The Dynamics of Framing Environmental Values and Policy: Four Models of Societal Processes

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ABSTRACT

While the subject of framing has achieved considerable recognition recently among social scientists and policy analysts, less attention has been given to how societies arrive at stable, collective frames of meaning for environmental values and policy. This paper proposes four models of societal processes by which framing occurs: narration, modelling, canonisation and normalisation. These four models are developed, compared, and explored in detail through a case study of the framing of the impacts of climate change on human societies in US science policy from the 1960s through the 1990s. I conclude by offering a number of potentially fruitful avenues for further research into the dynamics of framing.

KEYWORDS

Framing, climate change, environmental values, environmental policy

INTRODUCTION

In recent years, authors from a variety of social science and policy analytic disciplines have begun to recognise the importance of how societies choose to frame environmental and other public policy problems (Jasanoff and Wynne 1998; Kingdon 1995; Hajer 1995; Schon and Rein 1994; Cronon 1992). In general, writers invoke the concept of 'framing' in reference to the perceptual lenses, worldviews or underlying assumptions that guide communal interpretation and definition of particular issues. Use of the concept of framing reflects a growing acknowledgement that how societies view the environment is not

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simply given by nature but also reflects collective moral choices about the legitimacy of the myriad intersections of natural and human systems. William Cronon has described the interpretive overlays communities have put in place over nature, as well as the degree to which they often become taken for granted by those communities, as 'second nature' (Cronon 1991). Understood in this way, as the systematic lenses through which communities interpret human-nature interactions, social scientists have identified a number of ways frames help shape factors that can influence assessments of environmental change, including: 'the definitions of risk, the terms of participation, the range of policy options considered, and the nature of political debate (Miller et al. 1997)'.

Relatively less attention has been given, however, to the dynamic processes by which particular environmental frames emerge and acquire credibility in particular societies. Writings about framing often portray the contingent, contested, value-laden character of interpretive frames. To use the language of Collins and Pinch (1982), environmental problems display a great degree of 'interpretive flexibility'. This flexibility is particularly apparent in the American policy process, in which multiple frames often compete for credibility in public discourse about a given issue (Nelkin 1992). However, interpretive flexibility can also be found in other countries with close observation (see, e.g., Wynne 1995). What are the sources of competing frames in a given society? How are particular frames stabilised? How are decisions among disputed frames made? By whom? In what settings? On what criteria is the credibility of competing frames judged? How does the power to frame an environmental issue in a particular way relate to the articulation and distribution of power more generally in society?

In asking these questions, I am interested not so much in how individuals frame particular issues (although this is certainly a legitimate area of inquiry). Rather, I am interested in the institutional processes by which communities collectively attribute meaning to events. Economic analysis, for example, as a form of input to societal decisions, tends to aggregate social preferences as the median or mean of individual preferences. Even a rudimentary awareness of societal decision-making is sufficient to illustrate, however, that societies' collective articulations and expressions of meaning rarely reflect the averaging of individual values. Rather, the construction of meaning through framing takes place in a wide array of institutional locations in society, including economic analysis, elections, expert advice, judicial decisions, legislation, and numerous other social and communal practices. Each of these is then subsequently weighted in complex networks and arrangements that incorporate historically and culturally-situated norms and practices. And, of course, in the processes by which a particular community frames specific events, the collective identity of the community, ideas about who or what is acting as an agent in a particular causal narrative, and even the acceptance of what constitutes an 'event' may all become important subjects of dispute and negotiation.

Attention to questions about the dynamic processes through which framing occurs can shed light on comparative, cross-national differences in environmental frames. Different countries often frame ostensibly similar policy issues in remarkably different ways (see, e.g., comparative studies of US and European regulation of chemical carcinogens, Jasanoff 1986; Brickman et al. 1985). The United States, for example, has consistently adopted 'harm-based' standards for pollution prevention while many European countries have generally favoured more precautionary approaches (Jasanoff 1998). Additionally, attention to the dynamics of framing processes can help pinpoint strategies and opportunities for intervening where, for example, framing processes systematically exclude particular voices (e.g., the poor) or particular policy options (e.g., modifying social behaviours) whose inclusion may be important for efforts to manage environmental change. To date, however, efforts to understand how and why communities arrive at particular frames for interpreting environment problems suffer from a dearth of both empirical and theoretical work. In this essay, drawing from historical, political science, and anthropological essays on the framing of environmental impacts, I contrast several models of the dynamics of the framing process and provide examples of how each connects up with practices of societal assessment of environmental change. Before elaborating these models, however, I want to provide a quick example of how the process of framing climate impacts has taken place in the United States as a referent for some of what I will say later. (This example is drawn in part from Miller et al. 1997.)

CLIMATE IMPACT ASSESSMENT: A BRIEF EXAMPLE

In the discursive framework that underpins the UN Framework Convention on Climate Change, the phrase 'climate impacts' refers to the effects of greenhouse gas-induced changes in the climate system on human societies and terrestrial ecosystems worldwide (Houghton et al. 1996). This frame reflects the now widespread (although by no means universal) view that changes in the Earth's global climate system represent the proper focal point for atmospheric science and policy. Prior to the mid-1980s, however, a variety of alternative frames characterised discourses of climatic risks. In this section, I briefly examine the dynamics of these changing frames (as reflected in American scientific and policy discourses) in three periods: prior to 1970, the 1970s and early 1980s, and the mid-1980s to the present.

Through the 1960s, discourses of climate and weather were essentially identical. As defined by the 1941 Yearbook of U.S. Agriculture *Climate and Man*: 'the climate of a place is merely a build-up of all the weather from day to day (Hambidge 1941)'. Scientists investigated climate, in practice, by averaging long-term weather patterns characteristic of a particular locale. Consequently, when scientists and policymakers began in the 1950s and 1960s to grapple with

the idea that rising atmospheric concentrations of carbon dioxide might pose risks to human societies, they did so in terms that reflected this framing of atmospheric dynamics. Instead of phrases common today, such as 'global environmental change', carbon dioxide was framed in terms of 'weather modification'. Revelle and Suess (1957), in their pioneering work on the subject, described the 'carbon dioxide problem' merely as an ideal 'geophysical experiment' for learning about the dynamics of weather and climate, not a risk to the global environment. Discussing the potentially significant changes in local climates that could be brought about by rising carbon dioxide concentrations, a 1966 National Academy report nonetheless downplayed the idea that such changes posed a global risk: 'although some of the natural climatic changes have had locally catastrophic effects, they did not stop the steady evolution of civilization (NRC 1966)'.

During the 1970s and early 1980s, this essentially local framing of the climate change issue gave way to a new framing that instead represented the weather as merely a local manifestation of what was, in reality, an interconnected set of natural processes that could be investigated and understood on scales no smaller than the globe itself: the Earth's climate system. As this transition occurred, however, it opened up a variety of new questions about just how people should interpret the relationship between human society and this new understanding of nature as a planetary-scale system. During the 1970s, assessors offered at least four different interpretations of how society should conceptualise and respond to climate change. These views are contrasted in Table 1 at the end of this section. Each painted climate change in terms of a meaningful narrative familiar to Americans in the 1970s. Combined, these assessments and numerous others offered American policymakers a clearer picture of how choices about both broad values and specific policies could influence their ability to respond to climate change.

Pollution and environmental degradation. The 1970 MIT Study of Man's Impact on Climate portrayed climate change as a problem of global warming resulting from worldwide emissions of carbon dioxide into the atmosphere. Like other forms of pollution under consideration in the study, carbon dioxide posed a relatively unspecified risk to the environment that necessitated careful watching. Although the study did not suggest the necessity of further social response, it did offer a methodology for controlling carbon dioxide emissions consistent with other American environmental protection strategies that focused on 'end-of-pipe' technological fixes (SMIC 1970).

Limits to growth and economic transformation. The 1977 National Academy report *Energy and Climate* argued that the real problem was less environmental protection than long-term *energy planning*, of which climate change was only a small component. The study argued for strategies of lower energy consumption and alternative, non-fossil energy sources through long-term national energy policies (NAS 1977).

Natural disaster and social instability. A 1974 CIA report, various statements by the US State Department during the Sahelian drought, and the 1979 World Climate Conference, drew more closely on the prior, meteorological framing of climate. They suggested that the threat was less from global pollution or energy consumption than from *climatic variability*. Myriad natural changes and human activities at all scales (including but not limited to the emission of carbon dioxide and other greenhouse gases into the atmosphere) were projected to disrupt regional weather patterns and cause abnormal *weather extremes* from droughts to flooding (WMO 1979). In turn, these climatic changes were predicted to create wide-ranging 'impacts' on human societies, prompting, for the CIA, State Department, and others, fears of social instability leading to the possibility of security threats (CIA 1974).

Rational management of technological systems. A 1980 Department of Energy report suggested that far from being a threat, *control of the Earth's climate* could substantially benefit human society by bringing about improved climatic conditions (USDOE 1980).

Since the early 1980s, scientists as well as other policymakers and the American public have largely settled on the 'global pollution' framing of climate change. This shift is reflected in both scientific and policy discourses. Scientific practices for understanding climate have shifted dramatically. Through the late 1970s, statistical techniques for aggregating regional climatic information dominated the study of climate within the meteorological community. By the early 1980s, however, efforts to assess climate change, from scientific research to National Academy panels in 1979 and 1982 headed by Charney and Smagorinsky, increasingly established general circulation models of the global climate system as the preeminent tool for predicting future climatology. Climate impacts have also increasingly been framed in global terms (Long and Iles 1997). Concerns about sea level rise and shifts in climatic zones, for example, have largely displaced concerns about changes in local weather patterns as the primary focus of assessment activity (compare the 1985 Villach and IPCC assessments to their 1979 World Climate Conference predecessor; SCOPE 1986; Houghton et al. 1996, 1990; WMO 1979).

Similarly, policy discourses have adopted new directions. By the late 1970s and early 1980s, 'pollution' had become the language in which a wide array of environmental problems were addressed in the United States, contributing an easily adopted vocabulary and repertoire of policy frameworks to the emerging public discourse on climate change. The simultaneous emergence of the 'ozone hole' in the mid-1980s, too, added fuel to growing public concern about the stability of natural systems on planetary scales – giving rise, alongside climate change, to the discursive framing of risks to 'the global environment'. Emphasis on the global environment helped shift policy debates: (1) from an exclusive focus on energy to broader considerations of curbing deforestation, carbon sequestration, and reducing emissions of other greenhouse gases such as

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methane and nitrous oxide; and (2) from national responses to international treaties and global policy instruments, such as emissions trading and joint implementation (Fisher-Vanden 1997). These changes provided links to new policy initiatives, particularly in the US, that were less politically sensitive than energy planning (e.g., reducing methane and nitrous oxide emissions) and that enjoyed broad public support (e.g., eliminating CFCs and halting deforestation). In addition, they more readily dispersed responsibility for climate change across a wide array of actors both within the United States and around the world. At the same time, they opened up new opportunities for backlash.

Framing of 'CO$_2$ Problem'	Societal Narrative	View of Nature	Response Strategies	Exemplary Assessments
Global Warming	Pollution / Environmental Degradation	'Other' at Risk from Human Activities	End-of-Pipe Technology Innovation	SMIC 1970; SCOPE 1986; IPCC 1990, 1995
Climate Control	Rational Management of Technological Systems	System to be Controlled	Optimisation of System Input / Output Transfer Function	DOE 1980
Climatic Change; Variability; Weather Extremes	Natural Disaster	'Other' Posing Risks to Human Societies	Adaptation; Reduction of Vulnerability	CIA 1974; WMO 1979
Energy Planning	Limits to Growth and Economic Transformation	Constraint on Human Economy	Decarbonisation; Transition to Low Energy Economy	NAS 1977

TABLE 1. Alternative US Frames of Meaning for the 'CO$_2$ Problem' During the 1970s

FRAMING AS A DYNAMIC PROCESS

How should changes in the framing of climate impacts over the past three decades be understood? Realist models of science policy have typically ignored questions of framing, assuming that science could uniquely characterise the

objective features of environmental processes. However, this view of how framing occurs is difficult to reconcile with changes in the framing of climate impacts described above. Differences among the four frames of climate impacts during the 1970s (global pollution, energy planning, climatic variability and climate control) did not generally reflect disagreements over the science of climate change; all four relied on essentially similar information and came to similar conclusions about its reliability. Instead, the four frames illustrate how different expert communities interpreted the meaning of climate change for society within the context of their own policy authority. While differences among the four created confusion over how to respond to climate change, they also helped clarify how climate change cut across the concerns of various parts of American society in myriad ways. These differences illustrate a broad feature of American democracy: the pluralism of both the views presented in public debate and access to the resources necessary to express those views through the conduct of scientific assessments (Jasanoff 1990). Not all societies share both of those features, and many share neither.

Similarly, the shift from local to global representations of climate change reflects less a distinction between 'better' and 'worse' (or even merely changing) scientific understandings of nature than an emphasis on different dimensions of human-climate interactions and the different modes of scientific research and political organisation necessary to respond to them. People can have legitimate concerns about both their local and global environments. By what processes do societies choose how to sort out whether to cope with environmental issues in local, national or global terms? How should social scientists and others involved in trying to understand and improve assessment practice evaluate those processes? In the rest of this essay, in an effort to help lay the groundwork for answering such questions, I want to describe four models for probing further into framing processes: framing as storytelling or narration; framing as hypothesising or modelling; framing as canonisation; and framing as normalisation.

FRAMING AS STORYTELLING

William Cronon provides one model for understanding framing processes in his historiography of the 1930s dust bowl in the mid-western United States (Cronon 1992). Cronon's essay compares several historical accounts that have sought, over the past forty years, to make sense of the relationship between social and environmental change in the events of those years. What strikes Cronon as particularly interesting about these studies is the way in which different accounts draw very different conclusions about that relationship from comparable sources of data. For government policymakers in the 1940s, the dust bowl and its aftermath illustrated the progressive vision of gradual control of nature by society through government planning, expert knowledge, and technological

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development. For later historians of American government, it displayed the triumph of individual ingenuity and resolve over natural hardship as well as government meddling. For yet more recent environmental historians, the dust bowl exemplifies the eventual destruction of nature by unconstrained economic growth. How, Cronon asks, have demonstrably competent historians come to tell such very different stories about what were, presumably, the same events?

For Cronon, at least part of the answer is captured in the multiple narratives that characterise societal discourses about nature, society, government and self. The stories told about the dust bowl reflect, for Cronon, the dynamics of commonly shared rhetorical motifs for relating nature to society in American culture. Stories of progressive government policymaking, frontier individualism and environmental catastrophe have all, at various points in time and among various communities, served as credible frameworks for making sense out of – and attributing meaning to – sequences of events in public discourse.

The concept of narrative carries at least two important implications for how we understand the historical dynamics of framing in particular cultures. First, the use of narratives emphasises the importance of meaning in the framing process as a counter to the traditional emphasis of science on getting the facts straight. People tell stories to attach meaning to events going on around them, to fit their observations to their values, and to relate that meaning to particular contexts of social behaviour or action. Narratives are, in other words, a way of making sense of the world, of relating the way one sees things happening with the kinds of happenings one would like to see.

Equally important, the concept of narrative emphasises the importance of coherence in welding a story together. Cronon's analysis of the various stories relates, for example, the intertwining of plot lines, characterisations, settings, narrative devices, and other narrative elements. Specific plot lines require certain types of character and certain settings. Not all elements can simply be mixed and matched. What provides the linkages among the various elements of the story is the narrative's coherence as a whole. To be sure, the coherence of narratives, the apparent orderliness of particular clusterings of story elements, is historically and culturally embedded, but it draws from that embeddedness a certain rhetorical power to impose upon particular constructions of events an apparent sensibility – or lack thereof.

How does the model of *framing as narrative* help us to understand the historical framing of climate impacts and the broader social processes of framing environmental risks? Let us look first at the multiple framing of climate impacts in the United States during the 1970s. What emerged during the 1970s were four alternative framings of climate change and its impacts, each of which corresponded to a major narrative of public policy during that era: global pollution and environmental degradation; natural disaster and social instability; limits to growth and economic transformation; and technology and rational management. Each framing emerged from a different policy community, and each offered an

alternate interpretation of the importance of rising atmospheric concentrations of carbon dioxide to human society. Each reflected, in other words, a different way of attributing meaning to climate change.

Several conclusions flow from these observations about global environmental assessments. First, the framing process inevitably intertwines questions that have traditionally been viewed as within the domain of science with questions that have traditionally been viewed as within the domain of values. Hence, to the extent that assessments become an important site in a given society's construction of scientific accounts of environmental change, they invariably also become sites where the social meaning of environmental change is constructed. Framing environmental change involves the attribution of meaningful causal narratives to observations in a way that dissolves the distinction between scientific and societal judgements (although subsequent 'boundary work' can help re-represent the results as either 'science' or 'politics'; see Gieryn 1999, 1996; Jasanoff 1990). As the 1983 National Academy report *Changing Climate* pointed out in its introductory remarks, whether one views climate change through the lens of global pollution or local weather variability makes all the difference in the world for how one is likely to respond to rising concentrations of carbon dioxide.

> Viewed in terms of energy, global pollution and worldwide environmental damage, the 'CO_2 problem' appears intractable. Viewed as a problem of changes in local environmental factors – rainfall, river flow, sea level – the myriad of individual incremental problems take their place among the other stresses to which nations and individuals adapt. It is important to be flexible both in definition of the issue, which is really more climate change than CO_2, and in maintaining a variety of alternative options for response (NRC 1983).

To evaluate the effectiveness of processes of environmental assessment, therefore, it would appear necessary to understand both their role in societal framing activities as well as how they serve to jointly integrate and articulate value, meaning and expert knowledge. From the history of US climate assessments, for example, it would appear that the principle mechanism by which various meanings and values were articulated was through the development of competing assessment exercises among various governmental and non-governmental organisations. A more thorough examination of the practices and distribution of these assessments might tell us a great deal about whose values count, how they are made to count, and how practical reforms in assessment practice might alter these equations in US politics.

Second, the model of *framing as narrative* is also useful in understanding how frames link together disparate elements of a story (characterisation, setting, plot, theme, etc.) in pre-defined clusters. In analyzing global environmental assessments, one can observe similar linkages emerging in terms of the specific causal narratives and narrative strategies that particular assessments choose to adopt. Following the literary analogy, we might map notions of characterisation

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with agency, plot with causal story, etc., to illustrate various framing choices, such as whether to frame risks as risks to individuals, specially vulnerable populations, or society as a whole; whether to frame risks in terms of observed harm or precaution; whether to frame risks to humans or risks to the environment; or whether to frame risks locally or globally.

The 1979 World Climate Conference, for example, viewed the impacts of climate change through the lens of long-term changes in statistical weather patterns. In their narratives, weather patterns took on the role of endpoint in the causal story, and participants in the conference addressed a wide array of possible human actions that would affect weather patterns, including greenhouse gases, direct heat loss to the atmosphere, large-scale manipulation of the Earth's surface, and others (WMO 1979). By contrast, the 1985 Villach Conference took a significantly different approach, adopting greenhouse gases as the starting point of their causal story, and spelled out all of the potential consequences that flowed from their increase in the atmosphere (WMO 1985). Still a third approach, adopted by the International Research Institute (IRI) at Lamont-Doherty Earth Observatory for work with developing countries, treats climatic variability as the starting point for their causal narrative and works forward to ask how societies can better predict and respond to the consequences of climatic variability for social and economic activities. From the IRI's perspective, the prior derivation of climatic variability, be it from El Niño, global warming, solar variability, or any other natural or anthropogenic activity, is irrelevant to the important question of finding adequate policy responses (IRI 1997).

These three approaches illustrate the importance of narrative coherence in shaping assessments and demarcating stories of environmental change. The World Climate Conference and the Villach Conference both took as their basic narrative structure the proposition that *human activities are degrading environmental conditions*, but they opted to treat different aspects of the climate system as the primary focal point for their analysis. The World Climate Conference adopted a 'weather modification' framing, with a focus on changing weather patterns; the Villach Conference adopted a 'pollution' framing, with a focus on polluting chemicals (greenhouse gases). By contrast, the IRI has adopted the perspective of *a struggle against nature* as its basic narrative structure.

These differences tell us that how we choose to slice into complex issues is important for how societies come to understand risk and to view appropriate policy responses. Part of this framing is temporal. It matters how we choose to divide up time to construct cause and effect stories out of historical sequences of events. Human-induced environmental change occupies a different narrative space than the consequences of environmental change for human societies. But framing is more than just the choice of endpoints for a particular causal story, it is also about the particular lenses through which these larger narratives get viewed. Choosing weather as their lens led the World Climate Conference to essentially ignore questions of sea level rise associated with changes to the

climatic system; the Villach Conference, which stressed sea level rise as one of the most important potential impacts of climate change, in turn ignored many of the causes of local and regional weather changes that the World Climate Conference had addressed. Framing climate change differently led the two conferences to tell very different stories about what kinds of climate change mattered and why.

Framing as narrative also helps explain why two studies of climate change by the US National Academy of Sciences two decades apart reached almost identical conclusions (that climate change did not require immediate policy action on a global scale) from similar data (that a buildup of greenhouse gases would likely cause significant variations in the climate system around the world) for completely different reasons. In 1966, as the first quote above suggests, the Academy observed that the highest predictions for temperature changes (5–10°C, compared to 1.5–4.5°C predictions today by the Intergovernmental Panel on Climate Change) fell within the bounds of natural variability and that 'although some of the natural climatic changes have had locally catastrophic effects, they did not stop the steady advance of civilisation (NRC 1966)'. Focused on the collective survival, and even prosperity, of humankind as a whole, the assessors proposed that there was little reason to worry. In 1983, as the subsequent quote suggests, the Academy followed a different path of reasoning. Focusing on the relative resourcefulness of local communities against the limited capacities of their global counterpart, the Academy reached the conclusion that the local framing offered more plausible policy alternatives than the prospect of global environmental negotiations (NRC 1983).

FRAMING AS MODELLING

A second model for thinking about the dynamics of framing is to treat alternative narratives as hypotheses or models of coupled human-nature systems and to subject them to test (see also Brockington and Homewood 1996, who offer a similar argument for desertification narratives in Africa, and Lee 1993, who describes adaptive management as a form of policy modelling and testing). Framing emerges from this perspective as a dynamic process in which societies (implicitly or explicitly) model human and natural systems in different ways in an effort to find tractable, meaningful policy approaches. Multiple initial frames may arise subject to a variety of different forms of 'testing' (including, e.g., scientific evaluation, media representation to the public, elections, legislative hearings, policy 'experimentation', etc.) until a particular frame achieves temporary closure or stability. If we take seriously comparative studies of science-based regulation, then we are forced to ask how this broad process of societal modelling (development, elaboration, and testing) may differ from community to community.

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The concept of framing as modelling directs our attention to two aspects of framing. First, framing inevitably involves the *simplification* of complex natural and human systems to arrive at their 'essential' characteristics, as interpreted in particular policy contexts. Second, framing inevitably involves the *specification* of general normative principles as to their relevance to particular policy contexts. These two aspects are, of course, interconnected and decidedly not independent. For some cases, the specification of relevance may operate as a tool for selecting among alternative strategies of simplification while, in other cases, simplification may inform judgements of relevance. In all cases, however, the coupling of simplification and specification in framing processes forces us to evaluate how they construct collective understandings of both knowledge and values.

An example of how specification and simplification couple can be seen in the distinction between weather forecasting and long-term climate modelling. Both weather forecasting and climate modelling reflect a normative judgement that knowledge about the atmosphere has value to policy choices. Both likewise reflect the complexities of atmospheric dynamics on temporal and spatial scales from molecular interactions to general circulation. In rendering knowledge about the atmosphere policy-relevant, however, both provide simplified models of atmospheric dynamics and more precise specifications of the social decisions in question. Weather forecasting reflects one possible frame: the application of highly geographically- and temporally-specific information about cloudiness, precipitation and temperature to decisions about what to wear, how to route airplanes, etc. Climate modelling reflects another: the application of long-term, non-localised information about the future of the climate system to decisions about worldwide energy and forest policy.

The combination of simplification and specification inherent in any particular policy framing choice reflects a more general finding in the sociology and history of science. Lynch (1990), for example, illustrates the same features in scientists' drawings of microscopic animals. Each drawing, Lynch illustrates, offers a simplified representation of the animal's characteristics; however, choices about which simplifications to make are guided by the scientist's desire to use the drawings as specific exemplars of a more general scientific argument. Similarly, Dear (1995) illustrates how scientists in the seventeenth century used mathematical techniques to develop simplified representations of complex historical events and to specify the relevance of those events to universal principles, thus creating the modern idea of the scientific experiment.

The concept of framing as modelling carries a number of important implications for assessment practice. First, it allows for the recognition that framing is a contingent process and that frames need not be taken as given. Asking whether or not one has the right question is a potentially very useful place to begin any analysis. Particular frames can be subjected to critical judgement and reflection

on a variety of grounds, including their robustness, equity, quality and appropriateness in particular contexts. Moreover, the particular grounds for assessing robustness, equity, etc., are themselves contingent and subject to judgement and contestation. In this sense, critical reflection can usefully be brought to bear on any one of the numerous clustered concepts embedded (sometimes explicitly and sometimes implicitly) in particular narratives.

Framing can also run into difficulties (from policy failure, controversy, etc.) as a result of inappropriate simplifications or specifications carried over from different contexts. As much of Brian Wynne's work has emphasised, for example, tacit assumptions about human behaviour that get embedded into risk assessment frames can lead to wildly inappropriate claims about the magnitude of risks or the possibility of rational management and control. Such claims, in turn, have contributed to the creation and perpetuation of conditions in which the possibilities of such events as explosions, inadvertent exposures to radiation, and invalid models of soil uptake of radioactive chemicals were routinely underestimated. Where they have led experts to evaluate such risks differently from lay perceptions, embedded assumptions have also contributed to the emergence of public mistrust of government policy (see, e.g., Wynne 1995). Bhopal offers another context in which assumptions about human behaviour, grounded in risk assessments carried out for Union Carbide's facilities in North America and embedded in industrial safety protocols, systematically misrepresented worker practices in the their Indian facility at the time of the methyl isocynate leak (see, e.g., Jasanoff 1994). These and other stories, such as those told by Fairhead and Leach (1996) and described in the next section, make clear the dangers that arise when narratives developed in one context (geophysical, cultural, etc.) are applied without reflection onto other contexts. They thus illustrate the importance of bringing critical judgement to bear on the assumptions built into both simplification and specification.

Perhaps more than anything else, then, critical reflection on framing could benefit from the inputs of a wide array of perspectives, some scientific, some non-scientific. Too often, especially in contexts that cross social and geophysical boundaries, tacit and buried assumptions are insufficiently exposed to critical scrutiny. Wider participation among diverse groups may increase the breadth of knowledge about both human-nature interactions and human values incorporated into framing choices. To be sure, a wider array of participants inevitably creates opportunities for delay and dissension. Nevertheless, given the naive instrumentalism that pervades many institutions devoted to environmental management on planetary scales, encouraging a greater degree of reflexivity through more open participation in the framing of environmental assessments seems a good place to begin.

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FRAMING AS CANONISATION

James Fairhead and Melissa Leach develop a third model of the framing process in their recent work on the problem of deforestation in West Africa (Fairhead and Leach 1996). The landscape of West Africa, Fairhead and Leach note, is dominated by a savanna with small islands of forest scattered across it, many with small villages at their centre. Conventionally, Western scientists have viewed these islands as relics of a once vast forest, and their advice to first colonial and more recently post-independence governments in West Africa has been to pursue policies designed to curb deforestation. Based on careful anthropological evidence, however, Fairhead and Leach argue that the forest islands are not really relics of a once larger forest but rather the result of village cultivation of trees on the savanna. How, Fairhead and Leach ask, have Western scientists been so wrong for so long about the causes of forest growth and destruction in this region? And why have governments adopted their views of afforestation and deforestation over those of the peasant communities living in rural villages?

Fairhead and Leach's account of how Western scientists came to view forest islands as relics of deforestation reads as a history of canonisation. What is of interest is how scientists and public officials in both colonial and post-colonial governments came to adopt one particular narrative of the West African landscape as canonical. Three complementary explanations emerge from Fairhead and Leach's account, two of which are relevant to the idea of canonisation. The first explanation relates to the acquisition of power and authority within emerging colonial governments (and later post-independence states). Scientists, far more than rural peasants, had acquired the authority to frame governmental understandings and responses to environmental and natural resource issues through their institutionalisation into processes of governmental decision-making. Probing further, their second explanation focuses on narrative resonance between stories of deforestation and stories common in both ecological and political discourses. Fairhead and Leach point out that emerging theories within a variety of ecologically-oriented disciplines concerning 'soil, climate and 'desertification'' all lent credence to deforestation narratives. Particularly among American soil scientists, many of whose formative experiences took place during the Dust Bowl years, narratives of human-induced ecological collapse substantially coloured their work (see also Brockington and Homewood 1996). Similarly, deforestation narratives acquired persuasiveness through their resonance with progressive social narratives used to justify the relationship of both colonial and post-independence governments to the rural poor in developing countries.

In linking the development of canonical narratives to the formation of new social institutions, Fairhead and Leach's account is similar to recent develop-

ments in numerous fields of history and social science examining how particular constellations of ideas, images and material objects achieve stability or 'stickiness' in particular societal contexts. Historians, sociologists and political scientists alike have become interested in how symbolic resources acquire power in the creation and maintenance of social institutions. For Thomas Kuhn, for example, exemplary problems often came to define paradigms (Kuhn 1970). Historians of science have become interested in the relationship between the emergence of canonical narratives of specific scientific experiments or texts and the formation of scientific disciplines (e.g., Schaffer 1996; see also Pocock 1975 for a related account of ideas of political philosophy and the development of Western democratic governments). Benedict Anderson relates how images and imagined forms (Anderson's term is logo) can achieve symbolic status in the formation and maintenance of nationalist identities (Anderson 1983; see also Fussell 1975 for an account of how sunsets acquired harsher and colder meaning in British literature following World War I). Similarly, sociologists of science have explored how material objects and social practices interact to hold diverse constellations of communities together (Star and Griesemer 1989; Latour 1990; Fujimura 1996; Shackley and Wynne 1996; this work has used a variety of labels to describe this phenomenon, including: 'boundary objects', 'boundary ordering devices', 'immutable mobiles', 'standardised packages', and 'anchoring devices', among others).

Conceptualising framing as a process of canonisation, in which narratives come to be seen as central to the creation and maintenance of forms of social order, helps us think about the process by which the 'global pollution' narrative of climate change achieved predominance in the 1980s out of the many that were available in American policy contexts in the 1970s. There is no simple answer, of course, for why global environmental degradation came to be viewed as more appropriate as a frame for climate change than planetary ecosystem management, weather disasters or long-term energy planning. Nevertheless, one can point to enduring aspects of American political culture that contributed to its credibility – the already canonical status of pollution narratives in domestic environmental discourses and the representation of science as an objective, universal enterprise in Western models of liberal international governance—as well as more historically or contextually specific developments, such as the growing prevalence of satellite images of the Earth from space, the construction of general circulation models representing the Earth's atmosphere as a single, global system, and the constructive work of various institutions such as SCOPE and later the IPCC in isolating, promoting and lending credibility and authority to the global environmental narrative of climate change (for a more detailed accounting of this process, see Miller forthcoming, 'Undermining the Postwar Order').

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FRAMING AS NORMALISATION

The third explanation that emerges from Fairhead and Leach of the persistence of deforestation narratives in West Africa offers yet another model for thinking about the dynamics of the framing process. Fairhead and Leach describe how an important part of what lends credence to deforestation narratives in both colonial and post-independence governments is the extent to which they have simply become normalised, back-grounded, or 'black boxed' in the normal routines of everyday institutional practices. For example, early scientific accounts of West African ecology and agriculture did not necessarily set out to reproduce early ideas of deforestation. Nevertheless, according to Fairhead and Leach, much of the work built upon colonial botanical collections that had been selected according to criteria that assumed that the savanna resulted from fire-setting by inhabitants. Subsequently, Fairhead and Leach argue, during the transition from colonial to post-independence government, many of the institutions for conducting agricultural and ecological research were carried over into new governments in their entirety, without due consideration for the ways in which their embedded norms and practices might constrain future policymaking (see Storey 1997 for a similar pattern of developments in British Mauritius).

Studies of processes of normalisation derive most closely from the work of Foucault and others on the role of the human sciences (biology, nutrition, psychology, criminology, etc.) in establishing ideas of what is normal for human beings and on the incorporation of those ideas into the routine practices of the administrative state (e.g. Foucault 1973, 1977), as well as the ideas of Kuhn and others about 'normal science' (Kuhn 1970). More recent work has extended this idea beyond the individual to other societal institutions such as the nuclear family (Coontz 1992), other domains of social science inquiry such as statistics (Porter 1995), and policymaking strategies such as risk assessment (Winner 1986; Jasanoff 1990). All of this work points towards particular assumptions about both the nature of humans and human society that become implicit in the routine practices of knowledge production and policymaking.

The idea of normalisation can, of course, be generalised beyond tacit models of what it means to be human. One of the most interesting examples of this is the shift in climatological research methods that took place during the 1970s. Whereas throughout much of the twentieth century climatologists had principally studied climate through statistical aggregations of data from individual weather stations (or geographically proximate groups of stations), statistical methods had largely been replaced by general circulation models by the early 1980s. This shift carried with it tacit assumptions about the proper object of study, namely local and regional climates versus the global climate system. Discussions of climate impacts in the 1979 World Climate Conference report and the 1995 Second Assessment Report of the IPCC, for example, differed considerably in their treatment of climate impacts. In both, climate impacts are

treated as central areas of study, but whereas the 1979 World Climate Conference report treats the field of climate impacts research as well-established, with considerable expertise, the 1995 IPCC report treats it as emergent and poorly understood.

How did it come about that scientists appear to know less about the problem of climate impacts after two decades of study? One reason is that the framing of climate impacts has tacitly shifted through the adoption of computer modelling as the principal tool of climatological research. Climate change impacts research is now presumed to mean the determinative prediction of greenhouse gas-induced changes in the global climate system, as manifest on local and regional scales. From this point of view, scientists do indeed know very little. On the other hand, as long as climatology remained a predominantly statistical field, and thus offered little in the way of predictive capabilities, it nevertheless offered a great deal of knowledge about the interactions of climatological conditions and human institutions in particular localities and regions. This knowledge, while still extant in numerous institutions around the world, is no longer mobilised by institutions like the IPCC that have centred their activities and rationales around the predictive power of GCMs.

The model of framing as normalisation carries with it significant implications for understanding processes of frame change. Frame changes, as Jasanoff (1997) has argued, can play important roles in establishing compelling knowledge in policy contexts by shifting the grounds on which debate takes place and thus potentially resolving underlying tensions that manifest themselves as disputes over knowledge claims (see also Schon and Rein 1994). For example, framing climate change as a problem of global environmental degradation removed it from sterile debates over energy futures and convinced environmental groups to support efforts to prevent it. By the same token, frame changes can also open up new avenues of potential critique as happened, arguably, when climate change emerged in the 1980s in the frame of global environmental degradation. This framing, centred as it was on GCM results, was vulnerable to deconstruction by industry-supported scientists in a way that other frames, such as local weather disasters, might not have been. In the political and legal culture of the United States, in which demonstrated harms carry vastly greater moral authority than potential risks, the credibility of computer projections of future global warming has frequently succumbed to narrow, technical deconstruction by critics of climate change policies.

If we think about frame changes in the context of processes of institutionalisation, such as canonisation or normalisation, then two interesting features emerge. First, frames may evolve and change as institutional practices evolve and change, quite unintentionally and with little awareness of basic shifts in societal attitudes. If the initial motivation for practices becomes highly backgrounded or 'black boxed', then changes to those practices may introduce frame changes without any intention or recognition on the part of a given community.

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This seems particularly likely in contexts that involve complex institutions and social networks that provide multiple sites at which institutional innovation is taking place, each responding to different local conditions. The converse is also true. Institutional practices may persist long after the ideas and value judgements on which they were originally based have lost credibility. Arguably, one of the best examples of this may be the tendency for national political cultures to re-inscribe aspects of themselves whenever new policy issues arise (Jasanoff 1986; Brickman et al. 1985). Jasanoff (1995), for example, illustrates not only that the US, Germany, and Britain have handled the emergence of genetically-modified organisms as a public policy issue differently but also that the particular differences that have emerged reproduce systematic, well-understood aspects of each country's unique approaches to public policymaking.

CONCLUSIONS

The four models presented here – framing as narration, modelling, canonisation, and normalisation – should not be treated, as might be conventional in other areas of social science, as independent hypotheses that can be tested to see which one is 'right'. Rather, each emphasises some aspects of societal framing processes. Each points our attention in certain directions and not others. In that regard, they are themselves similar to different ways of framing the dynamics of framing. I have sketched in this paper some of the broad dimensions of these four processes. One important project for social scientists engaged in assessing the human dimensions of global environmental change is to begin fleshing out the precise social mechanisms by which each sorts out and (temporarily) stabilises frames of meaning around nature and the environment.

Comparatively, across the four, for example, more research is needed into the nature of agency within each process. Are the roles of experts, NGOs, individual citizens, bureaucratic officials, and other agents in society similar or different between narration and modelling or between canonisation and normalisation? Who are sources of frame innovation within each process? Likewise, research into the specific regimes of discourse and practice in which each process takes place would aid considerably in understanding the precise social mechanisms by which frames are sorted out and the criteria against which this occurs. Do the practices of institutions such as law, politics, science, and social movements differ in the way they stabilise or destabilise frames? Under what conditions can discourses and practices of narration, modelling, canonisation and normalisation be drawn from one domain of social activity and taken up into others?

A second important project is to understand how the four processes described in this paper intersect in particular historical and cultural contexts. At first glance, the four processes I have described almost appear as a kind of policy cycle. New frames of meaning emerge initially in collective storytelling. As

multiple frames emerge, they then become subject to societal processes of modelling, testing, and evaluation that help differentiate alternatives and connect them to issues of perceived relevance and importance in society. As social order reconfigures itself in response to the outcomes of modelling exercises, specific frames begin to acquire canonical status. Finally, canonical frames become so widely accepted as to become normalised in the routine practices of environmental management institutions, providing the background against which new processes of narration take place.

Such a picture is oversimplified, however, on several levels. First, it ascribes a certain temporal sequencing that may or may not be reflected in actual social practice. Second, it suggests a single process rather than the possibility of myriad framing activities occurring simultaneously at many sites throughout society. Third, it universalises what may be a historically and culturally contingent intersection of the four processes. One example of this is the extent to which the institutionalisation of collective storytelling and modelling in the policymaking process has taken a dramatically different form in Britain than in the United States (Jasanoff 1986). Perhaps more important are the different ways in which multiple frames of meaning have become stabilised alongside one another in the same society. The kind of narration, selection, stabilisation and normalisation cycle described above might fit well the kind of controversies described by Dorothy Nelkin (Nelkin 1992). As Mary Douglas and her students have shown, however, two or more frames can become embedded in deep, political divides between competing cultures and institutions in society (Douglas and Wildavsky 1982; Rayner and Thompson 1998). Indeed, as Stephen Lansing's anthropological work on the Green Revolution in Indonesia illustrates, alternative frames can sometimes exist side-by-side in society with dominant frames and yet remain entirely invisible within mainstream discourses (Lansing 1991). Teasing out how such arrangements come about and change over time is inordinately difficult and time-consuming work but inevitably necessary if we are to develop a deeper understanding of how environmental conflicts emerge and are resolved and how these dynamics are reshaping the distribution of power in modern societies.

A final project is to explore ways in which the more nuanced understanding of societal framing processes provided by such research can contribute to efforts to evaluate and improve practices of environmental assessment. What, in other words, are the normative implications of each of the four processes described in this paper and their intersections in different historical and cultural contexts? Are some, such as normalisation, inherently less transparent than others, both to outsiders (because they create barriers to looking in) and to insiders (because they render assumptions invisible)? Do others, such as narration, provide greater opportunities for marginalised groups to attain legitimacy and standing in societal decisionmaking, e.g., in the climate and biodiversity negotiations, the apparent support given by 'global' frames of meaning around environmental

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change to post-colonial narratives of wealth redistribution and narratives of identity for specially-vulnerable states like the small island states? Only against a background of more precise knowledge about how frames acquire stability in societies can we hope critically and reflexively to evaluate normatively important questions like these.

NOTE

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