Science or Science Fiction? Professionals' Discursive Construction of Climate Change

Lianne M. Lefsrud
University of Alberta, Canada

Renate E. Meyer
Vienna University of Economics and Business, Austria and Copenhagen Business School, Denmark

Abstract

This paper examines the framings and identity work associated with professionals' discursive construction of climate change science, their legitimation of themselves as experts on 'the truth', and their attitudes towards regulatory measures. Drawing from survey responses of 1077 professional engineers and geoscientists, we reconstruct their framings of the issue and knowledge claims to position themselves within their organizational and their professional institutions. In understanding the struggle over what constitutes and legitimizes expertise, we make apparent the heterogeneity of claims, legitimation strategies, and use of emotionality and metaphor. By linking notions of the science or science fiction of climate change to the assessment of the adequacy of global and local policies and of potential organizational responses, we contribute to the understanding of 'defensive institutional work' by professionals within petroleum companies, related industries, government regulators, and their professional association.

Keywords

climate change, defensive institutional work, emotion, expertise, framing, metaphor, petroleum industry

Introduction

> With all of the hysteria, all of the fear, all of the phony science, could it be that man-made global warming is the greatest hoax ever perpetrated on the American people? (Inhofe, 2003)

Climate change profoundly challenges governmental, non-governmental and private organizations (Hoffman & Woody, 2008) by creating pressure for emission reduction goals and adaptation measures. Alongside these actions, the debate continues in some quarters as to the causes and consequences of

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Corresponding author:
Lianne M. Lefsrud, Alberta School of Business, University of Alberta, Edmonton T6G 2R6, Canada
Email: lefsrud@ualberta.ca

global climate change – and, more importantly, potential directions of public policies and organizational strategies. The United Nations' Intergovernmental Panel on Climate Change (IPCC), representing the work of about 2,000 individuals, contends that recent global warming is a direct result of human activities for which we should mitigate the effects (IPCC, 2007a, 2007b). In contrast, 'climate sceptics' (as per Antonio & Brulle, 2011; Hamilton, 2010; Hoffman, 2011a, 2011b; Kahan, Jenkins-Smith & Braman, 2010; Levy & Rothenberg, 2002; McCright & Dunlap, 2000, 2011) have argued that the climate is changing due to natural causes and have countered with their own experts' reports.

> This Senate report is not a "list" of scientists [like that given by the IPCC; addition by authors], but a report that includes full biographies of … distinguished scientists … experts in..: climatology; geology; biology; glaciology; biogeography; meteorology; oceanography; economics; chemistry; mathematics; environmental sciences; astrophysics; engineering; physics and paleoclimatology. (US Senate, 2009, p. 7)

Indeed, while there is a broad consensus among climate scientists (IPCC, 2007a, 2007b), scepticism regarding anthropogenic climate change remains. The proportion of papers found in the ISI Web of Science database that explicitly endorsed anthropogenic climate change has fallen from 75% (for the period between 1993 and 2003) as of 2004 to 45% from 2004 to 2008, while outright disagreement has risen from 0% to 6% (Oreskes, 2004; Schulte, 2008). This drop in endorsement may be a manifestation of increasing taken-for-grantedness (e.g., Green, 2004) of anthropogenic climate science; the rise in disagreement may be a result of increased funding of sceptics by fossil fuel industries, conservative foundations and think tanks (McCright & Dunlap, 2010). Yet, apart from discussions among scientists, public concern over climate change is also waning in the US (Leiserowitz, Maibach & Roser-Renouf, 2008, 2010; Maibach, Leiserowitz, Roser-Renouf, & Mertz, 2011; Pew Research Center, 2009), the UK (Jowit, 2010), and Canada (Berry, Clarke, Pajot, Hutton, & Verret, 2009).

The ability to build and maintain consensus on issues such as climate change fundamentally depends upon expertise, ensconced in professional opinion. Yet, given the complexity and magnitude of this problem (Weingart, Engels, & Pansegrau, 2000), the credibility of the claims-maker becomes central, i.e., the status, reputation and prestige of the scientists and professional experts who vouch for or against the different interpretations (Snow & Benford, 1988, p. 208) and construct 'interpretive packages' or frames (Gamson & Modigliani, 1989) that stand in for the 'truth'. Besides defining the issue, framing is also the means by which professionals draw from broader values (Hulme, 2009), construct their self-definitions and expert identities (Beech, 2008; Sveningsson & Alvesson, 2003; Thomas & Linstead, 2002) and legitimate their position within this social field (Dyer & Keller-Cohen, 2000; Grandqvist & Laurila, 2011; Meyer & Höllerer, 2010; Phillips & Hardy, 2002), and their ability to prescribe actions. Our aim is to examine the construction and disputation of expertise in a contested issue field and the consequences this has for the mobilization for or against regulation.

Several assumptions have stymied advancements in understanding claims of expertise in contested issue fields. A first stymying assumption within institutional work and professions literatures is that professionals are a homogenous group, sharing cultural-cognitive conceptions of what problems require solving (Knorr-Cetina, 1999), and collaborating on solutions to maintain their authoritative monopoly over a scope of practice (Abbott, 1988) against outside forces (Scott, Ruef, Mendel, & Caronna, 2000; Thornton, 2002). Even climate change research has assumed a cohesive 'expert' versus public or media discourse (Boykoff, 2008; Carvalho, 2007; Olausson, 2009; Weingart et al., 2000). Rather than presuming that they draw

from one – professional – logic, we recognize their endogenous heterogeneity and ground our research in their internal contestations over expertise. Second, it is often assumed that those working to maintain institutions are primarily reproducing belief systems, 'largely unaware of the original purpose, or ultimate outcome, of their actions' (Lawrence & Suddaby, 2006, p. 234). However, defensive institutional work, i.e., the maintenance of institutions against disruptions, can be as deliberate and strategic as the efforts by proponents of change (Lawrence, Suddaby & Leca, 2009; Maguire & Hardy, 2009; Meyer & Höllerer, 2010). We contend that such defensive work can also be directed internally; professionals may simultaneously frame their own expert identities while defensively attacking fellow professionals as non-experts. In sum, the inter-institutional, discursive formation (or unraveling) of professionals' expert consensus has not been examined within organizational theory or climate change research to determine who will defend institutions against internal challenges, why, and how.

To address this, we reconstruct the frames of one group of experts who have not received much attention in previous research and yet play a central role in understanding industry responses – professional experts in petroleum and related industries. Not only are we interested in the positions they take towards climate change and in the recommendations for policy development and organizational decision-making that they derive from their framings, but also in how they construct and attempt to safeguard their expert status against others. To gain an understanding of the competing expert claims and to link them to issues of professional resistance and defensive institutional work, we combine insights from various disciplines and approaches: framing, professions literature, and institutional theory. This addresses the call from Zald and Lounsbury (2010, p. 970) for a systematic re-engagement 'of the critical and expanded role of experts and communities of expertise – especially the international dimension … [as] opportunities for scholarship in Organization Studies'. Using a qualitative methodology and induction, we find a variety of frames and the strategies used to promote them. Our study demonstrates that the majority of 'command posts' (Zald & Lounsbury, 2010, p. 963) within organizations, especially in the petroleum industry, seem to be manned with opponents to the IPCC and anthropogenic climate science who are actively engaged in defensive institutional work. We point out that in order to overcome the defense, a potent discourse coalition and a more integrative frame, for example by emphasizing climate change as a risk – a common enemy to be managed (per Kahan et al., 2010; Hoffman, 2011b; Nagel, 2011), has to be found.

Theoretical Context

In contested issue fields (Hoffman, 1999; Wynne, 2010), several versions of truth claims compete to become recognized as 'facts'. Since the world of science and the world of politics overlap, and, according to Collins and Evans (2009, p. 8), 'the speed of politics exceeds the speed of scientific consensus formation', there is a struggle over who has definitional authority. Due to the complex nature of the phenomenon, policy-makers and organizational decision-makers are dependent on scientists and other professional experts to define what evidence is to be seen as relevant and to provide rationales for action. Besides being the experts responsible for delivering technical interpretation for decision-making, in the aggregate, professions are an institution (Thornton, 2002) – granted the right to self-regulate in return for their support in establishing and maintaining the social order of the state (Larson, 1977). Given this, such professionals influence public policy formulation and implementation, act as intermediaries between organizations and the state, and reconfigure the organizational landscape.

Framing the climate change debate

Frames define how 'the debate … over climate change is determined by which actors are engaged, what kinds of problems are debated, how those problems are defined, and what kinds of solutions are considered appropriate' (Hoffman, 1999, p. 1369; also see Hoffman & Jennings, 2011). Each claim to know 'what is at issue' (Gamson & Modigliani, 1989, p. 3) with climate change is embedded within a specific frame. Frames work as 'schemata of interpretation' that enable individuals 'to locate, perceive, identify and label' occurrences within their life space and the world at large' (Snow, Rochford, Worden, & Benford, 1986, p. 464). According to Snow and Benford (1988) frames have three core tasks. Diagnostic framing refers to the identification of an aspect of the world considered to be in need of amelioration – the definition of the problem and the attribution of causality. Prognostic framing attempts to propose ameliorative action and possible solutions, while humbling, undermining or neutralizing existing counter-framings. While diagnostic and prognostic framing aim at mobilizing consensus, the third framing task – motivational framing – includes the 'call to arms' by elaborating vocabularies of motive that provide 'adherents with compelling accounts for engaging in collective action' (Benford & Snow, 2000, p. 617). Hence, groups may agree on the cause, severity and urgency of a problem, and still fundamentally differ in the proposed solution and the need to take action.

Framing as a means of constructing experts' identities

Frames not only provide worldviews; by introducing a vocabulary and constructing categorizations, ideals and models, frames also define social identities (Reger, Myers, & Einwohner, 2008; Snow & McAdam, 2000; Tajfel, 1981) and position actors in power/dependency relations to other categories of actors, associating with them a range of social expectations and capacities for actions. Apart from its actual content (the diagnosis, prognosis, and call to action), thus, each frame involves the negotiation of identities and roles, the building of alliances (the victims, villains and heroes, the advocates who are entitled to speak on behalf of others, etc.) and efforts to control participation in the struggle by active boundary management (Granqvist & Laurila, 2011; Meyer & Höllerer, 2010).

> Boundary work occurs as people contend for, legitimate, or challenge the cognitive authority of science – and the credibility, prestige, power, and material resources that attend such a position. Pragmatic demarcations of science from non-science are driven by a social interest in claiming, expanding, protecting, monopolizing, usurping, denying, or restricting the cognitive authority of science. (Gieryn, 1995, p. 405)

Such boundary work establishes an adversarial in-group/out-group distinction between 'us', the group that shares a worldview, and 'them', who are responsible for the problem and/or promote counter-frames (Gamson, 1992). Given that there are claims and counter-claims, prognostic framing typically advocates the efficacy of one's own remedies while trying to break the persuasiveness of the counter-frames' storylines. This can be achieved on two levels: either by legitimizing one's own and de-legitimizing the opponents' arguments and accounts and/or by undermining the identity position from which 'they' speak.

In struggles in which empirical credibility, i.e., the 'fit between the framing and events in the world' (Snow & Benford, 1988, p. 208; Wynne, 2010) cannot be established, the credibility of the claims-maker is the essential currency (Benford & Snow, 2000). As stocks of knowledge are differentially distributed (Berger & Luckmann, 1967), a 'hierarchy of credibility' exists (Becker, 1967, p. 242). For a phenomenon such as climate change, scientists and professional experts with

academic credentials are at the top of this hierarchy and have become the most authoritative voice to define the way things are and to propose potential solutions (Hitzler, 1994). Experts' claims are a specific type of knowledge claim (Lazega, 1992). Experts derive their expert status, i.e., their credibility and authority, from perceived differences in knowledge distribution. When experts speak, they claim to speak on behalf of 'truth'. They are expected to assess the quality or value of data (Peterson, 2009), establish certainty (Bugos, 1993), and exercise control (Perin, 2005). Unlike the claims from lay actors, experts' claims are challengeable only by other recognized members of an expert group (Collins & Evans, 2009). Therefore, much more so than other types of actors, experts have to establish the general perception in their audiences that (a) they are making informed claims based on their superior access to specialists' knowledge (*superiority of knowledge*) and (b) that they are independent and their claims are objective and not driven by particularistic interests (*independence*). In struggles between different expert groups, to defend one's framing always also includes defending one's status as expert. Hence, framing struggles in scientific debates are frequently stories of true and false knowledge and biased research (Keller, 2005).

Strategies of discursive (de)legitimation and defensive work

We argue that processes of constructing expert identities are political strategies that are parallel to the legitimation strategies found in public policy research (Van Leeuwen & Wodak, 1999) or in organization studies (Vaara & Monin, 2010; Vaara, Tienari & Laurila, 2006). These authors distinguish five main discursive strategies: authorization, rationalization, moral evaluation, mythopoiesis, and normalization, which we also expect to find, to varying degrees, in experts' claims. These align with rhetorical modes of proof (Suddaby & Greenwood, 2005): authorization, rationalization, and normalization strategies are forms of *logos*, moral evaluation aligns with *ethos*, and mythopoiesis aligns with *pathos*. To undermine the claims and frames put forward by other members of the same professional group, individuals may also employ antagonistic identity framing of others as non-experts (destructive strategy per Van Leeuwen & Wodak, 1999) using oppositional strategies (cf. social identity threats per Branscombe, Ellemers, Spears, & Doosje, 1999). Berger and Luckmann (1967) especially point to annihilation, be it by outright denial of the validity or by downplaying and ridiculing the claim or by attempting to assign an inferior status to the claimant and her or his sources of information.

Hence, despite that all experts' claims are similar in the sense that they are a certain type of claim – reliant upon the attribution as superior knowledge and independent from particularistic interests – they differ in their legitimation strategies and adversarial framing activities, depending on the *defensiveness*, i.e., the extent to which adherents feel threatened and 'under attack', and on the intensity of the *identification and mobilization* efforts inherent in the framing. We argue that both will increase sensemaking and accounting activities leading to more extensive use of legitimation/de-legitimation and identity/boundary work.

In expert-driven discourses, frames without endorsement by legitimated expert groups have little chance to prevail. However, if experts provide differing frames and prescribe different solutions, it is important not to stop at reconstructing the different interpretations but to contribute to an understanding of the social and political dimensions of these contestations, i.e., to trace the frames back to specific sponsors and the economic and cultural resources available to them (Gamson & Modigliani, 1989) as well as the discourse coalitions (Hajer, 1995; Meyer & Höllerer, 2010) they enable. These discursive struggles establish what counts as 'facts' and 'problematic', whose knowledge claims gain the status of truth, what impacts public policies (Motion & Leitch, 2009) and affects organizations' environmental strategies (Banerjee, 2002; Sharma, 2000). In the

context of climate change, the frames sponsored by experts in high hierarchical positions in the petroleum industry and in government agencies that regulate the industry are central 'command posts' (Zald & Lounsbury 2010, p. 963) and crucial to understanding defensive institutional work or outright resistance.

Maguire and Hardy (2009, p. 169) introduce the concept of defensive institutional work as the 'purposive action of individuals and organizations aimed at countering disruptive institutional work' by outsiders seeking to change or discard the existing practices. Parallel to Vaara et al.'s (2006) (de)legitimation strategies or Meyer and Höllerer's (2010) defendants of the traditional truce, Maguire and Hardy find that industry incumbents authored texts that challenged outsiders' assertions of the negative impacts of DDT; the categorizations of its use as unethical, undesirable, or inappropriate; and the calls for regulatory change to ban its use. Additional research is required, however, to understand how defensive institutional work is performed in response to insider-driven change (Maguire & Hardy, 2009). This provides the motivation for our research question: *How do professional experts frame the reality of climate change and themselves as experts, while engaging in defensive institutional work against others?*

Research Context, Design and Methods

To answer this question, we consider how climate change is constructed by professional engineers and geoscientists in the province of Alberta, Canada. We begin by describing our research context and the strategic importance of Canadian oil worldwide, to the economy of Canada, and the province of Alberta. We outline the influential role of engineers and geoscientists within this industry, which allows them to affect national and international policy. Then, we describe our research design and methods.

Research context: an instrumental case

The petroleum industry in Alberta is an instrumental case (Stake, 1995; per Greenwood & Suddaby, 2006) to examine the debate of climate change expertise given the economic centrality of the oil industry, the oil sands as a controversial energy source, and the dominance of professionals that gives them a privileged position as influencers of government and industry policy. Frames are always socio-historical constructions and, thus, time and location play an important role.

The petroleum industry is the largest single private sector investor in Canada (~CAD 35 billion in 2009) (CAPP, 2009) and it is projected that the petroleum industry will contribute CAD 1.7 trillion to Canada's GDP and create over 456,000 jobs over the next 25 years (Canadian Energy Research Institute, 2009). There are 540 multinational integrated, midsized, and junior oil and gas companies in Canada (nearly all headquartered in Calgary, Alberta) with operations worldwide. Further, Canada's oil reserves are considered to be a strategic resource (see Figure 1) with most reserves in Alberta and the oil sands. Given the relative political stability of Canada as a source of oil to the US, the Alberta oil sands are undergoing a CAD 250 billion expansion (AII, 2008).

Yet, the petroleum industry is particularly divisive and controversial. The oil industry in Alberta (especially the oil sands) is the largest source of greenhouse gases (GHG), in a country with rapidly growing (not decreasing) emissions. Overall, oil and gas production, transmission, and refining contribute 24% of Canada's emissions. Defendants note, however, when compared to other GHG sources in North America, emissions from the oil sands are equivalent to the emissions from coal-fired power in South Carolina, USA. As a country, Canada's GHG emissions have increased 26.6% from 1990 to 2004, rather than decreased by 6% as required by the Kyoto Protocol. In 2006, when
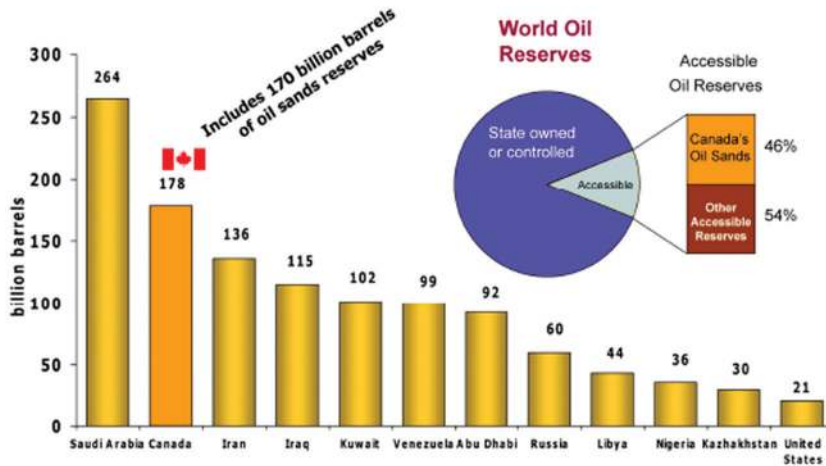
Figure 1. World Oil Reserves by Country

Stephen Harper was elected as the first Prime Minister of Canada from Calgary, his Conservative minority government removed the Government of Canada's climate change website. And, to reverse the criticism of a previous government's choice to sign the Kyoto Protocol, in December 2011 Canada formally withdrew from the international treaty to avoid the estimated CAD 14 billion in penalties (CBC, 2011).

With more than 15% higher GHG emissions than conventional oil, the oil sands have been categorized as particularly 'dirty' oil (Nikiforuk, 2008) and have become the 'whipping boy of European and American green groups fighting the "Great Climate War"' (Sweeney, 2010, p. 160). Al Gore builds on this by stating that the 'oil sands threaten our survival as a species' and 'Junkies find veins in the toes when the ones in their arms and their legs collapse. Developing tar sands and coal shale is the equivalent' (Sweeney, 2010, p. 168). While petroleum companies have claimed that they are adopting environmental initiatives (CAPP, 2007), critics question the veracity of those claims (Dyer, Moorhouse, Laufenberg & Powell, 2008; Nikiforuk, 2006). Yet, in 2008, Alberta became the first jurisdiction in North America to promulgate an offset system for GHG emissions. Further, provincial regulations require that companies must have their annual GHG emissions audited by either a professional engineer or a chartered accountant.

Professional engineers and geoscientists are particularly influential in this industry. Alberta has the highest per capita of professional engineers and geoscientists (a category of licensure that includes climatologists, geologists, glaciologists, meteorologists, geophysicists, and paleo-climatologists) in North America. And the petroleum industry – through oil and gas companies, related industrial services, and consulting services – is the largest employer, either directly or indirectly, of professional engineers and geoscientists in Alberta. In oil and gas companies, almost half of CEOs are professional engineers or geoscientists and most senior management teams and boards have at least one licensed professional. Within Alberta's Energy Resource Conservation Board (ERCB) – the quasi-judicial government agency that regulates petroleum development – five of the eight board members are professional engineers or geoscientists. Within the Albertan government, prominent engineers and geoscientists act as Deputy Ministers, Assistant Deputy Ministers, and as Chief of Staff. Further, within the broader field, they also act as advisors to government through think tanks such as the Canada West Foundation, task forces struck to review regulation, and environmental

activist organizations such as the Pembina Institute. These professionals and their organizations are regulated by a single professional self-regulatory authority –APEGA[1] – through the setting of education and experience standards for licensure, practice standards, a code of ethics, and a complaint and discipline process for anyone practicing in an unskilled or unethical manner. Given the dependence on the petroleum industry and relative homogeneity in licensure requirements, we might expect a consensus of opinion. Yet, perhaps surprisingly, the debate of the causes of climate change is particularly virulent among them.

Empirical design and methods

Since 1999, climate change had been debated among professionals in APEGA in over 150 articles and letters to the editor that had appeared in the association's monthly publication *The PEGG*. The discussion was becoming increasingly heated among a vocal few and, for the association, it was unclear whether these few were representing the majority of members. Given this debate, APEGA initiated a broad survey of its 40,000 members (as of 2007) concerning their beliefs about climate change, sources of knowledge, and opinions about the appropriate roles for individuals, industry, APEGA, and government. The first author was engaged by APEGA to develop the survey and analyze the results. The survey questionnaire contained closed- and open-ended questions and was published in *The PEGG* and on the website in October 2007.[2] A total of 1077 completed surveys were received and 12 respondents emailed or mailed in additional comments. While this is, effectively, a convenience (nonprobability) sample of self-selected respondents, the respondents are similar to the general APEGA membership when compared on professional designation, age, and gender as of October 2007 (see Table 1).[3] In their responses to the open-ended questions, respondents provided rich justifications. By considering these statements and claims, we are given a window to 'eavesdrop' into how they draw from broader narratives to make sense of climate change and legitimize themselves as experts while de-legitimizing others.

Data analysis

From our research question, we developed theoretically informed coding categories based upon a review of the identity, framing, professional competency, and legitimation literatures to heuristically circumscribe the discursive construction of expertise. As we engaged with the data, these coding categories were further refined and applied using NVivo 8.0 in an iterative manner.

Reconstruction of frames. The coding categories and emergent themes to reconstruct the frames were centered on the evaluation of climate change and the role of humankind. These categories were used to inductively derive the frames following Snow and Benford's (1988; Benford & Snow, 2000) notion of core framing tasks. Frames are distinct combinations of a diagnosis of the social problem in need of attention, a prognosis that prescribes particular solutions, and a rationale for action. As two frames may share the problem, but propose to attend to it differently, or propose the same means, but still diagnose the situation differently, we separated the frames if diagnosis, prognosis, or rationale for action distinctively differed from one another (Meyer & Höllerer, 2010). For diagnosis, we drew on respondents' evaluation of climate change (existence, causes, normalcy, controllability, etc.) and their assessment whether this is an issue that needs attention in general and relative to other issues and concerns. To reconstruct the prognosis, we included the perceived risk (potential impact, worst case scenarios; Kahan et al., 2010), the means respondents regard as adequate to attend to the situation and especially their position towards regulatory measures, in

Table 1. Demographics (designation, age, and gender) of the survey respondents versus the general membership of APEGA as of October 2007.

Comparison	% of survey respondents	% of general membership
By designation†		
Professional engineer (P.Eng.)	69.9	64.4
Professional geologist (P.Geol.)*	10.3	6.4
Professional geophysicist (P.Geoph.)*	3.5	2.0
Dual membership (P.Eng./P.Geol. and/or P.Geoph.*	0.2	0.3
Registered professional technologist (RPT)	0.4	0.4
Engineer in training (E.I.T.)	14.1	14.3
Geologist in training (Geol.I.T.)*	1.3	1.1
Geophysicist in training (Geoph.I.T.)*	0.4	0.3
By age		
20–29 years	19.3	18.5
30–39 years	19.2	19.8
40–49 years	20.2	22.1
50–59 years	21.4	19.8
60–69 years	12.8	9.1
70 + years	7.1	6.0
By gender		
Male	89.3	87.5
Female	10.7	12.6

†Note that totals do not add up to 100%, given that other categories of membership are not included such as examinees, honorary members, provisional licensees, restricted practitioners, students, and university students.
*These groups are aggregated as 'geoscientists'.

particular the Kyoto Protocol. As motivating action includes a 'call to arms', we used information on whether a respondent makes efforts to mobilize others and who they believe should become active or not. Depending upon diagnosis, prognosis, and action mobilization, each respondent was then categorized into one of five frames (see Figure 2).

Expert identities and boundary work. In framing contests, de-legitimizing the claims of opponents is often more effective than arguing one's own position. In order to capture positions against which a standpoint is taken, we included respondents' identity and boundary work. To show how these frames resemble or differ, we developed codes for the construction of 'actorhood' and the sources of own and others' expertise. While there is extensive debate on the intricacies of climate science, we especially focus on each frame's certainty in climate science and the methods by which individuals (de)legitimate that knowledge. We also developed codes for the different professional and ethical responsibilities (e.g., comply with the law, lobby for or against regulation, protect the public interest). As strong (dis)identification triggers emotion (Hoggett & Thompson, 2012; Stryker, 1987) and mobilization is facilitated by 'hot cognition' (Gamson, 1992), we particularly paid attention to the use of rhetorical figures, metaphors, and the emotionality involved.

To capture the interconnection between frame, identity, and boundary work, we coded each respondent's open-ended comments for the expression of all subthemes (Fairclough, 1995). The co-location of subthemes within respondents' comments indicates that they are connecting those elements in their framing (following Gephart, 1997), an indication of correlation but not
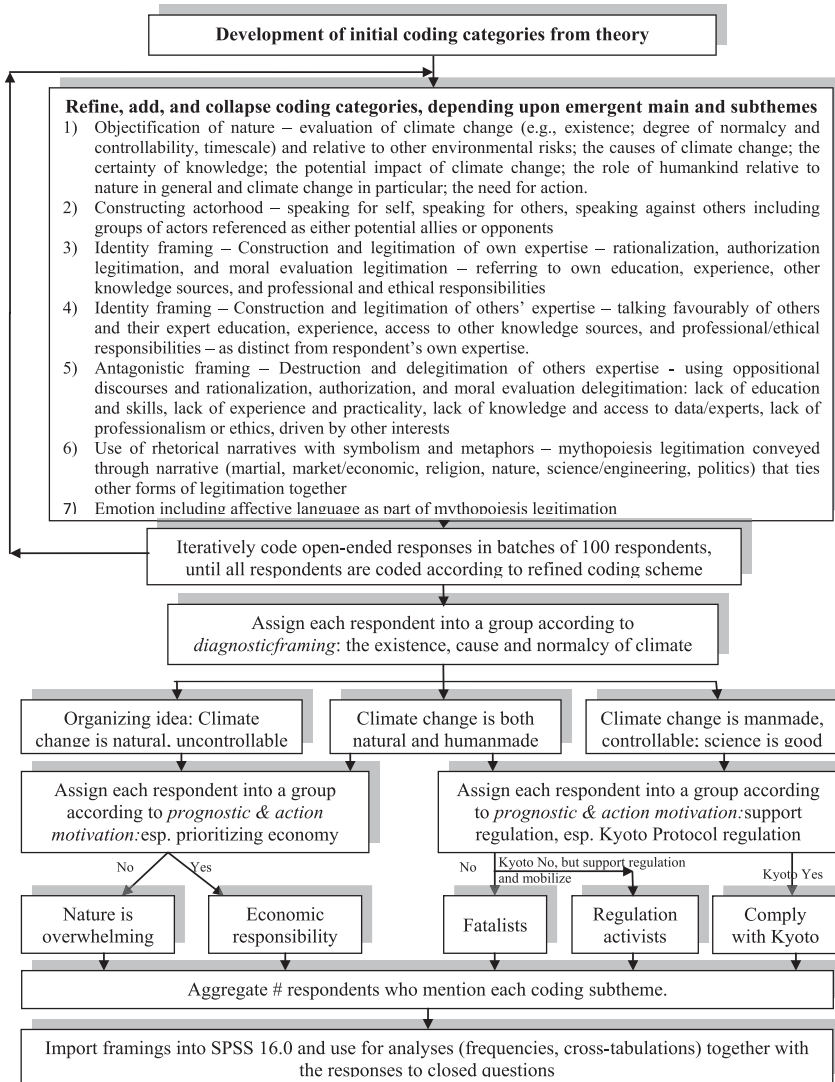
Figure 2. Reconstruction of Frames

necessarily causation. Table 2 presents all our main themes and subthemes with verbatim examples of each; Figure 2 illustrates the reconstruction of the frames. With the size of our data and iterative coding structure, our NVivo database has over 140,000 references. To make sense of our large amount of data and to understand the positioning of these framings within organizations and industry, all qualitatively generated codes were imported into SPSS 16.0 and used for further analyses (frequencies and cross-tabulations[4]) together with the responses to closed questions. In this manner, we follow the calls by recent scholars to combine qualitative and quantitative methods (e.g., Elsbach, 1994; Mohr, 1998; Owen-Smith & Powell, 2008; Schneiberg & Clemens, 2006).

Table 2. Summary of main themes in coding used to reconstruct respondents' frames with verbatim examples.

Main and subthemes in coding used to reconstruct respondents' framings		Verbatim examples
Objectification of nature – evaluation of causes, certainty of knowledge, role of humankind	Normalization legitimation – normalcy of climate change	'Our climate has always changed and always will… My opinion is that there is nothing happening now which has not happened before.'
	Rationalization legitimation – objectifying characteristics of nature that make it more/ less controllable – complexity, (un)certainty, responsibility, (un)controllability, conceptions of time	'Of course our climate is changing. It's an extremely complex system made up of various other systems that are in a constant state of flux…. The more appropriate question to be asked is whether or not human intervention has had a significant impact on the rate of environmental flux.'
Constructing actorhood	Speaking for self	Actual or implied use of 'I', 'me', or 'my' in identity framing
	Speaking for others	Actual or implied use of 'we' or 'our' in identity framing
	Speaking against others	Actual or implied use of 'they' or 'them', mostly used in antagonistic framing
Identity framing – construction and legitimation of own expertise	Rationalization legitimation – listing own education, experience	'I spent 1 year studying climate change and possible responses for a previous company.'
	Authorization legitimation – reference to other knowledge sources such as other experts and other bodies of knowledge	'When I talk to people who have done a lot of research into the data, they contend that the change going on is minimal. The Canadian Arctic weather stations typically indicate (with three exceptions in the Western Arctic) that no trend is apparent.'
	Moral evaluation legitimation – referencing professional and ethical responsibilities	'APEGA members, particularly geoscientists [speaker is a geoscientist], are well-positioned to advise government from a scientific point of view.'
Identity framing – construction and legitimation of others' expertise	Referring favourably to others and their expert education, experience, access to other knowledge sources, and professional/ ethical responsibilities – as distinct from respondent's expertise	'Members through their professional practice will develop mitigation and adaptation plans.' [Professional development] 'topics from prominent speakers such as Dr. Tim Ball [formerly of the University of Winnipeg] on how the human-caused warming is a complete fabrication would be useful.'

(Continued)

Table 2. (Continued)

Main and subthemes in coding used to reconstruct respondents' framings		Verbatim examples
Antagonistic framing – destruction and de-legitimation of others' expertise	Rationalization de-legitimation – lack of education and skills	'There is an immense amount of discussion generated by people who clearly have little understanding of scientific principles.'
	Authorization de-legitimation – lack of experience and practicality	'[Kyoto is] not economically or socially feasible. Does not address deforestation/desertification in any meaningful manner.'
	Authorization de-legitimation – lack of knowledge and access to data/experts	'It would be nice if some of the environmentalist[s] had a better understanding of past climates.'
	Moral evaluation de-legitimation – lack of professionalism or ethics, driven by other interests	'Canada's participation and obligations [in Kyoto Protocol] arose from a government more concerned with appearances than substance.'
Narratives using symbolism and metaphors	Mythopoiesis legitimation conveyed through narrative (martial, market/economic, religion, nature, science/engineering, politics) that ties other forms of legitimation together	'[mitigation is] overpriced and over my dead body.' 'Kyoto is a faith-based weapon wielded by those who wish to control the lives of us non-believers.' 'Science is not a democracy, nor is it a popularity contest.'
Emotion	Mythopoiesis legitimation conveyed through affective language tying other legitimation together	'I have been disgusted in the past by the blind followership of the oil industry line on climate change over the past decade.' 'Kyoto Accord had no chance to succeed and never should have been signed. The US knew better and so should have Canada. Shame on Cretin [sic] for being duped.'

Findings

We start with a description of the frames of the climate change debate that arose from our data and draw out the relative similarities and differences between these frames. We follow Gamson's (1992) advice and integrate original quotes from our respondents to represent their views in as unbiased a manner as possible in Table 3. Then, we discuss the specific 'ingredients' of these professionals' construction of their expert identities to show how each frame draws on these. While there are similarities in the form of legitimation strategies (invoking of authorities, reference to science, rationalization, interestedness of opponents, etc.) we find interesting differences (Figure 3). Lastly, we elaborate on the relative positioning of sponsors of these frames (Table 4).

Table 3. Framings of climate change and experts' identities via boundary work.

Framing element	Comply with Kyoto	Regulation-activists	Fatalists	Economic responsibility	Nature is overwhelming
Diagnostic	Human impact; not normal cycle	Natural and human caused; non trivial human impact, but problem is much more complex	Natural and human caused; little significant impact; nature uncontrollable/complex	Natural and human caused; no significant impact	Natural; normal cycles; humans are too small to affect the universe
Prognostic	Greater impact; also short-term effects; risk to public, personal life. Solution: Kyoto Protocol, regulation	Public risk and impact, but lesser degree than supporters of Kyoto Protocol. Solution: Own and others' responsibility to create a nd enforce regulation. Not Kyoto Protocol; far too late; not broad enough; unrealistic	Little public risk and negligible impact on personal life. Much less likely to provide any solutions	No long-term; no public risk, no impact on personal life. Solution: Protect the economy is foremost	No long-term, public risk, nor impact on personal life. Solution: Let the planet be; decrease pollution; less call for regulation or for the economy
Action mobilization	Medium	High	Low – generally apathetic	High	Low – less likely to prescribe action than other frames (except Fatalists)
Construction of identity and boundary work					
Certainty of knowledge	Scientific most optimistic framing; debate is settled; IPCC is credible source	Knowledge is partisan and biased and not yet validated; sceptical that debate is settled and IPCC gives accurate predictions	Debate is not settled and sceptical that the IPCC does provide accurate models	Debate is not settled and IPCC models are inaccurate	Climate change is fiction (hoax); debate is not settled and IPCC models are inaccurate
Responsibilities and emotionality	Fraternity and collaborate; obey the law; realize responsibility and find answers. Not very emotional and least adversarial	Reduce GHG; create regulation; also, but lesser fraternity. More emotional and adversarial: others driven by other interests and impractical in implementation	Much less likely to support regulation or prioritize the economy. Express much less emotion, except for denying responsibility. Much less likely to use metaphors and symbolism	Significantly more likely to refer to public interest, recommend to educate others, enhance efficiency and competitiveness. Express the most negative emotion: fraud, futility, and cynicism	Responsibility to correct 'errors' and help 'real' science to be heard. No difference from the mean with regard to extent

(Continued)

Table 3. (Continued)

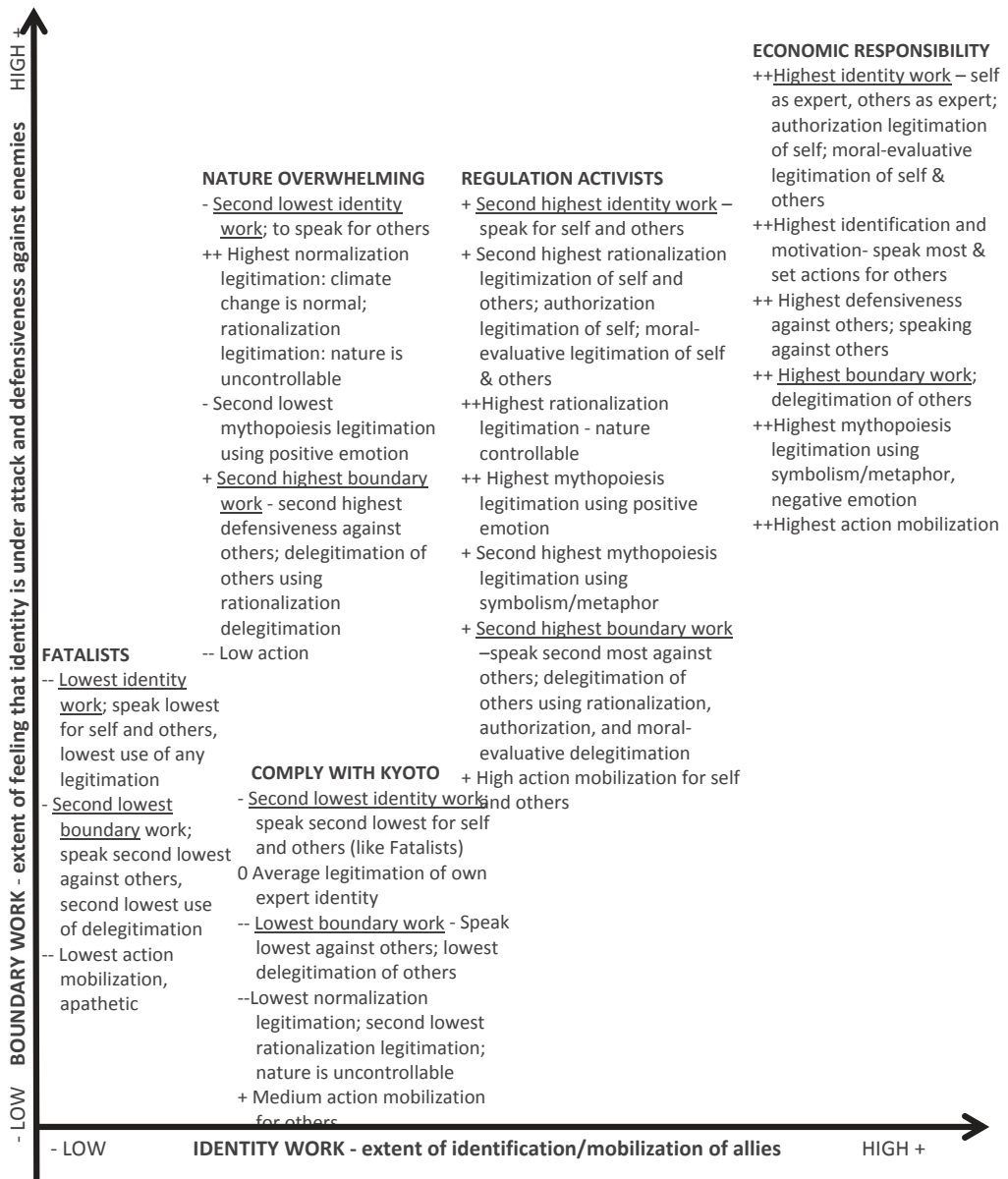|	Comply with Kyoto	Regulation-activists	Fatalists	Economic responsibility	Nature is overwhelming
Own expert identity	No differences from mean. Significantly more likely to complete research for themselves	Second most likely to legitimate themselves as experts based upon experience and ethics/professionalism	Significantly less likely to legitimate themselves as experts	Significantly more likely to use own expertise based upon education and other knowledge	No differences from the mean
Others' expert identities	Alberta government and people, Kyoto Protocol and supporters, Canadians and politicians, APEGA and members	Speak second most for others: Kyoto Protocol, Canada, Alberta, industry, APEGA and other professionals	Do not significantly list others as allies	Speak most for others: Canada, Alberta	Do not significantly list others as allies
Others as non-expert	None significant. Speak least against others, least likely to de-legitimate others	Speak second most against others: Kyoto Protocol, Canada, Alberta, politicians generally; criticize others' non-knowledge	None significant. Second least likely to de-legitimate others' expertise	Speak most against others: Kyoto Protocol, politicians, developing countries; de-legitimate others most	None significant. Criticize others' non-knowledge and hysteria

Y-axis (vertical): HIGH + / - LOW — BOUNDARY WORK - extent of feeling that identity is under attack and defensiveness against enemies

X-axis (horizontal): - LOW / HIGH + — IDENTITY WORK - extent of identification/mobilization of allies

NATURE OVERWHELMING
- Second lowest identity work; to speak for others
++ Highest normalization legitimation: climate change is normal; rationalization legitimation: nature is uncontrollable
- Second lowest mythopoiesis legitimation using positive emotion
+ Second highest boundary work - second highest defensiveness against others; delegitimation of others using rationalization delegitimation
-- Low action

REGULATION ACTIVISTS
+ Second highest identity work – speak for self and others
+ Second highest rationalization legitimization of self and others; authorization legitimation of self; moral-evaluative legitimation of self & others
++Highest rationalization legitimation - nature controllable
++ Highest mythopoiesis legitimation using positive emotion
+ Second highest mythopoiesis legitimation using symbolism/metaphor
+ Second highest boundary work –speak second most against others; delegitimation of others using rationalization, authorization, and moral-evaluative delegitimation
+ High action mobilization for self and others

ECONOMIC RESPONSIBILITY
++Highest identity work – self as expert, others as expert; authorization legitimation of self; moral-evaluative legitimation of self & others
++Highest identification and motivation- speak most & set actions for others
++ Highest defensiveness against others; speaking against others
++ Highest boundary work; delegitimation of others
++Highest mythopoiesis legitimation using symbolism/metaphor, negative emotion
++Highest action mobilization

FATALISTS
-- Lowest identity work; speak lowest for self and others, lowest use of any legitimation
- Second lowest boundary work; speak second lowest against others, second lowest use of delegitimation
-- Lowest action mobilization, apathetic

COMPLY WITH KYOTO
- Second lowest identity work; speak second lowest for self and others (like Fatalists)
0 Average legitimation of own expert identity
-- Lowest boundary work - Speak lowest against others; lowest delegitimation of others
--Lowest normalization legitimation; second lowest rationalization legitimation; nature is uncontrollable
+ Medium action mobilization for others

Figure 3. Frames' Identification/Motivation and Defensiveness Activating Legitimation and Action

Framing the climate change debate and constructing expertise

In our field of study, we note that there is a distinction between experts who express concern about the rapidly changing climate and those who deny that there is a problem related to climate change. The ensuing debate is often caricatured as a war between two sides – 'you either believe in climate

Table 4. Frames' relative positioning (percent) within their organization and industry.

	Overwhelming nature	Economic responsibility	Comply with Kyoto	Regulation activists	Fatalists	Disguised
All	24.0	9.7	36.3	4.7	17.4	7.9
Government	16.1	6.5	45.2	6.5	17.7	8.1
Oil and gas industry	29.8	13.3	27.6	5.1	19.4	4.8
Geoscientists	40.0	10.0	24.1	6.5	14.1	5.3
Top level – overall	34.8	12.9	24.3	3.3	21.9	2.9
Top level – oil and gas	47.1	16.2	16.2	2.9	16.2	1.5

change or you don't' – especially in North America. We find that virtually all respondents (99.4%) agree that the climate is changing. However, there is considerable disagreement as to cause, consequences, and lines of action (as outlined in Figure 2). On this basis, we find five different frames, each of them summarized in Table 3. Eight percent of respondents did not provide enough information regarding their framing of climate change to be categorized.

Frame 1: Comply with Kyoto

The largest group of APEGA respondents (36%) draws on a frame that we label 'comply with Kyoto'. In their diagnostic framing, they express the strong belief that climate change is happening, that it is not a normal cycle of nature, and humans are the main or central cause. Supporters of the Kyoto Protocol consider climate change to be a significant public risk and see an impact on their personal life. In their prognostic framing, they tend to fear that the risks are greater in extent (i.e., global and regional) and in magnitude (i.e., changes to both the average state and variability of the climate) than other groups; they believe to a lesser degree that climate change has long-term effects only and to a higher degree that it will result in warming as opposed to cooling and warming. They are the only group to see the scientific debate as mostly settled and the IPCC modeling to be accurate, e.g., 'I believe that the consensus that climate change is occurring is settled. The role of humans in climate change is controversial more because of the political/economic implications and the creation of winners and losers than the science.' They view the Kyoto Protocol and additional regulation as the solution: 'Absolutely! 1000%. It is the only effective way to curb pollutions…We, as Engineers, are very much responsible.' Advocates of this frame are less likely to use symbolism and metaphors; in speaking for themselves and legitimating their expertise, they do not deviate significantly from the average. Yet, more than others, they highlight fraternity and the need to act together, to realize one's responsibility, and to find answers. They are significantly less likely to use de-legitimation strategies and are least likely to speak against others. However, they request industry and corporations to comply with the law and encourage the creation of regulation: 'Industry should stop complaining and get on with it and provide leadership for us all.' They also believe that APEGA should support climate change science: 'Science is not a democracy, nor is it a popularity contest. APEGA must stand up for science.'

Frame 2: Nature is overwhelming

The second largest group (24%) express a 'nature is overwhelming' frame. In their diagnostic framing, they believe that changes to the climate are natural, normal cycles of the Earth. Their focus

is on the past: 'If you think about it, global warming is what brought us out of the Ice Age.' Humans are too insignificant to have an impact on nature: 'It is a mistake to think that human activity can change this… It would be like an ant in a bowling ball who thinks it can have a significant influence the roll of the ball.' More than others, they strongly disagree that climate change poses any significant public risk and see no impact on their personal lives. In their prognostic framing, they do not see any risks. If anything, climate change detracts from more important issues: 'Why don't we focus on more urgent issues… 25,000 people die each day due to hunger, malaria …' They are most likely to speak against climate science as being science fiction, 'manipulated and fraudulent'. They are least likely to believe that the scientific debate is settled, that IPCC modeling is accurate, and oppose all regulation 'based on the incorrect assumption that greenhouse gases cause climate change'. They recognize that we should reduce pollution regardless: 'We need to adapt to climate change, which has been going on for 4 billion years. We need to reduce polluting our planet.' In their identity and boundary work, they are least likely to list others as allies or prescribe any actions for themselves or others. Significantly, they are more likely to criticize others as unknowledgeable and to describe climate scientists and environmentalists as hysterical: 'This present hysteria on "global warming" is purely political and has little to do with real science.' APEGA 'should educate the public and the government … to counteract media hype and pressure from the green extremists.'

Frame 3: Economic responsibility

Ten percent of respondents draw on an 'economic responsibility' frame. They diagnose climate change as being natural or human caused. More than any other group, they underscore that the 'real' cause of climate change is unknown as nature is forever changing and uncontrollable. Similar to the 'nature is overwhelming' adherents, they disagree that climate change poses any significant public risk and see no impact on their personal life. They are also less likely to believe that the scientific debate is settled and that the IPCC modeling is accurate. In their prognostic framing, they point to the harm the Kyoto Protocol and all regulation will do to the economy. For them, any solution must protect the economy. More than others, they invoke the public interest and the need to promote an informed debate and to educate others, and recommend enhancing efficiency and competitiveness: 'Alberta must pursue to reduce truly toxic emissions, diversify our economy, and to meet the growing energy demands.' They are significantly more likely to position themselves as experts as a function of their own education and knowledge sources. They are most likely to speak against others and de-legitimate others as non-experts, as impractical: 'Conservation is always a good idea, but spending money without any real understanding of what the value you will be getting is always a bad idea.' More than any other group, they speak against the Kyoto Protocol and its supporters: 'third world countries (China, Egypt, etc.) [who are] free to burn garbage and pollute with no repercussions', and politicians who 'do nothing well except waste money that isn't theirs'. For them, 'Kyoto is simply designed to transfer large sums of money from the wallets of citizens of mostly Caucasian countries to the Swiss bank accounts of third world dictators.' They express much stronger and more negative emotions than any other group, especially that climate science is a fraud and hoax and that regulation is futile, useless, and impossible. They are more sceptical and cynical: 'Don't we pay enough taxes as it is? Do we need to send our money overseas?' Lastly, they use symbolism and metaphors much more than any other framing (see next section):

> This is obviously a left wing/liberal survey… You folks were probably calling out the sky is falling when Ozone was the latest left wing craze… The earth 'weather' has always been changing. Now you want to blame me and my gas furnace, big house, two cars, etc. Well get over it.

Frame 4: Fatalists

'Fatalists', a surprisingly large group (17%), diagnose climate change as both human- and naturally caused. 'Fatalists' consider climate change to be a smaller public risk with little impact on their personal life. They are sceptical that the scientific debate is settled regarding the IPCC modeling: 'The number of variables and their interrelationships are almost unlimited – if anyone thinks they have all the answers, they have failed to ask all of the questions.' 'Fatalists' consider the Kyoto Protocol as 'too late' and irrelevant. They are much less likely to support regulation generally, but do also not care about the economy, and are much less likely to express emotions (except for denying responsibility), or use symbolism and metaphors. Fatalists are not convinced that involvement will make a difference and, thus, following Gamson (1992), they do not develop the sense of agency. To the contrary, they seem generally apathetic – 'How can anyone take action if research is biased?' They are least likely to speak for themselves, define themselves as experts or admit any professional and ethical responsibilities. Likewise they are least likely to refer to others in a positive or negative way.

Frame 5: Regulation activists

The last group (5%) expresses a frame we call 'regulation activists'. This frame has the smallest number of adherents, expresses the most paradoxical framing, and yet is more agentic than 'comply with Kyoto'. Advocates of this frame diagnose climate change as being both human- and naturally caused, posing a moderate public risk, with only slight impact on their personal life. Advocates do not significantly vary from the mean in how they consider the magnitude, extent, or time scale of climate change. They are also sceptical with regard to the scientific debate being settled and are the most indecisive whether IPCC modeling is accurate: 'the largest challenge is to find out what the real truth is… I don't know what the impact really is. I suspect it is not good.' Despite their seemingly ambivalent stance, they are most likely to believe that nature is our responsibility: 'It is only reasonable to assume that we are changing our environment and climate, all you have to do is look out your window to see it.' They believe that the Kyoto Protocol is doomed to failure ('can't do it, even though we should'), yet they motivate others most of all to create regulation: 'Canada should implement aggressive policies to reduce GHG emissions in the spirit of the Kyoto Accord.' They also recommend that we define and enact sustainability/stewardship, reduce GHGs, and create incentives: 'No one technique will work. It will require a combination of all available options.' The emotions they invoke are to realize responsibility and find answers, prevent failure, and emphasize consensus and fraternity. They use nature, ecosystem and health metaphors more than other group: 'Educating the general public that the planet is a closed system.' Further, they envision an expanded role for professionals: 'APEGGA and the members should…have the guts to speak up and be heard when pending decisions become motivated by politics and short-term shareholder gratification.' 'Regulation activists' speak for themselves and legitimate their own expertise second most. However, they also do the second greatest de-legitimation of others' expertise, mostly on the basis of others' lack of knowledge: 'Kyoto targets were negotiated without sufficient scientific basis or economic forecasting.' They criticize politics ('The AB govt lives in the dark ages on environmental matters') and industry, especially the entanglement between the two: 'Regulations are no good if they are not enforced, or if written by industry based on profitability.' Yet, perhaps paradoxically, this group mobilizes more action than 'comply with Kyoto': 'Alberta should be developing a good overall environmental policy that will leave our grandchildren proud to live in Alberta, a slower pace to development of resources [that] may result in short-term pain for long-term gain.'

Framing experts' identities

All frames draw on the same 'ingredients' of expertise claims – discernment of true and false knowledge (superiority of knowledge) and biased research (independent decisions). Respondents believe themselves able to base professional work on solid scientific principles (highest mean: 'nature is overwhelming', lowest mean: 'fatalists') and, to a slightly lesser degree, to have sufficient scientific information to make informed professional decisions (highest mean: 'economic responsibility', lowest mean: 'fatalists'). Concerning unbiasedness, they are convinced to have sufficient professional independence to properly consider climate change science (highest mean: 'economic responsibility', lowest mean: 'comply with Kyoto'). Also, adherents of all frames do not feel pressured to base professional work on factors other than science principles. Only a very small minority (4%) are uncertain regarding their expertise, admitting in their open-ended responses that they feel unqualified to make recommendations.

Despite these similarities, there are interesting differences. As suggested by identification theory's in-grouping/out-grouping, individuals' responses vary as a function of (a) the extent that they identify with and try to mobilize allies and (b) the extent they feel their identity is threatened and under attack, leading to defensiveness against enemies. This is illustrated in Figure 3. The activation of both – identification and defensiveness – results in more extensive and intensive accounts offered, identity and boundary work, and effort in mobilizing action.

Thus, the two frames that identify/mobilize most ('economic responsibility' and 'regulation activists') are most active in their identity and boundary work. They use the most rationalization, authorization, and moral-evaluative legitimation to establish their own and others' expertise. However, they also de-legitimate others the most. Mobilization is the call to arms that provides appropriate vocabularies of motive (Benford & Snow, 2000). Indeed, these two frames also use the most mythopoiesis legitimation – symbolism, metaphors, and emotion – that offer these vocabularies. 'Economic responsibility' uses vocabularies of the market and war such as 'killing the market' and 'economic suicide' or 'fighting the lefties'. To describe the position of environmentalists, they use religious and faith-based metaphors and political metaphors in line with their pecuniary rationale. They warn not to 'sacrifice jobs at Gore's altar', or 'that very little actual benefit can be provided by sacrificing our standard of living to appease the false god of 'environmentalism', while 'carbon credits are the modern-day equivalent of indulgences. Pay and your "sin" of CO_2 is forgiven for no real benefit'.

The 'regulation activists' frame uses vocabularies of responsibility and stewardship of building consensus, realizing responsibility, and finding solutions to protect the environment. They enlist the most allies: Canada, Alberta, industry, APEGA, and other professionals. For them, they prescribe the second most amount of action – enacting stewardship, creating incentives, developing regulation, and reducing GHG. They urge APEGA to 'stop dithering and actively encourage its members to push for improved efficiency and emissions reduction. One of our laws requires us to protect the environment – this is not happening now' and to provide 'leadership in searching for real answers … based on the common good'. The government 'must mandate policies. Hopefully informed (from APEGA members) policies'.

The most defensive frames are 'economic responsibility' and 'nature is overwhelming' – both deny that climate change is a relevant problem and feel challenged by the IPCC positioning, which, as a counter-frame, puts these adherents in the defensive. As opponents to regulation, they have to stand against the inherently moral 'comply with Kyoto' frame, which they fear has become mainstream. Their opposition is reflected in their own framing activities: more affirmation of their own positioning as reflected in increased legitimation of their problem diagnosis and own expertise,

more boundary work (per Gieryn, 1995; Branscombe et al., 1999; Hunt et al., 1994) and more adversarial framing (Gamson, 1999) as reflected in the de-legitimation and undermining of others' expertise. Both frames buttress their position by normalizing climate change and rationalizing nature as uncontrollable, thus any action would be ineffective. While 'economic responsibility' adherents prescribe economic fixes, 'nature is overwhelming' adherents only support reducing pollution in general terms. Both liaise with 'true scientists' and de-legitimate the rationality of their opponents more than other frames: politicians ('too dumb to realize that it will take many decades to put in place an infrastructure to improve energy efficiency'), media ('media hype' and 'lack of unbiased information'), and – most of all – IPCC, and its supporters' scientific grounding – 'The holes left in the report by the IPCC leads me to form certain questions regarding the validity of claims made by the panel, the media and other alarmists.'

Relative positioning within the field

To determine the potential influence of these frames on policy responses, we compare the positions of the sponsors of these frames within their organization and the field (see Table 4). Adherents of frames that support regulation ('comply with Kyoto', 'regulation activists') are – in our study – significantly more likely to be lower in the organizational hierarchy, younger, female, and working in government. Indeed, in our study, only seven respondents using these frames are at the highest level in government. Conversely, adherents of those frames that are more defensive and oppose regulation ('nature is overwhelming', 'economic responsibility') are significantly more likely to be more senior in their organizations, male, older, geoscientists, and work in the oil and gas industry. Adherents of these two frames comprise 33.7% of our respondents overall, but 63.3% of top managers in the oil and gas industry as opposed to 19.1% supporting regulation. The majority of command posts within organizations, especially in the industry, seem to be manned with opponents to the IPCC and anthropogenic climate science. While it may not be overly surprising that industry executives support the industry's interests, taking into consideration that we have analyzed experts' frames that are founded on a claim of being independent and non-partisan, it is also important to note that the two frames that especially dwell on the point of 'real science' versus 'hoax' at the same time represent core economic interests.

Discussion and Conclusion

Climate change could irreversibly affect future generations and, as such, is one of the most urgent issues facing organizations (Hoffman, 2007; Porter & Reinhardt, 2007). It is being hotly debated in the public and among scientists and economists, yet few articles study global warming or climate change from an organizational and management research perspective (Ansari, Gray, & Wijen, 2011; Goodall, 2008). Most research has focused on the contestation of GHG governance and management (Engels, 2006; Levy & Egan, 2003; Mackenzie, 2009; Okereke, 2007; Wittneben, 2008), while underestimating the still ongoing debate among experts over core assumptions. Although there seems to be consensus that anthropogenic climate change presents a profound global challenge, policy makers and companies have opposed the regulations of GHG emissions. As Levy and colleagues (e.g., Levy & Kolk, 2002; Levy & Rothenberg, 2002) argue, business responses particularly in North America have been substantively ineffective, barely exceeding reputational and brand management issues. For obvious reasons, fossil fuel industries' stakes in this struggle are high and, not surprisingly, they are at the forefront of the opposition to carbon regulation (Wittneben, Okereke, Banerjee, & Levy, 2009).

We agree with Hoffman (2011a, 2011b) that in order to understand this defense and resistance and to move forward with international policies, organizational researchers must gain more in-depth understanding of the subtleties of the contestation and unravel the whole spectrum of frames including those of climate change deniers and sceptics. However, given the polarized debate (Antonio & Brulle, 2011; Hamilton, 2010; McCright & Dunlop, 2011), gaining access to the reasoning of deniers and sceptics (Kemp, Milne, & Reay, 2010), let alone unraveling their framings, is far more difficult than analyzing supporters of regulatory measures (Hoffman, 2011a). This has motivated our research question: *How do professional experts use frames to construct the reality of climate change, and themselves as experts, their credibility in making recommendations and decisions, while engaging in defensive institutional work against others?*

We examine the discursive contestation of climate change and associated expertise by professional engineers and geoscientists. We use an instrumental case to examine the debate among these professionals who dominate the oil industry in Alberta, with the oil sands as a source of particularly 'dirty' oil. In answering our research question, this article discusses both the construction of expertise in discursive battlefields and elucidates a more nuanced understanding of climate change frames. From this, we make several contributions.

First, our analysis contributes to the theoretical understanding of the internal bases of professional sublogics. Rather than consider professionals as being subject to exogenous forces (Greenwood & Suddaby, 2006; Meyer & Hammerschmid, 2006; Scott et al., 2000; Thornton, 2002) or to an expert vs. media debate (Boykoff, 2001; Carvalho, 2007; Olausson, 2009; Weingart et al., 2000), we examine the contestation within their profession and the endogenous heterogeneity. These professionals do not ascribe to a monolithic, homogeneous logic based on shared cultural-cognitive conceptions (per Knorr-Cetina, 1999) or values (Kahan et al., 2010). Nor is this merely a binary debate of whether climate change is 'science or science fiction'. There are more nuanced intermediary frames that are constructed by these professionals. Indeed, by differing in their normalization and rationalization of nature, they vary in their identification with and defensiveness against others, and in their mobilization of action.

Second, our analysis contributes to the theoretical understanding of the discursive construction of expertise. While climate change poses an excellent example in terms of complexity of a problem and the need to form consensus, the type of expertise-based decisions we analyze is not unusual in organizations and policy-making. Ours is not simply a story of alternative frames; this is a contestation among those who wish to claim definitional authority. Expertise, as we have pointed out, relies on credibility and has to demonstrate 'informedness' and objectivity of judgment. The overwhelming majority of these professionals use these elements to construct their frames and ground the appropriateness of their judgments; nonetheless they come to very different viewpoints concerning the 'problem' and attitudes towards regulation and action. However, these professionals do not only engage in a dispute over the 'cause' or content of their claim, i.e., the appropriate definition of an issue or the adequacy of a proposed solution; they also engage in identity and boundary work – to varying degrees – to legitimate themselves as experts and de-legitimate opponents as non-experts, while establishing the cognitive authority of their version of science versus others' non-science. Defense can result from different worldviews *and* from identity threats.

Third, we show that the consensus of IPCC experts meets a much larger, and again heterogenous, sceptical group of experts in the relevant industries and organizations (at least in Alberta) than is generally assumed. We find that climate science scepticism is not limited to the scientifically illiterate (per Hoffman, 2011a), but well ensconced within this group of professional experts with scientific training – who work as leaders or advisors to management in governmental, non-governmental, and corporate organizations. Following Levy and Rothenberg's (2002) examination

of the automotive industry, we find that professional experts employed in the petroleum industry are more likely to be sceptical of the IPCC and of anthropogenic climate change. Given this, the defensive institutional work of these professionals to maintain existing institutions clearly exceeds the mere maintenance of 'routines and rituals of their reproduction' (Lawrence & Suddaby, 2006, p. 234). Marquis and Lounsbury (2007) suggest that banking professionals are more able to resist due to their stronger professional identity; Jonsson (2009) finds that professional resistance differs across firms, depending upon the relative influence of professionals and the logics associated. Our research connects and extends these findings to understand how defensive institutional work is performed in response to insider-driven challenges. We find that the heterogeneity of professionals' framings is a function of their degree of identification/mobilization with others (as suggested by Marquis & Lounsbury, 2007) but is also a function of their degree of defensiveness against others (as suggested by Maguire & Hardy, 2009), even other insiders. Further, these professionals' framings are also linked to their position within their firm (as suggested by Jonsson, 2009), to their industry, and to the industry's relevance for the region (Levy & Rothenberg, 2002). We discuss this in more detail below. Hence, our findings give greater granularity in understanding which professionals are more likely to resist, why and how they will resist, and who is more likely to be successful.

Fourth, we add to the body of empirical studies on the different framings of climate change and contribute to the understanding of the role of professions in the construction of climate change as a public policy issue. This debate has often been caricatured as being two-sided: believers versus sceptics. We confirm elements of claims and counter-claims as found by others (i.e., McCright & Dunlap, 2000) within our own framings to varying degrees. However, the use of counter-claims is not restricted to sceptics; nor do all counter-claims result in resistance to regulation. Despite several differences (e.g., percentage who believe climate change is happening, technical backgrounds of respondents, and methodology), our framings of climate change also align with those found in the US general population (Leiserowitz et al., 2008, 2010; Maibach et al., 2011).

With our findings, we provide additional insights into climate change resistance. Our study confirms that there are significant framing differences regarding the existence of anthropogenic climate change and the consequent calls for action or, equally often, inaction on the policy and organizational level (see Hulme, 2009), even within professional experts in one particular geographical context. The vast majority of these professional experts believe that the climate is changing; it is the cause, the severity and the urgency of the problem, and the need to take action, especially the efficacy of regulation, that is at issue. By looking into the content of the frames, the discourse coalitions they enable, and the identity and boundary work they entail, our results provide more nuanced insights into the subtleties of institutional defense.

While 'comply with Kyoto' adherents share the storyline privileged by the IPCC and regard scientific knowledge to be conclusive enough to support mandatory action, not even the second pro-regulation group ('regulation activists') joins their support for the international Protocol. In addition, 'comply with Kyoto' adherents do not engage in mobilization and boundary work and do little to legitimate their position. This may seem surprising, but becomes more comprehensible when taking into consideration their strong belief that the fundamental debate on whether or not climate change is anthropogenic is settled and that the 'consensus among scientists' has informed enforceable regulation. From such a perspective, it seems reasonable to avoid re-heating old conflict lines and being as inclusive as possible – our findings show that they emphasize fraternity and collaboration, and keep emotionality low. What they seem to have underestimated is that, even if the contestation may have been over on scientific terms, it was certainly not over on political grounds – as indicated by Canada's recent decision to pull out of the Kyoto Protocol.

On the other hand, regulation contrarians form a discourse coalition despite different rationales underlying their scepticism. Anthropogenic climate change sceptics ('nature is overwhelming') link up with promoters of 'economic responsibility' who – irrespective of what actually causes climate change – oppose the high economic cost of interventions that, according to them, will negatively affect competitiveness and jeopardize progress in the Western world. Both downplay the environmental risks associated with climate change and, hence, deny the appropriateness of regulation and global agreements (Kahan et al., 2010). In addition, we found quite a large group of 'fatalists'. Although they do not share the contrarians' diagnosis or prognosis – for them, the issue is too complex and all knowledge we have is biased – they also do not believe in the efficacy of taking action. In this sense, through their fatalism and inaction, they benefit the non-regulationists and contribute to defense.

If the role of humans on climate change is negligible, regulation will have no more impact than non-regulation. Hence, while it is clear that their frame includes no pro-regulation action motivation, from the rationale provided, 'nature is overwhelming' adherents could be indifferent in this respect. However, in framing contests between different expert groups, it is not only the 'truth' that is at stake, but also one's status as expert. It would threaten the expert identity and undermine the positioning of this group in the future if regulators 'listened' to professional experts whose truth claims contradict their own. Thus, by opposing regulation, they are defending their expert status. Nonetheless, similar to 'comply with Kyoto' adherents, this group's legitimation activity, boundary work, and action mobilization is low. The interpretation scheme inherent in their frame and the position of the adherents in the socio-economic field of our study offer several potential answers. They make a strong claim that climate science is fraudulent and believe that the debate is not settled and 'good science' will eventually overcome science fiction. Since all regulation is ineffective anyway, there is also no urgency. In addition, Table 4 shows that this group is clearly overrepresented in top management positions, especially in the oil and gas industry. Thus, they may see little need to legitimate their own framing and mobilize because they are in the command posts of their organizations anyway. Moreover, to downplay the impact of humankind on the environment in general is a quite 'handy' framing for top management of oil and gas corporations.

While 'nature is overwhelming' adherents only see regulation to be useless, 'economic responsibility' proponents actively oppose regulation and mobilize against it. This is consistent with the prognosis and action rationale inherent in their frame. For them, the 'cure is much worse than the disease'. Thus, not only is their position as expert threatened; what is in danger and in need of protection is not so much the environment as the economic development and interests that are put at stake by badly counseled politicians. This may explain why 'economic responsibility' adherents de-legitimate 'them', undermine their standing, and are much more emotional than other groups.

What are the potential implications of these findings for organizational and policy responses? In matters such as climate change, organizational decision-makers and policy-makers must turn to scientists and experts to justify their lines of action. We have shown that action is delayed not only by those who see interests they prioritize jeopardized and therefore actively engage in defensive institutional work; when action is required (either to decide new regulation or to implement existing regulation), inaction contributes to defense, and identity threats make opponents. Moreover, as is known from research in corporate political activities, with issues like this, variance in experts' opinions is an effective strategy to undermine legislation and regulation (e.g., Bonardi & Keim, 2005). Thus, the mere existence of a lively contestation counts as an asset on the side of the regulation opponents and delays action. Moreover, as our analyses of the diagnostic, prognostic and motivational claims-making revealed, currently there are more effective discursive opportunities to

engage in coalitions for regulation opponents (especially against the Kyoto Protocol) than for supporters.

What is more, the fact that we study experts who work as corporate representatives and/or policy advisors makes apparent the social and political dimensions of this framing controversy. The influence of individual experts on decision-making is dependent on their embeddedness within their organizations. On the one end of the influence spectrum, there are those experts who are in positions to impact organizational decision-making, either directly, via hierarchical position, or indirectly, via their position as advisors to decision-makers. On the other end, there are experts with little or no authority to make their insights binding or relevant for others. Although most experts are positioned somewhere in the middle, our results indicate that those who are more defensive occupy more senior organizational positions and are much closer to decision-making than activists. This can only partly be explained by adherents of defensive framings being older and more likely to be male compared to activists. More importantly, this entanglement of frames and identities with economic positions raises the question for future research whether these individuals adapt their frames as they move upwards in the hierarchy of industry's organizations or whether a defensive attitude towards environmental regulation is a prerequisite to such a career. This evidently has an impact on organizational strategies to address climate change and may partly account for the reluctance to develop and implement adequate strategies. Given the impact of this industry on Alberta and the Canadian economy as a whole, it seems unlikely that the defensive institutional work by those in powerful positions within fossil fuel-related firms and industry associations can be breached in the near future without global enforcement mechanisms. And from a policy perspective, the continuing scientific disagreement regarding anthropogenic climate change together with the increasing weariness and fatigue about the subject on the part of the electorate is unlikely to increase policy-makers' inclination to further regulate GHG emissions. The Canadian Government's decision in December 2011 to withdraw from the Kyoto Protocol and avoid CAD 14 billion in penalties has shown this quite plainly.

Yet this dissension, declining public interest, and political intransigence may be immaterial. A potential, yet so far unused discursive opportunity to 'broker' between pro-regulation frames and 'economic responsibility' may lie in a more comprehensive (i.e., including financial) understanding of risk (Hoffman, 2011b). Nagel (2011) discusses how the insurance and reinsurance industry is supremely concerned about exposure to financial risks associated with extreme weather events. The US military is concerned about security risks associated with 'population displacements, increased potential for failed states and terrorism, potential escalation of conflicts over resources' (Nagel, 2011, p. 206). Risk management is of fundamental concern to all – including energy – companies, insurance and finance industries, military and other government agencies. Professional engineers and geoscientists (and lawyers, accountants, corporate officers, etc.) are in the business of managing risk. Indeed, engineers have recognized these risks, been working behind the scenes, and revised the Canadian Building Codes to adapt to the changing climate. As our analysis of the different storylines shows, reframing climate change as a risk to be managed – as has been promoted by the IPCC in their recent report (IPCC, 2011) – has the discursive potential to provide a bridge (Snow et al., 1986) to integrate various frames (except 'fatalists' who seem generally apathetic) and inject a legitimate diagnosis, established prognoses, identity scripts, and motivational consensus. Financial risks would resonate with 'economic responsibility' adherents, environmental risks with 'comply with Kyoto' and 'regulation activists', regulatory risks with all anti-regulationists, and risks of contamination could resonate with 'nature is overwhelming'. By using a common enemy – risk – an interest-based discourse coalition (Gray & Stites, 2011; Hoffman, 2011b; Nagel, 2011) may be formed that has the potential to overcome the defensiveness. It would seem that

'regulation activists' (they have the highest action mobilization, recommending more actions than any other frame) could forward this. However, as Knox-Hayes and Levy (2011) point out for carbon disclosure, it remains open whether such a 'win-win' framing would also provide a viable business model to gain stabilization and, more fundamentally, what effect such a privileging of an economic rationality would have on the overall debate and the power positions of the various types of experts involved.

Notes

1   As of April 2012, APEGGA (Association of Professional Engineers, Geologists, and Geophysicists of Alberta) changed its name to APEGA (Association of Professional Engineers and Geoscientists of Alberta).
2   The survey questionnaire and resulting report to APEGA and its membership are available online at www.apegga.org/Environment/reports/ClimateChangesurveyreport.pdf .
3   Given our nonprobability sample, there are limitations. First, though it is not our intent to generalize to larger populations but to create theoretical generalizability, response bias is still a possible concern. However, such concern is reduced by the accessibility of the survey to all APEGA members without any systematic exclusion, the fact that members were responding to a survey by their regulator as they normally would, the respectable size of our sample, and the apparent representativeness of respondents to the membership as a whole. Second, framings are socio-historical constructions – embedded in specific worldviews, social positions, and interests that are bounded in space and time. Thus, the specific socio-economic location of our group of experts – the constellation of professional designations and industries, and the relevance of the petroleum industry for Alberta – may influence the findings, especially the frequency of frames. In addition, while these experts' framings may have represented those of October 2007 in Alberta, Canada, the science and policy positions may have since shifted there as elsewhere.
4   As the aim of our paper is the reconstruction of the framings and their relative positioning to each other and not the testing of hypotheses, we restrict the quantitative analyses to measure simple frequencies and the strength of the association between variables. Thus, the mainly categorical data were the basis for contingency tables. For the interpretation, the association coefficient Cramer-V (as most variables have more than two categories) and the table of standardized residuals were used. Standardized residuals give the difference between the observed and expected observations, divided by the square root of the expected observation. Standardized residuals higher than 2 or lower than −2 indicate that cells are not fitted very well by the assumption of independence between row and column. Further, for variables measured on an ordinal scale, means and standard deviations were calculated.

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Acknowledgements

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Author biographies

Lianne M. Lefsrud is a Doctoral Candidate in Strategic Management and Organization at the University of Alberta. Her research program examines the role of language and rhetoric to define, value, and shape our conceptions of science, technology, the environment and the associated state and self-regulatory institutions. A majority of her work uses mixed methods to explore issues of sustainability and development of contested energy sources, such as the Alberta oil sands.

Renate E. Meyer is Professor of Public Management and Governance at WU Vienna, Austria, and Permanent Visiting Professor at Copenhagen Business School, Denmark, at the Department for Organization. Her research interests currently include visual and discursive framing strategies, ambiguity as response to institutional complexity, and new forms of governance in the public sector.