Winter 12-1-2010

Framing Climate Policy Debates: Science, Network, and U.S. Congress, 1976-2007

Hyung Sam Park
Texas A & M University - College Station, hpark@bushschool.tamu.edu

Xinsheng Liu
Texas A & M University - College Station

Arnold Vedlitz
Texas A & M University - College Station

Framing Climate Policy Debates: Science, Network, and U.S. Congress, 1976-2007[1]

Hyung Sam Park[2] *Xinsheng Liu* *Arnold Vedlitz*
Institute for Science, Technology, and Public Policy (ISTPP)
Bush School of Government and Public Service
Texas A&M University

Abstract. Debates on global climate change (GCC) have been heavily influenced by such factors as scientific evidence, media coverage, public concerns, partisan interest, and so forth. Focusing on the linkages among the congressional committees, hearings, and invited witnesses (and their sectors), this study investigates the relational conditions under which congressional committees have mobilized climate expertise to discuss climate change issues for the past decades in U.S. Congress. Our findings show that agenda setting and witness selection by the committees significantly differed across the party lines: more environmental scientists were invited to define GCC as a threat in Democratic Congresses, whereas industrial scientists, to search for solutions in Republican Congresses. Except for a few proactive committees, committee jurisdiction was limitedly exercised. Our findings presents strong evidence along which climate policy debates have been framed based on a biased input of climate expertise.

Keywords: Climate change, mobilization, framing, committee, hearing, climate policy, Congress

Of various environmental issues, climate change is one of the most debated issues in recent decades. The debate has included not only domestic policymakers, (climate, social) scientists, and industry leaders but inter/transnational actors shown in efforts such as the Kyoto Protocol and the Intergovernmental Panel on Climate Change (IPCC 2001). Over time, there has been growing consensus (regarding human dimensions) on the causes, processes, and consequences of climate change in the science and policy communities (Alley 2000, Mayewski and White 2002, NRC/NAS 1992, 1994, 1999, Oreskes 2004b, Rosa et al. 2004, Rosa et al. 2007, Stern and Wilbanks 2008, York et al. 2003a, 2003b). As is typical of other sources of modern risk (Beck [1986] 1992, Giddens 1990, 1999, Perrow [1984] 1999), however, climate change involves causes, processes, and consequences that might not be fully known. Further, despite a growing

[1] This study is based on research conducted by the Institute for Science, Technology, and Public Policy at Texas A&M University and supported under award NA04OAR4600172 by the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce. The statements, findings, conclusions, and recommendations are those of the authors and do not necessarily reflect the views of the National Oceanic and Atmospheric Administration or the Department of Commerce.
[2] Address correspondence to Hyung Sam Park, Institute for Science, Technology, and Public Policy, Bush School of Government and Public Service, Texas A&M University, 4350 TAMU, College Station, TX 77834-4350.

consensus, both conflicting evidence utilized and oppositional claims made in the science and policy communities have kept collective efforts to mitigate from moving forward.

Effective policy debate and policymaking, however, along with grassroots activism and civic engagement, are important because they can facilitate collective societal efforts to be enforced to mitigate climate change. Indeed, for decades U.S. Congress has been a pivotal policy arena in which climate science, sector capacity, and policymaking have been intertwined forging national climate policies. Investigating the ways in which they have been linked in the climate debate will allow us to better understand the climate policy process and outcomes in recent decades in the United States. Yet, except for a few studies and their findings (Anderson 2002, Brown 1997, Stallworthy 2009), little is empirically studied regarding the conditions under which Congress has affected national climate change debates and policies. Furthermore, even the studies above did not pay adequate attention to the structural-relational dimensions in the institutional environment that have defined the contents of the climate debate in Congress, which we believe enabled framing of climate policy debates for the past decades.

In this study, we investigate the conditions under which climate change and policy options were debated in Congress from 1976 to 2007 in an attempt to uncover the linkages that potentially facilitated framing of climate policy debates. Analyzing these linkages will demonstrate the ways that policymakers mobilized resources such as climate science from societal sectors to frame the climate debate. Analyses are done in two steps: First, we aim to reveal the characteristics of the interconnectedness among the forces that influence the climate debate including partisan interests, committee jurisdictions, and sector priorities (or input) for the given period. Second, we discuss the implications of the structural-relational characteristics of the "policy network" for framing the climate debate and policy outcomes (for general discussions of policy networks, see Knoke 1990, Knoke et al. 1996).

Scientific Uncertainty and Climate Debates

Science has allowed societies to achieve specific goals by supplying knowledge and information (Sarewitz and Pielke 2007). Nonetheless, scientific evidence is frequently thought to be uncertain in public policy debates on controversial issues such as climate change. The literature points out two different reasons behind scientific uncertainty: First, as Oreskes (2004a:369-370) claims, "[S]cience does not produce logically indisputable proofs about the natural world. At best, it produces a robust consensus based on a process of inquiry that allows for continued scrutiny, re-examination, and revision." Thus, competing evidence and disagreements are unavoidable within the scientific community resulting in a lack of coherence and a conflict when the issues of interest become salient. Second, science cannot warrant certainty about the matters of interest because scientific uncertainty is amplified as contesting parties in disputes use their own bodies of legitimated facts (Fischer 1990, Herrick and Sarewitz 2000, Sarewitz 2004).

The second source of scientific uncertainty presented above is particularly important in understanding the relationship between environmental science and policymaking. As Levy and Rothenberg (2002:173) argued, "collective interpretations about the nature and solutions to climate change" are "molded and contested within institutional fields" including industry associations, universities, the media, and national and international governance structures, and these collective interpretations constitute the scientific, policy, and industry responses. Similarly, Gough and Shackley (2001) focuses on the establishment of an epistemic community that brings together a broad array of actors and how its members construct the problem, objectives, core

beliefs, and responses to climate change. Importantly, the possibility that policy actors influence scientific certainty based on their collective interpretations and interests, is open to all policy communities regardless of their types and ideologies.

Several empirical studies have demonstrated the processes by which these collective interpretations, interests, and efforts have attempted to influence the climate policy debate. For example, McCright and Dunlap (2000, 2003) examine the counter-claims to construct the "non-problematicity" of global warming to challenge the global warming claims of mainstream climate science, which was largely promoted by the conservative movement including conservative foundations, conservative think tanks, and sympathetic skeptic scientists (also see UCS 2004a, 2004b). Others examine climate policy responses and strategies by the industries in an attempt to negotiate national and international climate change policies (Levy and Egan 1998, Pulver 2007). Brown (1997) introduces conservative claims that scientific communities exaggerate scientific certainty and consensus on environmental problems and that the bureaucrats use these statements for stringent regulations and funding for these scientific communities (see Oreskes 2004b for the scientific consensus on climate change).

Given the relationship between science and policy presented in the literature (Collingridge and Reeve 1986, Guston 2003, Jasanoff 1990, 1996, Kuehn and Porter 1981), a key to understanding climate policy process and outcomes is to investigate how policy actors that are mostly aggregated collectivities such as organizations and sectors use scientific evidence as a type of political resource in policy debates. Investigating the linkages among the policy actors, science, and political events such as congressional hearings allows us to better understand the conditions under which the climate policy debate can be *framed* due to the dominant actors or dominant patterns of utilization of science (for discussions of "frame" analysis and its emphasis on symbolic processes and discourse in collective behavior, see Snow et al. 1986, Benford 1997). Despite the pivotal role of Congress in national and international policy processes (Wilson 1956, Krehbiel 1991, Dion 1992), specific conditions under which policy actors (committees, witnesses) have used scientific evidence on climate change to advance the agenda toward achieving their goals have largely been understudied.

As presented in several studies, policy debates in Congress provide policy communities with not only facts regarding the issues of interest but symbolic outputs including heightened public attention, which will influence drafting of legislation (Burstein and Bricher 1997, Burstein et al. 1995, Johns et al. 1993). In particular, we note two different sources that may influence the climate policy debate in Congress: Committees (including committee members' party identification and oversight jurisdiction) and societal sectors. As Burstein and associates noted, congressional committees are influential because the ways they define a problem, for example, sets the stage for further legislative action (Burstein et al. 1995, Burstein and Bricher 1997). Similarly, while explaining the dynamics of jurisdictional control, Jones et al. (1993) observed significant issue bias by the committees and yet the level of jurisdictional monopoly controlled as new committees claimed jurisdiction over issues. In addition to the committees, societal sectors from which witnesses are invited for input attempt to define and frame issues of interest, leaving open the possibility that political resources such as scientific evidence are selectively mobilized. Thus, the section below presents a structural-relational framework to analyze the mobilizing patterns of scientific and non-scientific expertise on climate change in prioritizing issues, defining problems, and finding viable solutions in the climate policy debate in Congress.

Mobilizing Science in Climate Debates

Contemporary theories of collective sociopolitical behavior such as that of policy actors emphasize the actors' ability to acquire and mobilize political resources to advance their political goals (Diani and McAdam 2003, Tilly 1978, also see models of public policymaking in Birkland 2005). The importance of the access to and control over political resources has been evidenced in collective activities including creating organizational structures, capturing media's attention, and forming alliances, which have been increasingly found in recent policy processes, collective action, and social movements (Kübler 2001, McCarthy and Zald 1973, 1977, Zald and McCarthy 1987). Thus, as discussed above, addressing the relationship between science and the climate policy debate in Congress necessitates an investigation of the mobilizing patterns of scientific (and non-scientific) expertise on climate change in prioritizing issues, defining problems, and finding viable solutions.

There have been noticeable developments in the 1990s in attempts to investigate mobilizing structures in policy processes focusing on the *connectedness* among the policy constituents (actors, resources, events, etc.). For example, Knoke and associates (Knoke 1990, Knoke et al. 1996) represented and analyzed political and policy communities as *networks*: Knoke (1990) studied political systems as political networks based on the assumption that the most important element of political power is the relationship of influence and domination among social actors. Knoke et al. (1996:6) investigate *policy networks* that "link heterogeneous communities of policy actors into intricate webs of common benefit-seeking actions" (also see Heclo 1978, Katzenstein 1978, Laumann and Knoke 1987, Marin and Mayntz 1991, Wilks and Wright 1987).

Since then, more efforts have been made to integrate policy process theories and policy network approaches. Attempting to advance the Sabatier's (1993, 2007) Advocacy Coalition Framework (ACF), Fenger and Klok (2001) demonstrate that attention for interdependency significantly contributes to explaining the behavior of policy actors and advocacy coalitions. In a managerial orientation, Klijn and Koppenjan (2004) address risk and uncertainty using the concept of network strategy developed based on the Kingdon's (1984) Stream Model and the Sabatier's ACF. Recently, Kim and Roh (2008) presents further conceptual steps to move beyond the ACF in a policy network approach. For example, they attempt to predict the relationship between policy actors based on the proximity of the actors' policy interests, resources, and trust. While remaining distance away from an agreed, plausible "theory" of policy networks, Peterson (2003) notices the level of governance via policy networks in the EU. He states that public policies are made in policy networks, which is a hybrid arrangement beyond traditional Weberian hierarchies or pure markets. While investigating the relationships among the structural features of policy networks, their organizing capacities, and their performance, Sandström and Carlsson (2008) confirm the explanatory power of policy networks in the educational policy sector.

As the literature above has shown, integrating policy network approaches into the policy process theories provide invaluable insights into the policy process and policy outcomes by allowing for uncovered patterns of political influence and resource flows in policy communities. Further, the findings contribute to both institutional collectivistic approaches (Powell and DiMaggio 1991) and variable-based individualistic approaches (most survey-based studies) to political and policy phenomena. However, most attempts thus far have limited themselves to using policy networks as a metaphor rather than an empirical substance to analyze based on

specific network measures (Wasserman and Faust 1994, Wellman and Berkowitz 1998). Indeed, little is known from this integrative approach regarding the extent to which the linkages among policy actors, issues, and events characterize and facilitate the climate policy debate in Congress. It would be difficult for us to confirm the degree to which congressional debates on climate change have been framed in particular directions without explicitly examining mobilizing structures from a policy network perspective.

Research Methods

As stated at the outset of this study, we place our analytic focus on the following two related inquiries: What were the characteristics of the interconnectedness among the forces that influenced the climate policy debate including partisan interests, committee jurisdictions, and sector priorities (or input)? What were the implications of the structural-relational characteristics of the "policy network" for framing the climate debate and policy outcomes? In answering the two questions above, first, we used statistical analysis to examine the extent to which the congressional committees, hearings (issues, objectives), and mobilized sectors were statistically associated with each other and, second, we used network analysis to map and analyze the connectedness of the mobilizing structure of political resources.

Data: Source and Nature. The primary data source for this study was the congressional hearings and the testimonies on climate change. To obtain the records of congressional hearings and testimonies on climate change, we searched the *Lexis-Nexis* congressional database with the keywords of "climate change," "global warming," and "greenhouse gases." The search allowed us to retrieve the records on 246 hearings and 1,595 testimonies between 1976 and 2007. Each record on hearing and testimony contained detailed information including hearing title, date, involved committee(s), topic, summary, witness name, and witness' affiliation. The records showed that altogether 21 unique congressional committees were involved in these hearings. When a committee changed its name during the period, we used its current name (e.g., Committee on Science and Technology (1974-1987) → Science, Space, and Technology (1987-1995) → Science (1995-2007) → Science and Technology (2007-present): Then, "Committee on Science and Technology"). We classified all 21 committees into *proactive* (12 committees) versus *inactive* (10) types toward climate-related issues based on their levels of activities: A committee was coded as *proactive* when it held hearings on climate change regardless of the party control in Congress. Otherwise, it was coded *inactive*.

We coded the retrieved records on the hearings as follows: First, each hearing was classified according to its main objective as "problem definition (PD)" or "solution search (SS)": We coded a hearing as PD when its main objective was to define the causes, processes, and impacts of climate change as a problematic source of environmental risk based on the witnesses' expertise. We coded a hearing as SS when its main objective was to search for the solutions to the issues at hand. Second, the hearings were also classified according to their primary foci as "energy and natural resources." (e.g., energy production, emission standards, alternative energy sources), "international climate negotiation" (e.g., ratifying Kyoto Protocol), "economic consequences" (impacts on the industry), and "climate science" (e.g., scientific evidence). Additionally, we considered party control (Democratic, Divided, or Republican) in Congress.

Invited witnesses were classified according to the organizations and sectors from which they came: "Environment-Science", "Environment-Non-Science", "Industry-Science", or "Industry-Non-Science." As the literature on the relationship between science and policy

indicates, we assumed that the witnesses would attempt to move congressional policy debates in a direction favorable to their organizations and sectors by representing their collective interests and interpretations. The authors crosschecked all coding procedure to maximize inter-coder reliability. Although we based our study in the limited data available inside and outside Congress, we did not believe that framing climate policy debates would be a function of those variables and linkages only. For example, several external factors such as scientific discovery, media coverage, and social, economic, and political events may have played a role in congressional climate debates. Considering the potential influences of all those forces would need a separate study. Table 1 below summarizes frequency distributions of the variables used in analysis.

Hypotheses. In the sections that follow, we test three hypotheses regarding the political mobilization of climate (scientific, nonscientific) expertise by the congressional committees that were largely under control of political parties, which sheds light on the nature of framing of climate policy debates in Congress for the given period.

H_1. Congressional committees are more likely to frame global climate change as threatening in the climate policy debate by holding hearings to define climate-related problems and assess their negative consequences than by holding hearings to search for the solutions in Democratic Congresses.

H_2. Congressional committees are more likely to frame global climate change as threatening in the climate policy debate by mobilizing the environmentalist sector than by mobilizing the non-environmentalist sector in Democratic Congresses.

H_3. Congressional committees are more likely to frame global climate change as threatening in the climate policy debate by mobilizing the science sector than by mobilizing the non-science sector in Democratic Congresses.

Table 1. Frequency Distribution of Variables of Interest

Party	Committee	Hearing		Sector
Type: Freq (%)	Type: Freq (%)	Objective: Freq (%)	Issue: Freq (%)	Type: Freq (%)
Democratic 14 (0.44) Divided 8 (0.25) Republican 10 (0.31)	Proactive 12 (0.57) Inactive 9 (0.43)	Problem 111 (45.12) Solution 135 (54.88)	Energy 92 (37.40) Foreign 54 (21.95) Impact 23 (9.35) Science 77 (31.30)	*Environment* 139 (56.50) Science 111 (45.12) Non-Science 28 (11.38) *Industry* 107 (43.50) Science 42 (17.07) Non-Science 65 (26.42)
32 (100.00)	21 (100.00)	246 (100.00)	246 (100.00)	246 (100.00)

Note: The frequencies of the variable, *party* indicate years of party domination in Congress.

Findings

In the following two sections, we present our findings, first, on the mobilizing patterns in the climate policy debates in Congress and their structural characteristics. We discuss the extent to which the mobilizing patterns among the committees, issues, and sectors potentially facilitated framing of the climate policy debate across party lines. Second, we statistically test the relationships among the committees, issues, and sectors for independence and reach the conclusions regarding the hypotheses on the biased nature of the mobilizing patterns and their implications for the policy debates.

Mapping Mobilizing Patterns in Climate Policy Debates

The first congressional hearing on climate change was held by the Committee on (1)Science and Technology for the National Climate Program Act in 1976. After that, committees have paid increasingly more attention on climate change over time, which may reflect more societal interest in and concerns about climate change (Liu and Vedlitz, forthcoming). Our investigation shows that the committee involvement in climate change was active only when either party controlled Congress rather than when Congress was divided: In Democratic Congresses (21 years; 1970s; from late-1980s to early-1990s), committees held on average 7.33 hearings per year (total 154 hearings) versus 7.90 hearings (total 79 hearings) in Republican Congresses (10 years; from late-1990s to early 2000s). In Congresses when party control was divided (8 years; early 1980s; early 2000s), only eight committees held, on average, 1.63 hearings per year (total 13 hearings). For a complete list of the committees and the number of hearings that they held under each party control, refer to Table A in Appendix.

As known, partisan politics is one of the fundamental forces to influence policy debates (Anderson 2002, Brown 1997, Stallworthy 2009). Thus, we map the mobilizing patterns and their structural characteristics in the congressional debates separately by the political parties that controlled Congress. Figures 1 and 3 display the entire networks of expertise mobilization in Democratic and Republican Congresses, respectively, in which the committees, the issue foci and objectives on which the committees primarily focused, and the sectors that the committees primarily mobilized in each hearing. They are followed by the two core networks (Figures 2 and 4) showing the densely connected parts only in each period. Table C in the Appendix summarizes the key differences between the two mobilizing networks. The period when Congress was divided is not reported in this section, although our statistical analysis in the following section includes this period as well.

Comparison shows that the patterns to mobilize climate expertise were substantially different in structural dimensions between the two Congresses. First, the mobilizing network was significantly larger in Democratic Congresses (Figure 1) than in Republican Congresses (Figure 3): In Democratic Congresses, 21 committees held 154 hearings (i.e., value sum of the lines incident to the committees) to discuss climate change issues, whereas only twelve committees held 79 hearings in Republican Congresses. Even more committees being active in Democratic Congresses, on average each committee held 3.21 hearings, which was considerably higher than 2.26 hearings in Republican Congresses. Considering the similar numbers of years when each party dominated Congress when the hearings occurred (11 Democratic versus 10 Republican), our findings indicate that a significantly larger volume of climate expertise was brought into the climate policy debate in Democratic Congresses.

Second, as shown in Figure 1, the mobilizing network was more hierarchically organized around a few committees, issues, objectives, and sectors: After binarizing the line values (0 = no tie, 1 = ≥1 in Figure 1), the network density was 0.57 (= #ties divided by the #maximum possible ties), which was substantially lower than 0.73 in Republican Congresses. In Democratic Congresses, climate debates and expertise mobilization were mostly initiated by a few central committees including the Committees on (1)Environment and Public Works, (1)Energy and Natural Resources, (1)Science and Technology, (1)Energy and Commerce, and (1)Commerce, Science, and Transportation, which held 111 (72.08%) hearings in combination. Nonetheless, compared to Republican Congresses, there were nine more “inactive” committees that held hearings only in Democratic Congresses, which may further support the influence of party

control in the climate policy debate in Congress. Of those inactive committees, the central position of the Committee on (0)Energy Independence and Global Warming is particularly noticeable.

The hierarchy of the mobilizing pattern in Democratic Congresses was also found in the sectors that the committees preferentially utilized. The committees heavily utilized the Environment–Science (ENV.SCI) sector, which was a dominant source of climate expertise in 70 (45.45%) hearings in this period. This concentrated pattern is displayed in thicker lines in Figure 1. As displayed, several "inactive" committees also invited witnesses only from this sector. While societal sectors may have their own collective interpretations of the climate conditions (Gough and Shackley 2001, Levy and Rothenberg 2002), this concentrated pattern found in Democratic Congresses may have not allowed competing evidence or oppositional claims to sustain in the climate policy debate, which in turn may have facilitated the debate and legislation drafting process.

The densely connected cores (Figures 2 and 4) display the central parts of the mobilizing structure where the network ingredients are linked through four or more hearings. Focusing on these cores allows us to observe the typical patterns of expertise mobilization in each Congress. Figure 2 shows that Committees on (1)Energy and Public Works and (1)Energy and Natural Resources were deeply embedded in congressional climate debates while working on climate science issues to define problems and assess impacts (Science.PD) and energy-related issues (Energy.PD and Energy.SS). The Environment-Science (ENV.SCI) was the dominant source from which Congress mobilized information. The most typical pattern that characterized this period is represented as the triangular structures of the committees to address the climate science issue (Science.PD) with the Environment-Science (ENV.SCI) sector to (i.e., the thick link between Science.PD and ENV.SCI) and the committees to work on the energy-related issue in search of solutions (Energy.SS) based on the input from the Industry-Science (IND.SCI) sector to (i.e., the thick link from IND.SCI to Energy.SS). The committees in this core network played a significant role in considering major environmental, if not solely climate, regulatory acts such as NEPA 1970 and Superfund 1980) legislated in Democratic Congresses.

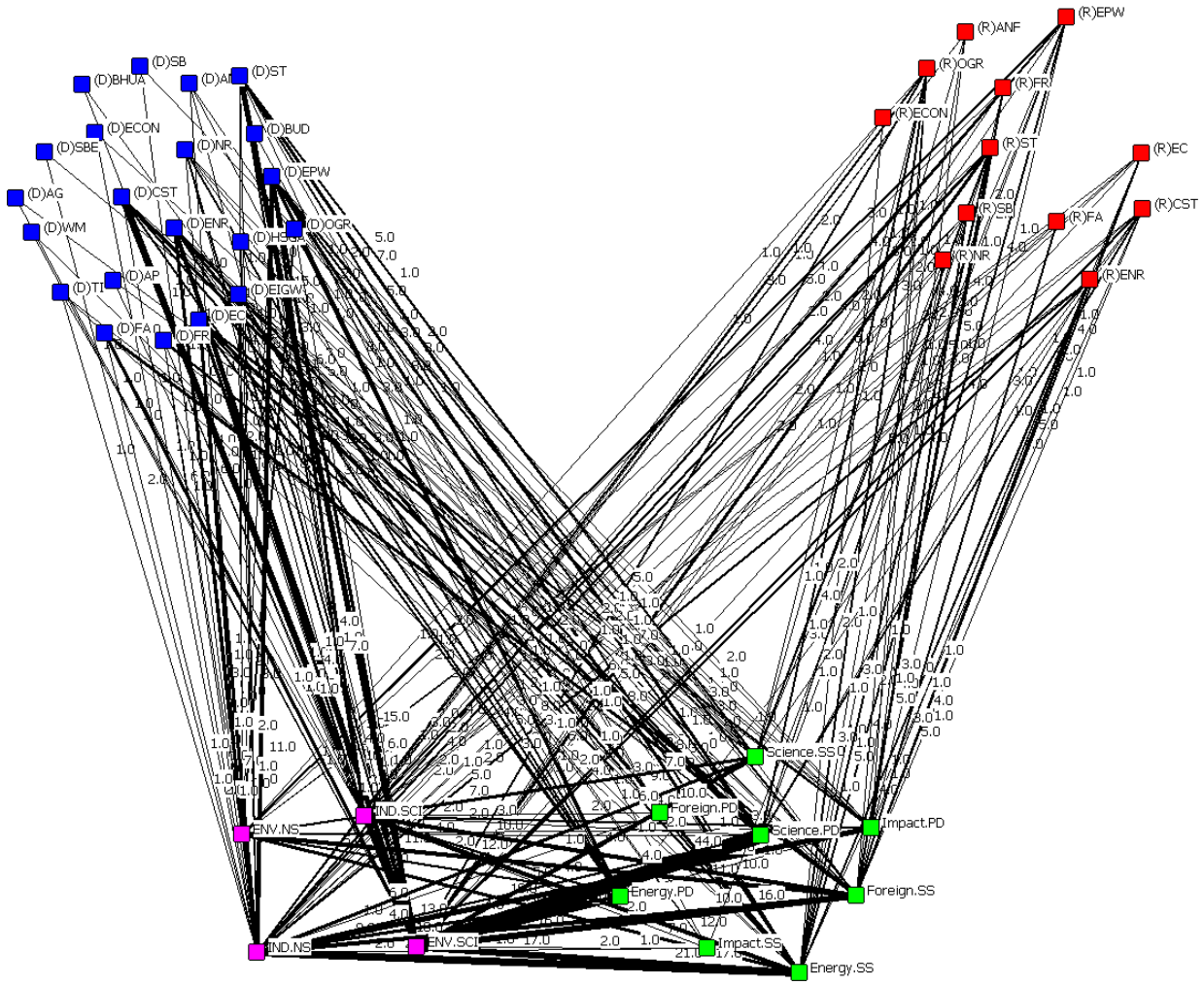

Figure 1. Mobilizing Network in Congress

Note: 1. (0) = "inactive" versus (1) = "proactive" committees based on their levels of activities under each party control

2. The numbers by the links indicate the frequencies of hearings in which the focal committees invited witnesses from the focal sectors more than from other sectors (e.g., the link, (1)Natural Resources 3→ Environment–Science shows that the inactive Committee on (0)Natural Resources invited more witnesses from the Environment–Science sector in three hearings).

3. Network Dimension:

   1) Democratic: 21 Committees, 8 Hearing Types, 4 Sectors, and 154 Hearings

   2) Republican: 12 Committees, 8 Hearing Types, 4 Sectors, and 79 Hearings

In Republican Congresses, the Committees on (1)Science and Technology, (1)Energy and Natural Resources, (1)Environment and Public Works, and (1)Oversight and Government Reform initiated 47 (59.49%) hearings in combination. While all committees that held hearings in this period were a subset of the committees that appeared in Figure 1, the Committee on (1)Oversight and Government Reform was the only committee that was more active in this period. The hierarchy of the mobilizing pattern found in Democratic Congresses was not noticeable in this period. In addition to the Environment–Science (ENV.SCI) sector that was a main source of information in 26 (32.91%) hearings, other sectors such as the Industry–Science (IND.SCI) and Industry–Non_Science (IND.NS) sectors were also actively mobilized. As studies note, industries have actively responded in their strategies to climate policies in an attempt to

negotiate national and international climate change policies (Levy and Egan 1998, Pulver 2007). Bringing into the policy debate diverse sectors that had ideologically and scientifically diverse opinions and claims may have allowed counter-claims to construct the "non-problematicity" of climate change to challenge the global warming claims of mainstream climate science, which in turn may have created a stalemate in furthering debates and legislation process in any direction (McCright and Dunlap (2000, 2003).

The diffused mobilizing pattern in Republican Congresses is more noticeable in Figure 4 that shows the core network. Committee on (1)Science and Technology was particularly more involved in the climate debate to discuss the topics related to energy (Energy.SS), and foreign (Foreign.SS) issues. Not only the Environment-Science (ENV.SCI) but the Industry-Non-Science (IND.NS) sector also provided the debates with a large volume of climate expertise. The most typical pattern that described this period is displayed as the triangular structures of the committees working on the climate science issue (Science.PD) with the Environment-Science (ENV.SCI) (i.e., the thick link between Science.PD and ENV.SCI) and the committees to work on the energy-related issue in search of solutions (Energy.SS) based on the input from the Industry-Non-Science (IND.NS) sector (i.e., the thick link between Energy.SS and IND.NS). In contrast to the Democratic period, no major enactment of climate or even environmental regulations was made in this period, although climate change surged as a public issue globally as well as domestically (e.g., Kyoto Protocol 1997).

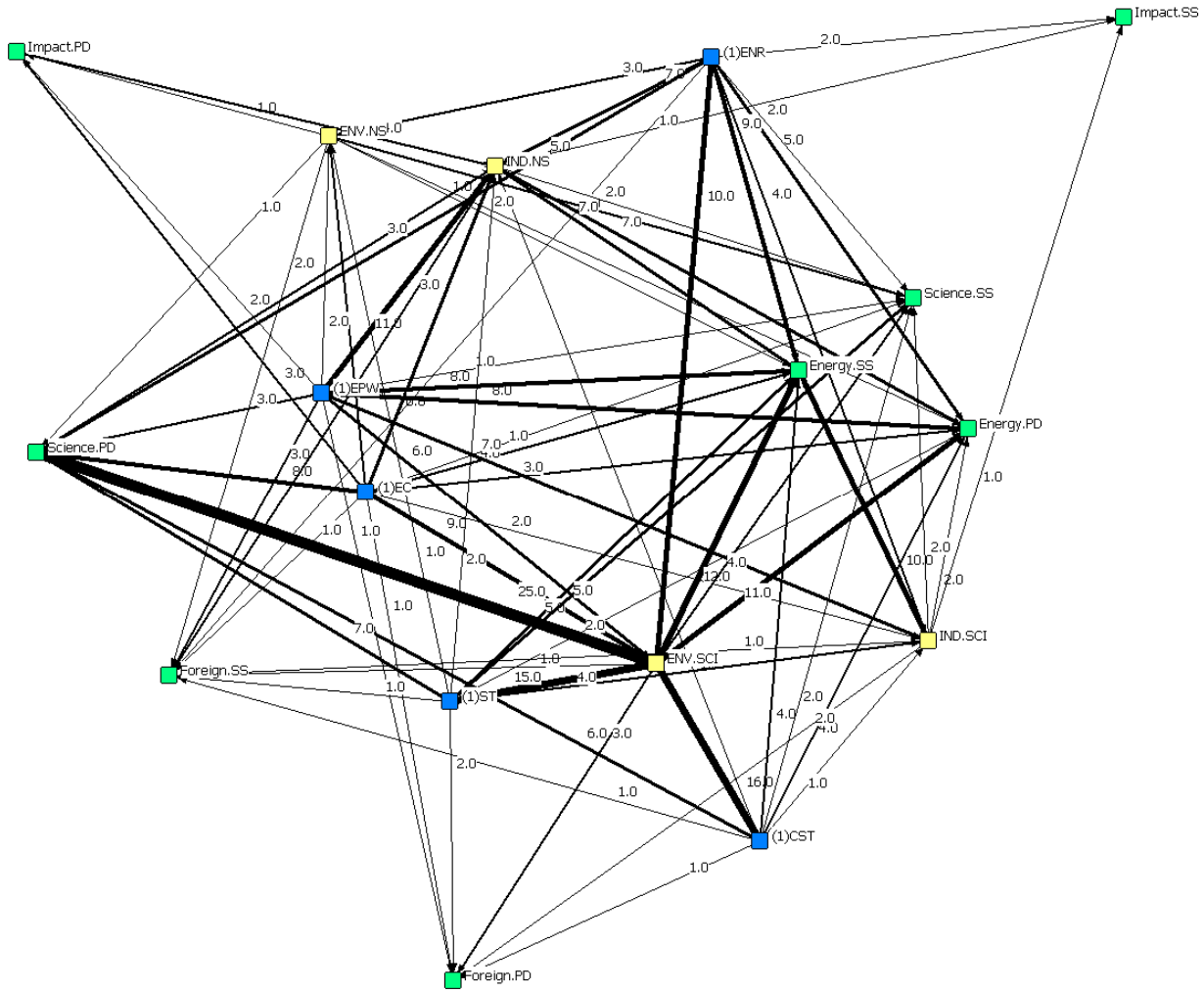

Figure 2. Mobilizing Network: Democratic Core
Note: Five core committees (#hearing ≥ 10) and their links (8 issue foci, 4 sectors)

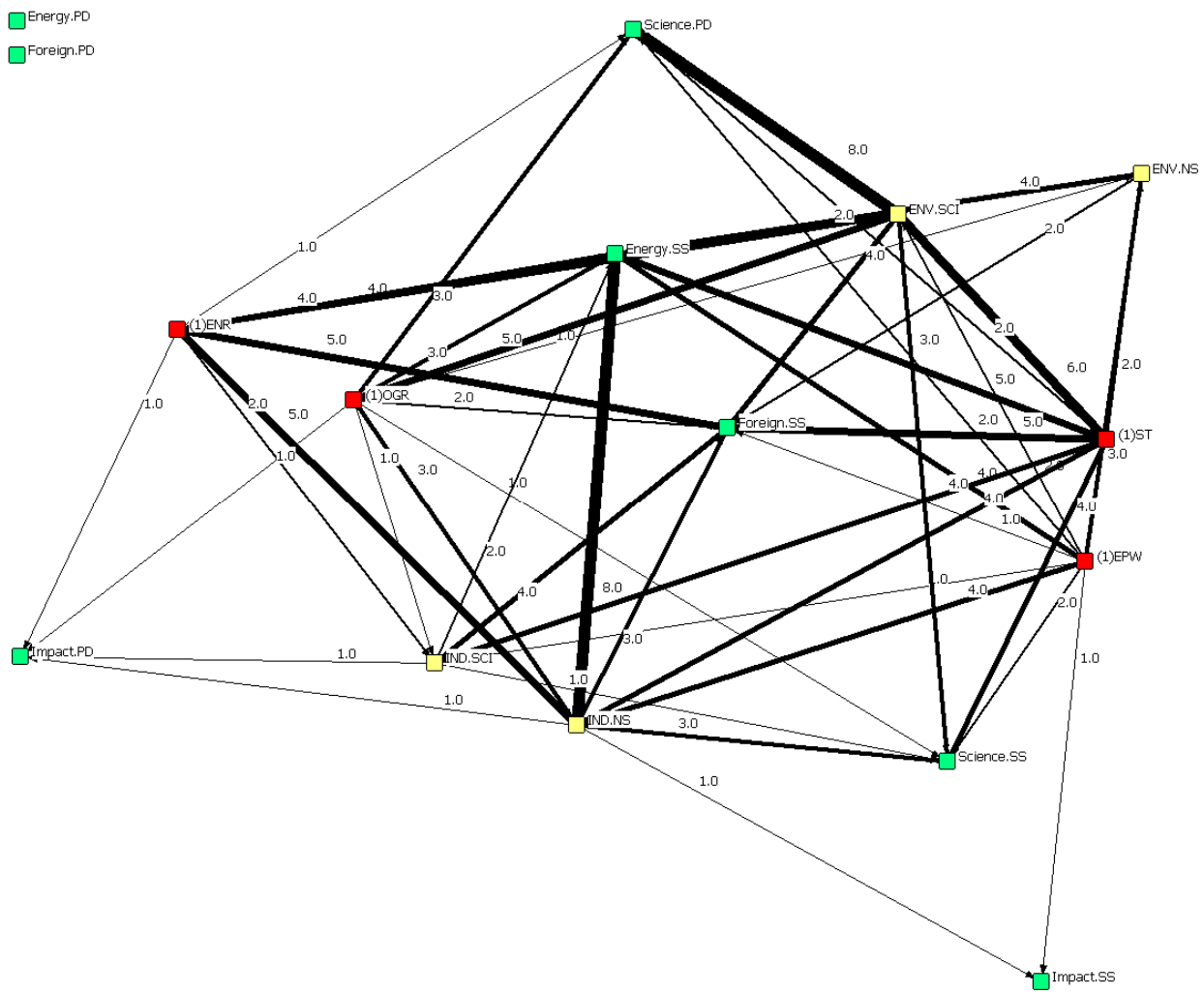

Figure 3. Mobilizing Network: Republican Core
Note: Four core committees (#hearing ≥ 10) and their links (6 issue foci, 4 sectors)

Testing the Bias: Hearings, Sectors, and Parties

Beyond mapping the mobilizing patterns in the climate policy debate in Congress and their structural characteristics, in this section we statistically test whether or not the climate issues on which the committees focused and the societal sectors that the committees mobilized differed depending on the party lines. The conclusions we make later will be based on the evidence from these two inquiries. As described above, the hearings have been classified according to the objectives that the committees intended to achieve and the substantive issues. Tables 2 and 3 summarize the climate issues and objectives on which the committees focused under each party control. Table 2 shows that climate issues addressed in Congress differed across the party lines (chi2 = 8.0920; Pr > chi2 = 0.044): While energy and natural resources (38.20% of their hearings) was the issue that drew most attention of the committees, it was addressed mostly by the committees in Democratic Congresses (42.86%), followed by the issue of science (29.87%). In contrast, in Republican Congresses, they held more hearings on foreign relations (32.91%) such as ratifying the Kyoto Protocol and energy-related issues (29.11%). There was no significant difference in the issues regarding economic impact and science across party control.

The objectives that the committees aimed to achieve through the hearings were also different along the party lines. As Table 3 shows, the committees in Democratic Congresses were more likely to assess the negative impacts of climate change and subsequently define climate change as problematic (53.25% of their hearings), whereas those in Republican Congresses, discuss viable solutions to climate change (74.68%). Although this discrepancy in hearing objectives may reflect the influences from other contextual forces during the periods when each party controlled Congress, the findings so far partially support our first hypothesis: we conclude that congressional committees are more likely to frame climate change as threatening in the climate policy debate by holding hearings to assess the negative consequences from climate change and define climate change as threatening than by holding hearings to search for the solutions in Democratic Congresses.

Table 2. Hearing Issues by Party

Issue \ Party	Democratic	Republican	Total
Energy	66 (42.86)	23 (29.11)	89 (38.20)
Foreign	27 (17.53)	26 (32.91)	53 (22.75)
Impact	15 (9.74)	8 (10.13)	23 (9.87)
Science	46 (29.87)	22 (27.85)	68 (29.18)
Total	154 (100.00)	79 (100.00)	233 (100.00)

Note: Pearson chi2(3) = 8.0920 (Pr = 0.044); Cramer's *V* = 0.1864

Table 3. Hearing Objectives by Party

Objective \ Party	Democratic	Republican	Total
Problem Definition	82 (53.25)	20 (25.32)	102 (43.78)
Solution Search	72 (46.75)	59 (74.68)	131 (56.22)
Total	159 (100.00)	79 (100.00)	233 (100.00)

Note: Pearson chi2(1) = 16.5494 (Pr = 0.000);
Cramér's *V* = 0.2665

Investigating the extent to which climate change was debated in biased conditions in Congress needs further evidence on the patterns of the committees' witness selection. Deciding witnesses to be invited to the hearings is an important political action because climate debates may proceed in different directions based on the witnesses' input that often represents collective positions and interests of the sectors from which they have come. As described in research methods, the witnesses have been categorized depending on, first, whether they came from the environment or industry sector and, second, whether they came from the science or non-science sector. When a witness came from the science sector, the witness was thought to hold scientific knowledge. As summarized in Table 4, there was significant variation in the patterns of selecting witnesses depending on the party lines: In Democratic Congresses, for example, committees invited more witnesses from the environment sector (in 60.39% of their hearings), whereas, in Republican Congresses, they brought slightly more witnesses from the industry sector (53.16%). Thus, our findings support the second hypotheses: Congressional committees are more likely to frame climate change as threatening in the climate policy debate by mobilizing the environment sector rather than the industry sector in Democratic Congresses.

Utilizing scientific knowledge over non-scientific was also different along the party lines. In Democratic Congresses, committees invited more witnesses from the science sector (in 64.94% of their hearings) than did those in Republican Congresses. Under Republican control, invitations were almost evenly divided between scientific and non-scientific knowledge. As displayed in Figures 1 thru 3 above, when the two criteria to classify sectors were combined, the "Environment–Science" was the modal sector from which climate expertise was mobilized in Democratic Congresses, whereas, in Republican Congresses, the "Industry–Non_Science" sector was as much utilized as the "Environment–Science" sector. Thus, our findings also support the

third hypothesis: Congressional committees are more likely to frame climate change as threatening in the climate policy debate by mobilizing the science sector rater than the non-science sector in Democratic Congresses.

Table 4. Sector Mobilization by Party

Sector \ Party	Democratic	Republican	Total
Environment	93 (60.39)	37 (46.84)	130 (55.79)
Industry	61 (39.61)	42 (53.16)	103 (44.21)
Total	154 (100.00)	79 (100.00)	233 (100.00)

Note: Pearson chi2(1) = 3.8893 (Pr = 0.049); Cramér's *V* = 0.1292

Table 5. Knowledge Mobilization by Party

Knowledge \ Party	Democratic	Republican	Total
Non-Science	54 (35.06)	39 (49.37)	93 (39.91)
Science	100 (64.94)	40 (50.63)	140 (60.09)
Total	154 (100.00)	79 (100.00)	233 (100.00)

Pearson chi2(1) = 4.4534 (Pr = 0.035); Cramér's *V* = -0.1383

Compared to the party control, the committees had only a limited influence on the climate policy debate in Congress. They did not appear to select climate issues to advance policy agenda and invite witnesses to hear from based on their independent oversight jurisdictions. For example, a few committees including (1)Energy and Commerce and (1)Oversight and Government Reform were substantially different in the issue foci, objectives, and sector utilization: In Democratic Congresses, they were either inactive or working on scientific issues to define climate change as a problem based on the input from the environmental sector. In Republican Congresses, they did not exclusively commit themselves to a particular issue, objective, or sector. Thus, the prevalent evidence indicates a limited role of committee jurisdictions as far as climate change issues are concerned compared to the party influence. It was predominantly traditional party lines rather than oversight jurisdictions of the committees that were instrumental in the climate policy debate for the given period. These findings are only partially consistent with those by previous studies of the influential role of the committees in congressional policy debates (Burstein and Bricher 1997, Burstein et al. 1995, Jones et al. 1993).

Nonetheless, our findings also show that a few committees consistently exercised oversight jurisdiction regardless of the party control. In both Congresses, one the one hand, a few committees consistently held a large volume of hearings to address climate-related issues: they include Committees on (1)Science and Technology, (1)Environment and Public Works, and (1)Energy and Natural Resources. On the other hand, a few committees attended consistently to specific issues/objectives and sectors, regardless of the party control: For example, of active committees, the Committees on (1)Commerce, Science, and Transportation, (1)Energy and Natural Resources, (1)Environment and Public Works, and (1)Science and Technology initiated hearings similarly.

Discussion

Appendix

Table A. Party Control and Number of Congressional Hearings on Climate Change

Year	Party Control	Hearings (Freq.)	Hearings (Pct.)
1976	Democratic	1	0.4
1979	Democratic	1	0.4
1985	Divided	1	0.4
1986	Divided	1	0.4
1987	Democratic	3	1.2
1988	Democratic	8	3.19
1989	Democratic	**21**	8.37
1990	Democratic	6	2.39
1991	Democratic	**10**	3.98
1992	Democratic	**10**	3.98
1993	Democratic	**11**	4.38
1994	Democratic	5	1.99
1995	Republican	3	1.2
1996	Republican	4	1.59
1997	Republican	**10**	3.98
1998	Republican	**15**	5.98
1999	Republican	**9**	3.59
2000	Republican	**9**	3.59
2001	Divided	5	1.99
2002	Divided	6	2.39
2003	Republican	2	0.8
2004	Republican	3	1.2
2005	Republican	**10**	3.98
2006	Republican	**14**	5.58
2007	Democratic	**83**	33.07
Total		251	100.00

Table B. Congressional Committees: Climate Policy Positions and Hearings by Party

Committee	Position	Hearings (Freq.)			
		Dem	Div	Rep	Total
Agriculture	Inactive	1	0	0	1
Agriculture, Nutrition, and Forestry	**Proactive**	3	0	3	6
Appropriations	Inactive	2	1	0	3
Banking, Housing, and Urban Affairs	Inactive	1	0	0	1
Budget	Inactive	1	0	0	1
Commerce, Science, and Transportation	**Proactive**	18	1	7	**26**
Economic	**Proactive**	1	0	1	2
Energy Independence and Global Warming	Inactive	6	0	0	6
Energy and Commerce	**Proactive**	21	1	6	**28**
Energy and Natural Resources	**Proactive**	24	1	11	**36**
Environment and Public Works	**Proactive**	29	4	10	**43**
Foreign Affairs	**Proactive**	9	0	3	**12**
Foreign Relations	**Proactive**	4	0	5	**9**
Homeland Security and Governmental Affairs	Inactive	2	1	0	3
Natural Resources	**Proactive**	6	1	3	10
Oversight and Government Reform	**Proactive**	4	0	10	14
Science and Technology	**Proactive**	22	3	16	**41**
Small Business	**Proactive**	1	0	4	5
Small Business and Entrepreneurship	Inactive	1	0	0	1
Transportation and Infrastructure	Inactive	2	0	0	2
Ways and Means	Inactive	1	0	0	1
Total		159	13	79	251

Table C. Comparison of Mobilizing Networks by Party

Variables \ Party Control	Democratic	Republican
# Committees	21 (100.00)	12 (100.00)
Active	12 (0.57)	12 (100.00)
Inactive	9 (0.43)	0 (0.00)
# Hearings: Issues	154 (100.00)	79 (100.00)
Energy (Natural Resources)	66 (42.86)	23 (29.11)
Foreign (e.g., Kyoto Protocol)	27 (17.53)	26 (32.91)
Impact (Economic)	15 (9.74)	8 (10.13)
Science (R&D)	46 (29.87)	22 (27.85)
# Hearings: Objectives	154 (100.00)	79 (100.00)
Problem Definition	82 (53.25)	20 (25.32)
Solution Search	72 (46.75)	59 (74.68)
Information: Scientific?	154 (100.00)	79 (100.00)
Science	100 (0.65)	40 (0.51)
Non-Science	54 (0.35)	39 (0.49)
Sectors: Environmental?	154 (100.00)	79 (100.00)
Environment	93 (0.60)	37 (0.47)
Industry	61 (0.40)	42 (0.53)
Network Density		
Valued	3.21 (=154/48)	2.26 (=79/35)
Binary	0.57 (=48/84)	0.73 (=35/48)

Note: 1. Network density in a valued network = sum of the line values / number of existing lines;
2. Network density in a binary network = number of existing lines / number of maximum possible lines;
3. Network binarized as 0 and 1; 0 if the original line value was 0 and 1 if the original line value was 1 or greater;

Literature

Alley, Richard B. 2000. *The Two-Mile Time Machine*. Princeton: Princeton University Press.

Anderson, Kai S. 2002. "The Climate Policy Debate in the U.S. Congress." *In Climate Change Policy: A Survey*. Edited by Stephen H. Schneider, Armin Rosencranz, and John O. Niles. Island Press.

Beck, U. [1986] 1992. Risk Society: Towards a New Modernity. London: Sage Publications.

Benford, R. 1997. "An Insider's Critique of the Social Movement Framing Perspective." *Sociological Inquiry* 67:409-30.

Birkland, Thomas A. 2005. *An Introduction to the Policy Process: Theories, Concepts, and Models of Public Policy Making*. M. E. Sharpe.

Brown, George E. Jr. 1997. "Environmental Science Under Siege in the U.S. Congress." *Environment 39:12-31*.

Burstein, P. and R. M. Bricher. 1997. "Problem Definition and Public Policy: Congressional Committees Confront Work, Family, and Gender, 1945-1990." *Social Forces* 76(1):135-168.

Burstein, P., R. M. Bricher, and R. L. Einwohner. 1995. "Policy Alternatives and Political Change: Work, Family, and Gender on the Congressional Agenda, 1945-1990." *American Sociological Review* 60(1):67-83.

Collingridge, D. and Reeve, C. 1986. *Science Speaks to Power: The Role of Experts in Policy Making*. New York: St. Martin's Press.

Diani, M. and D. McAdam 2003. *Social Movements and Networks*. Oxford University Press.

Dion, D. 1992. "The Robustness of Structure-Induced Equilibrium." *American Journal of Political Science* 36:462-82.

Fenger, M. and Klok, P. J. 2001. "Interdependencies, Beliefs, and Coalition Behaviour: A Contribution to the Advocacy Coalition Framework." *Policy Science* 34(2).

Fischer, Frank. 1990. *Technocracy and the Politics of Expertise*. Newbury Park, CA: Sage.

Giddens, A. 1990. *Consequences of Modernity*. Cambridge: Policy Press.

Giddens, A. 1999. "Risk and Responsibility." *Modern Law Review* 62(1): 1-10.

Gough, Clair and Simon Shackley. 2001. The Respectable Politics of Climate Change: The Epistemic Communities and NGOs. *International Affairs (Royal Institute of International Affairs 1944-)*, Vol. 77, No. 2 (Apr., 2001), pp. 329-345.

Guston, D. H. 2003. "Principal-Agent Theory and the Structure of Science Policy, Revisited: 'Science in Policy' and the US Report on Carcinogens." *Science and Public Policy* 30(5):347-57.

Heclo, Hugh. 1978. “Issue Networks and the Executive Establishment.” In Anthony King (ed). *The New American Political System*. Washington, D.C.: American Enterprise Institute, pp.87-124.

Herrick, C. and D. Sarewitz. 2000. “Ex Post Evaluation: A More Effective Role for Scientific Assessments in Environmental Policy.” *Science Technology and Human Values* 25(3):309-331.

Intergovernmental Panel on Climate Change. 2001. Climate Change 2001: Synthesis Report. Cambridge, UK: World Meteorological Organization/United Nations Environment Programme.

Jasanoff, S. 1990. *The Fifth Branch: Science Advisors as Policymakers*. Cambridge: Harvard University Press.

Jones, B. D., F. R. Baumgartner, and J. C. Talbert. 1993. “The Destruction of Issue Monopolies in Congress.” *American Political Science Review* Vol. 87(3):657-671.

Katzenstein, Peter. 1978. *Between Power and Plenty: Foreign Economic Policies of Advanced Industrial States*. Cambridge, MA: Harvard University Press.

Kim, Young-Jung and Chul-Young Roh. 2008. “Beyond the Advocacy Coalition Framework in Policy Process.” *International Journal of Public Administration* 31(6):668-689.

Kingdon, John W. 1995. *Agendas, Alternatives, and Public Policies*. Addison-Wesley Educational Publishers.

Klijn, E. H. and Koppenjan, J. F. M. 2004. *Managing Uncertainties in Networks*. Sage.

Knoke, D. 1990. *Political Networks: The Structural Perspective*. Cambridge University Press.

Knoke, D., Pappi, F. U., Broadbent, J., and Tsujinaka, Y. 1996. *Comparing Policy Networks: Labor Politics in the U.S., Germany, and Japan*. Cambridge University Press.

Krehbiel, K. 1991. *Information and Legislative Organization*. Ann Arbor: University of Michigan Press.

Kübler, Daniel. 2001. “Understanding Policy Change with the Advocacy Coalition Framework: An Application to Swiss Drug Policy.” *Journal of European Public Policy* 8(4):623-641.

Kuehn, T. J. and Porter, A. L. 1981. *Science, Technology, and National Policy*. Cornell University Press.

Laumann, E. O. and D. Knoke 1987. *The Organizational State*. Madison, WI: University of Wisconsin Press.

Levy, David L. and Daniel Egan. 1998. "Capital Contests: National and Transnational Channels of Corporate Influence on the Climate Change Negotiations." *Politics and Society 26:337-61.*

Levy, David, and Sandra Rothenberg. 2002. Heterogeneity and Change in Environmental Strategy: Technological and Political Responses to Climate Change in the Global Automobile Industry. In *Organizations, Policy, and the Natural Environment: Institutional and Strategic Perspectives,* edited by A. J. Hoffman anq M. Ventresca.

Stanford, *CA:* Stanford University Press.

Marin, B. and Mayntz, R. 1991. *Policy Networks: Empirical Evidence and Theoretical Considerations*. Boulder, CO: Westview Press.

Mayewski, Paul Andrew and Frank White. 2002. *The Ice Chronicles: The Quest to Understand Global Climate Change*. Hanover, NH: University Press of New England.

McCarthy, J. D. and M. N. Zald 1973. *The Trend of Social Movements in America: Professionalization and Resource Mobilization*. Morristown, NJ: General Learning Press.

McCarthy, J. D. and M. N. Zald. 1977. "Resource Mobilization and Social Movements: A Partial Theory." *American Journal of Sociology* 82(6):1212-41.

McCright, Aaron M., and Riley E. Dunlap. 2000. "Challenging Global Warming as a Social Problem: An Analysis of the Conservative Movement's Counter Claims." *Social Problems* 47(4): 499-522.

McCright, Aaron M., and Riley E. Dunlap. 2003. "Defeating Kyoto: The Conservative Movement's Impact on U.S. Climate Change Policy." *Social Problems* 50(3): 348-373.

National Research Council/National Academy of Sciences. 1992. *Global Environmental Change: Understanding the Human Dimensions.* Washington, DC: National Academy Press.

National Research Council/National Academy of Sciences. 1994. *Science Priorities for the Human Dimensions of Global Change.* Washington, DC: National Academy Press.

National Research Council/National Academy of Sciences. 1999. *Human Dimensions of Global Environmental Change: Research Pathways for the Next Decade.* Washington, DC: National Academy Press.

Oreskes, Naomi. 2004a. "Science and Public Policy: What's Proof Got to do with it?" *Environmental Science and Policy* 7:369-383.

Oreskes, Naomi. 2004b. "Beyond the Ivory Tower: The Scientific Consensus on Climate Change." *Science* 306:1686.

Perrow, Charles. [1984] 1999. *Normal Accidents: Living with High-Risk Technologies*. Princeton University Press.

Peterson, John. 2003. "Policy Networks." In Antje Wiener and Thomas Dietz (eds). *European Integration Theory*. Oxford University Press.

Powell, W. W. and DiMaggio, P. 1991. *New Institutionalism in Organizational Analysis*. Chicago, IL: University of Chicago Press.

Pulver, Simone. 2007. Making Sense of Corporate Environmentalism: An environmental contestation approach to understanding the causes and consequences of the climate change policy split in the oil industry. *Organization & Environment* 20 (1):44-83.

Rosa, Eugene, Richard York, and Thomas Dietz. 2004. "Tracking the Anthropogenic Drivers of Ecological Impacts." *AMBIO: A Journal ofthe Human Environment* 33:509-512.

Rosa, Eugene A., Roger Kasperson, and Edward L. Miles. 2007. "Panel to Address Capacity

Building for Research in Human Dimensions of Global Environmental Change. Draft, Committee on the Human Dimensions of Global Change, National Academy of Sciences (May).

Sabatier, Paul A. 2007. *Theories of the Policy Process*. Westview Press.

Sabatier, Paul A. and Hank C. Jenkins-Smith 1993. *Policy Change and Learning: An Advocacy Coalition Approach*. Westview Press.

Sandstrom, Annica and Lars Carlsson. 2008. "The Performance of Policy Networks: The Relation between Network Structure and Network Performance." *Policy Studies Journal* 36(4):497-524.

Sarewitz, Daniel. 2004. "How Science Makes Environmental Controversies Worse." *Environmental Science and Policy* 7(5):385-403.

Sarewitz, Daniel and Roger A. Pielke, Jr. 2007. "The neglected heart of science policy: reconciling supply and demand for science." *Environmental Science and Policy* 10:5-16.

Snow, D. A., Burke Rochford, E. A. Jr., Worden, S. K., and Bernford, R. D. 1986. "Frame Alignment Processes, Micromobilization, and Movement Participation." *American Sociological Review* 51:464-81.

Stallworthy, Mark. 2009. Legislating against Climate Change: A UK Perspective on a Sisyphean Challenge. *The Modern Law Review*, Vol. 72, No. 3 (May, 2009), pp. 412-436

Stern, Paul and Thomas Wilbanks. 2008. "Fundamental research priorities to improve the understanding of human dimensions of climate change. A Discussion Paper Prepared for the National Research Council's Committee on Strategic Advice to the U.S. Climate Change Science Program.

Tilly, Charles. 1978. *From Mobilization to Revolution*. New York: McGraw-Hill.

Union of Concerned Scientists. 2004a. *Scientific Integrity in Policymaking: An Investigation into the Bush Administration's Misuse of Science.* March. Cambridge, MA: Union of Concerned Scientists.

Union of Concerned Scientists. 2004b. *Scientific Integrity in Policy Making: Further Investigation of the Bush Administration's Misuse of Science.* July. Cambridge, MA: Union of Concerned Scientists.

Wasserman, S. and K. Faust 1994. *Social Network Analysis*. Cambridge/New York: Cambridge University Press.

Wellman, Barry and S. D. Berkowitz. 1988. *Social Structures: A Network Approach*. Cambridge: Cambridge University Press.

Wilks, Stephen and Maurice Wright. 1987. "Comparing Government-Industry Relations: States, Sectors, and Networks." Pp.274-313 in *Comparative Government-Industry Relations: Western Europe, the United States, and Japan*. Oxford: Clarendon Press.

Wilson, W. 1956. *Congressional Government*. Cleveland: Meridian Books.

York, Richard, Eugene Rosa, and Thomas Dietz. 2003. "STIRPAT, IPAT and ImPACT: analytic

tools for unpacking the driving forces of environmental impact." *Ecological Economics 46:351-365.*

York, Richard, Eugene A. Rosa, and Thomas Dietz. 2003b. "A Rift in Modernity? Assessing the Anthropogenic Sources of Global Climate Change with the STIRPAT Model." *International Journal of Sociology and Social Policy23:31-51.*

Zald, M. N. and J. D. McCarthy. 1987. *Social Movements in An Organizational Society*. New Brunswick, NJ: Transaction Press.