large population, and its role as a national environmental leader the US. However, just as each region will inevitably differ in its search for regionally adapted solutions, its size and influence as an independent actor will also vary widely.

Given the somewhat unique power of the California example, it is difficult to argue on the basis of this case alone that regional policy initiatives will make a significant difference to broader climate policy processes (e.g. internationally or even nationally) on their own. The potential for regional action to exert significant power or influence at larger scales is only possible if such actions can be situated within a larger transnational network of regional scale action, actors and experience. Regional actions can also be seen as an important testing ground for new ideas and policy alternatives. They have the advantage of working to a narrower set of local constituents and interests which can in turn open the opportunity to be relatively more experimental and innovative than policy processes working at larger scales, with necessarily more diverse audiences. Where such experiments are successful, and even possibly before, it may be possible to demonstrate movement away from status quo in new directions for an acceptable level of cost (or benefit) to local economies and people. Especially when combined to reflect significant shares of the population or of the economy within a nation, or across national boundaries, such regional efforts may begin to wield influence to shape markets and business interests in new directions, and to create new constituencies for action. Growing transnational networks of influence already exist, and may continue to grow to link efforts across city and other sub-national governments with those at national or international scale (Betsill and Bulkeley 2004). When

these new sub-political forces combine with increasingly global markets for technologies they may show that new forces of change are emerging on climate change. Fully enabling such developments across regional scale actions will only be possible once there is more acknowledgement and empowerment of these actors and may require some decentralisation of resources and authority to regional governments to move climate policy forward. Were empowerment of regional actors and institutions to occur, new ideas and visions of the future, based in part on regional experience, could emerge and spread quickly across regional and national boundaries. In such a context, local initiatives have potential to lead the way to broader diffusion of innovative policy approaches, as well as to become social and technological forces of change.

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APPENDIX 1: INTERVIEW BACKGROUND MATERIALS

This appendix contains a brief description of how interview data were treated in the research. It also contains the two different interview protocols that were used to develop the data. Short background notes are included in each of the protocols. Both the questions and the background notes were circulated in advance to interviewees. The appendix supplements information contained in Chapter 1 on methodology and approach to the research.

1.1. Interview data: how was the story constructed?

Written transcripts were developed from fifty of the audio and written interview records and used as the basis for interpretive analysis. A large number, but not all, of the formal interview transcripts (38 out of 50)[150] were coded and analysed. Those transcripts that were not coded served as background for the analysis. Coding for interviews was undertaken in three distinct stages, each corresponding to a higher level of understanding and insight that I gained from previous stages of the work:

- An initial set of codes was developed based on theoretical notions (e.g. which actors, deliberative process or not) and on policy themes (e.g. mitigation – energy, adaptation). This approach was used to code a number of the first round of interview transcripts (7 interviews) but was found to be too complicated with too many layers and levels of coding to provide clear insights.
- A second stage was the initial interpretive analysis and memoing on conceptual and thematic issues emerging from the data. It is in this stage that a number of new themes emerged from the data, in particular the importance of experiential knowledge and of the differential framing of expert knowledge and climate issues in the California context. The insights gathered in this second stage of research stimulated further investigation of theoretical writings on these topics.

[150] Note, although 52 interviews were conducted, only 50 were recorded and provided transcripts and thus the basis for a textual analysis. Two of the interviews were entirely off the record.

- In the third stage a final set of codes was developed and used to guide the coding of a majority of the interview transcripts. The codes corresponded to the analytical framework laid out in Chapter 3. This approach was more simplified and aimed to investigate the issues that were emerging from the interview data initially analysed. In parallel a simplified interview protocol was developed along these lines and this was used to complete the remainder of the interviews (36 interviews of the 50 formal long interviews).

1.2. Interviewees and summary statistics

Among state actors, I interviewed fourteen civil service officials that were chosen from a large number of different branches of government (e.g. energy; air pollution and environmental institutions; water, agriculture and forests). I also interviewed five individuals who were political appointees – one from the legislative branch, two from the Governor's Office , and two political appointees – Commissioner James Boyd of the CPUC and Shannon Eddy, special advisor to the Governor's Office on the CPUC. These five people are important because they are more closely linked to origin of policy, and the political process surrounding such action, while those from the civil service are most active in the day-to-day climate policy implementation and regulatory process.

Among non-state actors, the interviews extended to three main categories of people focusing on those that are most active in the California climate policy process: 8 representatives of non-governmental organisations; and 10 representatives of business organisations or of corporations; and 11 independent experts (e.g. academics or consultants). I also interviewed one person from the local media covering public policy issues, including climate change.

Within each of the main groupings of state and non-state actors, I selected interviewees in part on the basis of their expertise or specialised competence in two key sector areas related to climate change: water and electricity sectors. Electricity was chosen because it is typically a major source of greenhouse gas emissions, and its large, centralised structure, as well as its history of being a regulated industry, often means it is one of the first sectors to be included in climate change mitigation strategies. I chose water as a second thematic area of the interest because adaptation is an important aspect of climate policy and I wanted to see what if anything was occurring to deal with climate change in this sector.

Nine of the interviewees can be considered specialists on the interface between electricity and climate change. Interviewees were selected to represent the different interests within this sector. Two interviewees were from municipal and two from investor-owned utilities. Another four interviewees were from the regulatory agency overseeing operations of investor-owned utilities in the state, and at least four others are from non-governmental organizations with extensive experience in this electricity regulatory process in the State of California. Two interviewees represented municipal utility interests.

On the theme of water, four interviewees are water policy experts or specialists; these experts included two government officials, one representative from a non-governmental organisation, and one independent experts.

1.3. Background Note and Protocol I – January 2006

1.3.1. California in the Greenhouse: Regional Climate Policies and the Global Environment

The scientific community has made an increasingly compelling case for political action to address climate change. Social recognition of climate change has grown along with scientific understanding, helping to propel global warming to near the top of the international political agenda. Despite the urgency accorded by the international community to climate change, concrete actions are lagging [1]. Policy implementation rests largely with national governments, however regional and local governments also have a role to play, as do business and environmental organizations [2, 3]. A central challenge is moving from relatively well-established global framings of the policy problem to salient framings at smaller scales.

Aim: Through an in-depth case study of California (US), the research project aims to identify constraints and opportunities of regional (sub-national) processes to promote sound climate policies. It will:

- set California policies in the context of national and international developments;
- take California as a leadership example and analyze how and why climate policies are moving forward;
- investigate how different actors and institutions interact with climate impact science, taking a detailed look at adaptation and mitigation in electricity and water sectors;

- explore the notion of climate change risk and how understandings of risk affect policy responses.

Establishing an understanding of climate change risk is potentially a central task of any regional policy process as it can "localize" climate change and helps to establish a rationale for policy action [4, 5].

Approach: The project is designed to test the following hypotheses:

- State-of-the-art impact science has helped to establish a broad risk framing of climate change in California that is broadly accepted across a wide-range of actors and institutions, which in turn has provided a political basis for climate action;
- California has a long-standing precedent of innovative energy-environmental policies, including significant networks linking institutions and actors, which provide a strong experience base from which to craft climate policies.

The research approach is interpretive, qualitative analysis [6, 7] to be based on the results of a series of semi-structured interviews with key actors directly and indirectly involved in the California climate policy process and on analysis of reports and records in the public domain [8-12]. The sources will be drawn from government and scientific community, as well as affected stakeholders such as businesses and environmental organisations.

My interest in this project stems from more than a decade of work through the OECD with national government decision-makers on climate change issues. The OECD is an inter-governmental forum for policy assessment and dialogue amongst national policymakers on a wide range of topics including environment. Its main mission is to promote economic cooperation and development. Although I am currently on academic leave, I will return to the OECD Environment Directorate in October 2006, where I am head of the climate program.

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1.3.2. Interview plan

These questions provide the broad scope for the interviews. They will be used to guide our discussions; ideally we will focus on those questions that are central to your experience with the California climate policy process.

Please let me know at the start of the interview if you have a preference to keep the interview, or particular statements, off-the-record, and/or not to be named as a source in this work. Unless agreed otherwise, the interviews will be recorded and will be considered to be

on-the-record so as to provide a direct source of research data. Short excerpts from on-the-record interviews may be used in the research report, either citing the interviewee as the source, or not, depending upon the context for the citation and of course on your preferences.

Proposed interview questions/themes

1. **Drivers of policy and leadership:** What are the main drivers of the current climate change process and leadership on climate change in California? Science? Economics? Politics? Social considerations?

2. **The role of scientific knowledge**: How is scientific knowledge, for example in the form of climate impact assessment, influencing the California policy process?

3. **The role of other expert knowledge:** How have other forms of technical or expert knowledge been influential in the policy process? For example, how influential was the 2005 Tellus report on the potential for clean technology and energy efficiency developments to boost both economic and environmental performance in California? If so, why and how did this influence work in the policy circles?

4. **The balance between mitigation and adaptation:** Even though recent impact assessments indicate that some types of impacts are clearly unavoidable, such as increased frequency and intensity of heat waves, almost the entire policy thrust in California seems to be on mitigation. Why is this?

5. **Influence of different actors and actor networks:** Describe some of the key networks of actors influencing the climate policy process, how they operate *e.g.* business groups, environmental organisations, scientific community, different parts of the state (or national) government, the media (tv, radio, newspapers, internet sites or blogs).

6. **Influence of the role of different institutions:** What are some of the key institutions (*e.g.* research or academic institutions, governor's administration and its respective parts, the state legislature, the CPUC, nationally-based government institutions such as EPA, pension-funds and other institutional investors, California Climate Action Registry) that are influencing, or will, in your view, influence the climate policy process in California?

1.4. Background Note and Protocol II – May to June 2006

1.4.1. California in the Greenhouse: Regional Climate Policies and the Global Environment

The project sets California policy developments in the context of national and international climate policy. Through an in-depth case study on California, I will explore how mitigation and adaptation policies are developing at a regional level (sub-national), looking in particular at the interface between scientific and other expert knowledge, politics and policy. The analysis will look at how different people and organizations are interacting with science and other expert knowledge to advance climate policy as well as how and why policy is moving forward. Relevant actors span businesses, environmental organizations, scientists and other experts, the media and various parts and scales of government. The objective is to better understand how ideas have emerged, leadership coalesced and agendas established to advance climate policies, with attention to key sectors such as electricity and water.

Leadership on climate change mitigation is relatively recent and the benefits of such leadership are still heavily contested (*e.g.* the US and Australia cite economic reasons in their national decisions to back away from the Kyoto Protocol). While regional governments are well positioned to implement climate change policies, given responsibility for issues such as land use, human settlement patterns and transport systems, it is less clear what the possibilities are for regional governments "to set the agenda" for climate policy. By setting the agenda, I refer to the establishment of broad policy frameworks and goals to guide action over the long-term. Any political decision to deal with climate change inevitably involves balance and tension amongst a range of choices with one challenge being the balance of effort "now versus later." Further, dealing with climate change implies shifting investment patterns and redistributing public resources. Governments need political support for any decision to address climate change and finding that support on a contested issue, such as climate change, can be difficult.

Using California as a "leadership" example in regional climate governance, the project will explore recent and historical policy developments to understand why it has taken a leadership position and how this has occurred. One hypothesis is that state-of-the-art impact science has helped to establish a broad risk framing of climate change in California that is broadly accepted across a wide-range of actors and institutions. Additionally California has a long-standing precedent of innovative energy-environmental policy that provides a strong experience base from which to craft climate policies. Thus a second hypothesis is that early action on climate related issues such as energy-environmental policy, has facilitated the political transition to a low greenhouse gas future by aligning political interests and establishing networks linking a range of powerful institutions and actors in a common direction. When

combined these two factors have opened a range of political possibilities in California and provided a platform for political leadership on the contested issue of climate change. The project is designed to test these hypotheses.

1.4.2. Interview plan

The interviews are expected to last about one hour. With your permission, I would like to record the interviews. Please assume that all of the information obtained during the interviews is off the record and not for direct attribution unless we have agreed otherwise. If there are interview segments that I would like to use in academic publications I would send you a list of quotes for approval for attribution, and use only if and after your approval. Please let me know how you would like to be contacted for approval for using quotes from the interview.

Proposed interview questions/themes

1. Please begin by introducing yourself, the focus of your position within your organisation and how that relates to climate change policy in California.
    a. What is your academic and professional background – and how did you come to be in this position?
2. What are the main challenges for California climate change policy?
3. Shifting now to policy responses, what is the main way that the State of California is addressing these problems?
4. What is the main reason that the California state government has chosen to address these climate change problems? How did these problems come to the forefront of policy and why?
5. How have these policies and programs come forward as responses?
    a. What was the main driver for these policy responses?
6. Looking down the road to the next ten years, do you expect a shift in the problems or solutions to be dealt with in the climate change area? Is so, what issues will move to the forefront and why?
7. Who is most influential in shaping the climate change agenda in California (*i.e.* framing the problems, proposing and advancing policy solutions)?
    a. Which types of people are most influential and on what issues? (e.g. industry

representatives or business groups, environmental organisations, the media, scientific community, legislators, or interest groups in different parts of the state or at national level).

b. Which institutions are most influential and why? (e.g. research or academic institutions, science and research or policy making and implementing institutions, governor's administration and its respective parts, the state legislature, the CPUC, nationally-based government institutions such as EPA, pension-funds and other institutional investors, California Climate Action Registry).

8. What do you think is the role of the media?

a. How important and influential are the media in the California policy process and how is this playing out (tv, radio, newspapers, internet sites or blogs)?

1.5. List of interviewees participating in the long-interview

Name	Given Name	Affiliation	Type I	Type II	Date - Prot
Alvord	Adrienne	Pavley's Office	S-Legislator		May-June II
Baker	Anne	CalEPA	State		May-June II
Beebe	Bud	SMUD	NGO	Bus	Jan I
Bishop	K.C.	Chevron	NGO	Bus	May-June II
Boyd	James	CEC	S-Appointee		May-June II
Brown	Susan	CEC	State		Jan I
Burroughs	Timothy	ICLEI	NGO/Local	ENV	May-June II
Callison	Jeffrey	KXJZ	Media		May-June II
Cavanagh	Ralph	NRDC	NGO	ENV	Jan I
Chung	Francis	DWR	State		May-June II
Clinton	Jeanne	Independent	Expert		Jan I
Dale	Larry	LBL	Expert		May-June II
Dimare	Dominic	CCC	NGO	Bus	May-June II
Douglas	Karen	EDF	NGO	Env	May-June II
duVair	Pierre	CEC	State		Jan I
Eddy	Shannon	Gov Office	S-Legislator		May-June II
Fitch	Julie	CPUC	State		Jan I
Franco	Guido	CEC	State		Jan I
Gleick	Peter	Pacific Institute	Expert		May-June II
Graff	Tom	EDF	NGO	ENV	May-June II
Hanemann	Michael	UCBerkeley	Expert		Jan I
Heitz	Eric	Energy	NGO	ENV	Jan I
Hickox	Winston	CALPERS	State		May-June II
Luers	Amy	UCS	NGO	ENV	Jan I
Michelson	Denise	BP	NGO	Bus	May-June II
Miller	Norm	LBL	Expert		May-June II
Motamedi	Lainie	CPUC	State		Jan I

Table continued

Name	Given Name	Affiliation	Type I	Type II	Date - Prot
Nichols	Mary	UCLA Env Inst	Expert		May-June II
Peevey	Michael	CPUC	S-Appointee		May-June II
Price	Lynne	LBL	Expert		May-June II
Pulling	Wendy	PG&E	NGO	Bus	May-June II
Raney	David	Honda	NGO	Bus	May-June II
Roos	Maurice	Dept of Water	State		May-June II
Ryan	Nancy	CPUC	State		Jan I
Sanstad	Alan	LBL	Expert		May-June II
Schiller	Steve	Independent	Expert		May-June II
Schneider	Steve	Stanford	Expert		Jan I
Shaffer	Steve	Dept of	State		May-June II
Shulock	Chuck	CARB	State		Jan I
Sterkel	Meredith	CPUC	State		May-June II
Sutley	Nancy	LA City /	S-Local		May-June II
Tamminen	Terry	Gov Office	S-Legislator		Jan I
Tsunezumi	Minnie	Shell	NGO	Bus	May-June II
Tutt	Eileen	CalEPA	State		May-June II
Vine	Ed	LBL	Expert		May-June II
Wan	Fong	PG&E	NGO	Bus	May-June II
Wang	Devra	PG&E	NGO	Bus	May-June II
Weisser	Vic	CEEB	NGO	Bus	May-June II
White	V. John	CEERT	NGO	ENV	May-June II
Wickizer	Doug	Dept of Forests	State		May-June II
Wittenberg	Diane	CCAR	NGO	Bus	May-June II