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Good press, bad press: A 25-year comparison of arguments and trends in American news coverage of climate change and the ozone hole

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GOOD PRESS, BAD PRESS: A 25-YEAR COMPARISON OF ARGUMENTS AND TRENDS IN AMERICAN NEWS COVERAGE OF CLIMATE CHANGE AND THE OZONE HOLE

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DEDICATION

This work is dedicated to my three beautiful children – Sam, Maggie and Cameron Howland – who are my greatest teachers. Whatever paths you choose, please remember that learning, which is a value your family holds dear, is a lifelong journey that takes many forms. The world is a wonderful classroom. Your mother and I encourage you to travel and share your experiences and love with others to help make it a better place for everyone.

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With luck, the research in the pages that follow will make a positive contribution, however small, to understanding and improving the way the news media covers global environmental problems – problems like the ozone hole and climate change, that pose a threat to humanity and the myriad ecosystems that support our lives. This dissertation has been a team effort, and so I must thank my All-Star team: my adviser, Dr. Mimi Becker, for taking me on as a non-traditional student and empowering me with her knowledge of the policy process; and the other members of my interdisciplinary committee: Professors Larry Prelli, Dork Sahagian, Richard England and Bob Eckert for their expertise in rhetoric, earth systems science, economics and systems thinking. You are my role models for how to work effectively across academic traditions. I owe a big debt to my research subjects: my undergraduate coders, Ingrid Nugent and Brian Topping, who helped successfully test the content analysis system used in this study; and my seven interview subjects, who took time from their busy schedules to help me understand the issues from their perspectives with honest, insightful observations.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

GOOD PRESS, BAD PRESS: A 25-YEAR COMPARISON OF ARGUMENTS AND TRENDS IN AMERICAN NEWS COVERAGE OF CLIMATE CHANGE AND THE OZONE HOLE

by

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This study uses an original content analysis categorical system to seek out and compare the substance of arguments in a quarter century of American news coverage about the ozone hole and climate change. Findings from an examination of more than 1,000 news articles written by The Associated Press, United Press International and The New York Times are combined with interviews with members of key stakeholder groups in both cases including scientists, politicians, industry officials, environmentalists and news reporters. The analysis illuminates the social and political processes at work – that is, those captured by the press – in the evolution of the Montreal ozone and Kyoto climate treaties. The study concludes: 1) The timing and structure of arguments in American news coverage of the ozone hole has paralleled the policy success of the Montreal Protocol in the United States over the past quarter century; 2) By contrast, the landscape of arguments about climate change is still very much a battleground – reflecting the mixed fortunes and current failure of the Kyoto Protocol in America; 3) Over time, the climate change debate has shifted from one about the legitimacy of global warming science to one about what policy action should be taken. This is underscored by state efforts to address climate change in absence of federal action; 4) Uncertainty about the climate change phenomenon has been a hallmark of climate change news coverage in the 25-year sample and one that has buffered calls for policy action. It seems to have derived from a combination of deft lobbying by industry, reporters attempting to "balance" coverage of a confusing, controversial issue, and scientists unwilling or unable to place their work in context. There are very recent signs that this is changing. The study includes a critique of news coverage and recommendations for news reporters, scientists and readers to enhance their communication about and understanding of these critical environmental problems. It concludes with an evaluation of the research model and its future potential.

CHAPTER I

BACKGROUND

The Topic of and Justification for this Study

This dissertation is a case study comparison of nearly a quarter century of American news media coverage of two of the most intractable environmental problems of modern times. The efforts to understand and address the twin environmental threats of stratospheric ozone destruction and climate change – which hold potentially profound consequences for the environment, human health and the economy – comprise a tale of scientific, social and political struggle, success and failure. Indeed, the media itself – as agenda setting research on the press and policy has repeatedly shown – is an important part of the story. By choosing what issues to focus on and who to quote, news reporters and editors play a major role in shaping the course of events. Their work both reflects and influences public opinion and policymaking (Jamieson and Campbell 1988; Nelkin 1995; Trumbo 1995). This study, rendered in five chapters, examines how news coverage of the ozone hole and climate change problems has unfolded in the American press over the past 25 years. It takes stock of trends in a dizzying array of economic, political, social, scientific and environmental arguments in those reports, and explores what they can tell us about America's role in the very different outcomes of international treaties forged to address the issues. This dissertation's findings are relevant to anyone interested in how the ozone hole and climate change played in the press – what arguments and whose arguments were emphasized when, and what relevance they had to the treaties that emerged. The study was accomplished with the help of an original categorical content analysis system designed to identify and sort arguments in news stories. Combined with some exciting and powerful analytic frameworks, it offers a unique approach for understanding how the important tales of our time are told.

Two Problems, Two Outcomes

In the ozone case, the U.S. media told a story of how chlorofluorocarbons – versatile, inexpensive, non-flammable, non-toxic chemicals with myriad industrial and commercial uses – became a threat to the planet. It reported the work of future Nobel laureates who discovered that the chemicals, knows as CFCs, could potentially shred the delicate veil in the stratosphere that protects the Earth's surface from harmful ultraviolet radiation. The media chronicled the polar expeditions, number crunching and warnings of scientists that a growing hole in the sky threatened to spread skin cancer and destroy the food chain. And it documented the social and political response: environmental protests, tales of blinded livestock in South America, industry resistance ,Washington infighting, and, ultimately, the emergence of the Montreal Protocol treaty. This landmark pact limited, then banned the production of ozone destroying substances worldwide (UNEP 2000). Despite scientific uncertainly, the United States recognized the seriousness of the ozone problem and generated the political will to forge a global solution. Quoted by The Associated Press, meteorologist Peter Usher of the United Nations Environment Program explained the stakes: "Without this treaty, we were on a crash course for disaster. Life on Earth was at risk within a century" (Bradley 1987). Industry on both sides of the Atlantic has since produced economically viable substitutes to replace CFCs and has successfully marketed them. Indeed, the Montreal Protocol, which underwent a series of revisions to toughen its restrictions, seems to be having a positive effect on the atmosphere (Revkin 2003; UNEP 2005).

The story of climate change is remarkably similar – to a point. It too, begins with growing warnings from scientists about another human-made threat – the buildup of fossil fuel emissions in the atmosphere which trap heat from the sun. This problem comes with its own set of frightening potential consequences for the planet: melting glaciers, rising sea levels, violent shifts in weather and possibly even a sudden ice age (IPCC Group I 2001; IPCC Group II 2001; Capozza 2002; Broecker 1997). The story also includes a concerted resistance led by the oil and automotive industries, their political backers, and scientists wary of the economic consequences for limiting fossil fuel consumption. But inspired by the successful response to the ozone crisis, world leaders used the convention/protocol process that led to Montreal as a guide to develop a treaty to address the climate change problem. Ten years after the Montreal Protocol, representatives from 150 nations including the United States, signed a pact in Kyoto, Japan to reduce greenhouse gas emissions (United Nations 1997). But here is where the two tales diverge.

As of this dissertation's publication, the U.S. has yet to ratify the Kyoto Protocol and is unlikely to do so in face of persistent domestic opposition (Cushman 1998; Heilprin 2004) grounded in arguments that the treaty does not include the growing nations of China and India, the science it is based on is too uncertain, and the emissions cuts would cause too much pain to the U.S. economy. It is a complicated environmental problem and a complicated treaty. But these and other concerns were overcome overseas and the protocol went into effect without the United States when Russia ratified it in November, 2004.

The gulf of difference between the ozone policy success and efforts to win U.S. ratification of Kyoto treaty has not been lost on the American news media. Three national environmental news reporters interviewed for this dissertation emphasized the intractability of the younger policy effort. "On climate change, climate change asks you to totally rethink your entire, almost your entire energy structure, which has much broader implications, much broader costs, much broader upheaval of what's going on," said Josef Hebert, a veteran environmental and Congressional reporter for The Associated Press. "So I think that when you say that 'Why was one [policy] successful and one's still struggling?' to a certain extent that's because climate is a much more difficult issue to tackle than dealing with the ozone."

The Media's Role

Media scholars and key participants in both the ozone and climate change regimes agree that the news media has played a central role in presenting these twin issues to the public, but they give mixed reviews on its performance (Benedick 1998; McComas and Shanahan 1999; Stamm, Clark, and Eblacas 2000; Ungar 2000; Zehr 2000). "The media is absolutely a critical component of the debate for several reasons," Robert Watson, chief scientist for the World Bank and former chairman of the Intergovernmental Panel on Climate Change (IPCC) said in an interview for this dissertation. "If we live in a democracy – which I would argue we do in the US – then public opinion is absolutely critical for policy formation by government. It's also critical as a message to the private sector as to what is acceptable and what is not acceptable in the products they produce. The media played a really important role to be able to take the information we gained such as the Antarctic ozone hole and spread it across America. They got the message out that we were decreasing ozone and it would lead to skin cancer or potentially lead to skin cancer." However, on climate change, Watson said "the media is almost silent ... compared to the media in Europe." He added that the American news media has confused the public about the issue by giving almost equal play to skeptics of climate change as scientists in the mainstream majority who say the problem is real and growing. On climate change in particular, the news media has come in for a wide range of criticism. Echoing Watson's argument, a recent analysis of news reports on climate change claims the media's traditional quest for balance has biased its coverage against mainstream science, particularly the efforts of the IPCC (Boykoff and Boykoff 2004). Layzer notes that climate change skeptics took advantage of this "balance" norm to boost their impact (2002). Other studies suggest the news media focused too heavily on science. In separate articles on climate news coverage, Wilkins and Zehr conclude that the news media covered scientists to the exclusion of lay views, diminishing the role the public could potentially play in a solution (Zehr 2000; Wilkins 1993). By contrast, some climate skeptics charge that the news media was complicit with environmental groups in stirring up public fear about climate change with "apocalyptic" messages "to sell newspapers and television time" (Layzer 2002, 221). McComas and Shanahan report that early news coverage of climate change effectively cried wolf by overplaying potentially dire consequences that never materialized (McComas and Shanahan 1999). Ungar notes that fundamentally different characterizations of the ozone and climate change problems have led the public to fear the former and basically ignore the latter (Ungar 2000). A critique of the content analysis methodology employed by these studies can be found in the Methods chapter.

What is certain is the importance of the media's role in informing the public about these twin global environmental problems. Less understood is what role, if any, the U.S. news reports played in their starkly different outcomes in America. This is a critical question, again, because agenda setting research has demonstrated that what is written in the newspapers shapes public opinion and also policy making. But before the answer can be grasped, a systematic apples-to-apples comparison of news coverage of both policies is required. This dissertation sets out to perform that comparison by examining a sample of more than 1,000 articles written about the ozone hole and climate change during the past quarter century by The New York Times, The Associated Press and United Press International. The task is aided by an original content analysis categorical system developed for the study and used by human coders. The results are placed in context by interviews conducted by the author with key stakeholders in both problems, and an analysis of scholarly literature on the cases. The results are scrutinized and reported with the help of the powerful policy sciences analytic framework geared to make sense of complex policy problems (Clark 2002; Brewer and deLeon 1983; Lasswell 1971). Two overall research questions drive the study: How have the sources, structure and content of arguments carried by mainstream American print media about the ozone hole and climate change evolved from 1980 to 2004? What do the trends in social and decision process emerging from this analysis reveal about the relative success of the Montreal Protocol in the United States versus the failure of the Kyoto Protocol?

The remainder of this chapter is split into three sections. The first, *Historical, scientific and political context*, discusses the evolution of science and policy of the ozone hole and climate change problems and explores some of the literature comparing the two cases. The second, *Theoretical Frameworks*, explains this study's research approach and the literature that supports it and then explores – in two sub sections – literature on a wide range of competing economic and environmental philosophies for conceptualizing and addressing environmental problems. The third section, *Research Products and Questions* explains what products will come of the study and lists the many questions that will help derive them.

Historical, Scientific and Political Context

Before evaluating the news media's coverage of ozone depletion and climate change, it is necessary to understand some basics of the science that underlies both problems (including a little atmospheric chemistry and earth system science), the political processes that evolved to grapple with them, and their relative strengths and weaknesses in the eyes of scholars that study them. This section is intended to cover these areas, giving readers a general frame of reference for the further exploration of these issues in the chapters ahead. The summaries of ozone and climate change science to follow draw on several texts and papers, but especially the work of Kump and colleagues, whose book, The Earth System, served as an excellent, accessible reference to the scientific fundamentals of both cases. To place this work in context, this section opens first with a brief history of human impacts on the environment.

Humans and Environmental Change

Humans have affected the environment around them in significant ways for millennia (Steen 1999). Researchers suspect a combination of overexploitation of water, the exhaustion of soil organic matter and salinization from irrigation, caused the decline of ancient Jericho (8000 BC). Equipped with new tools made of copper, bronze and iron, the Babylonians, Assyrians, Greeks and Romans "devastated forests through heavy grazing, wood collection for copper and iron manufacturing and ship building, as well as through burning for land reclamation, hunting, war and sheer carelessness" (Steen 1999, 368). In many cases, resource exploitation has hastened the decline or outright demise of entire societies, most famously the population of Easter Island which denuded its forests and with it its wildlife and crop yields in what biologist Jared Diamond described as "as close as we can get to a 'pure' ecological collapse" (2005, 20). Diamond also includes in his analysis the Maya, who succumbed to a combination of environmental damage, population growth and climate change, and the Greenland Norse who failed to adjust their lifestyle to a changing climate. The point of these examples is to underscore that throughout history, societies' environmental resource management choices have had real consequences for their survival. In a chapter on of the globalization of environmental problems, Held and colleagues note that before European modernity, plagues and ice ages were essentially the only causes of global environmental change (1999). They report the pace of environmental degradation picked up in the sixteenth and seventeenth centuries with colonial agriculture and intensive hunting in Asia and the Americas to meet European demand, which led to some species extinctions. "Nonetheless, despite these loops of cause and effect between continents and economies, most environmental degradation was caused locally, impacted locally" (1999, 391). The Industrial Revolution raised the intensity of environmental damage within nations. But it was not until the middle of the last century that environmental impacts of human activity began to take on truly global dimensions. Held et. al. report that this emerged with the marriage of Western capitalism and Southern industrialization (1999, 391):

> When these forces were combined with the immense transformative power and ecological risks inherent in many modern technologies – new chemicals, industries, mass transport systems dependent on fossil fuels, nuclear technologies – environmental degradation acquired a decisively global form. No historic parallel exists for the contemporary levels of transboundary pollution, environmental commons problems and resource squeezes. Nor unsurprisingly, is there any significant historical comparator for today's environmental movements, treaties and international agencies.

Arguably, stratospheric ozone depletion and climate change are exhibits A and B in the categories of unprecedented global pollution and policy efforts to address it.

Stratospheric Ozone Depletion

The Scientific Basis. In the upper layer of the stratosphere, which stretches from 10 to 50 kilometers (6 to 30 miles) above the earth's surface, an unstable form of oxygen called ozone is perpetually destroyed and recreated in a process that scientists believe played a critical role in the evolution of advanced forms of life on Earth and continues to preserve it today (Kump, Kasting, and Crane 1999). Ozone (O_3) – comprised of a stable molecule of oxygen (O_2) bonded loosely to a third oxygen atom – shields the planet surface from three forms of ultraviolet (UV) radiation that range from relatively harmless to lethal. It absorbs UV radiation with wavelengths ranging from 200 to 400 nanometers (nm). These include UVA (320-400 nm, which causes tanning of human skin), UVB (290-320 nm, which causes sunburn and skin cancer), and UVC (200-290 nm, an extremely harmful range, absorbed almost entirely by ozone) (Kump, Kasting, and Crane 1999, 279). The basic photo-chemical process by which ozone is created and destroyed is represented in the four-step Chapman mechanism, represented in the Figure 1 below.

Figure 1. The Chapman Cycle

1. O_2 + UV photon → O + O
2. O + O_2 + M → O_3 + M
3. O_3 + photon → O_2 + O
4. O + O_3 → 2 O_2

(Kump, Kasting, and Crane 1999, 283).

Lines 1 and 2 depict the creation of ozone. In line one, two single oxygen atoms are set loose when a stable oxygen molecule is split by a UV photon in a process called photolysis. Next, in line two, a single oxygen atom attaches to an oxygen molecule with the help of another molecule – an extra oxygen or nitrogen molecule, for example – which is needed to carry off the excess energy of the collision between the O and O_2 molecules, enabling them to adhere. Lines 3 and 4 show two ways ozone can be destroyed: first by photolysis, which, again, is the UV absorption that protects the planet surface, and second by joining with a loose oxygen atom to create two stable oxygen molecules.

In addition, nitric oxide (NO), chlorine (Cl), and bromine (Br) – from both natural and man-made sources – can catalyze the destruction of stratospheric ozone. These radicals play a critical role in the formation of the ozone hole. Their role in that will be discussed after a brief explanation of their basic function. Figure 2 below shows how chlorine and nitric oxide catalyze ozone destruction.

Figure 2. The Chlorine and Nitrogen Catalytic Cycles

$$Cl + O_3 \rightarrow ClO + O_2$$
$$ClO + O \rightarrow Cl + O_2$$

$$NO + O_3 \rightarrow NO_2 + O_2$$
$$NO_2 + O \rightarrow NO + O_2$$

(Fellenberg 2000, 64; Kump, Kasting, and Crane 1999, 285)

Nitrogen makes its way to the stratosphere as nitrous oxide (NO_2), a byproduct of bacterial dentrification on land and in the ocean, which can be enhanced by fertilizers. It can be injected directly into the stratosphere as a byproduct of combustion from supersonic jet airplanes. Chlorine is introduced naturally into the stratosphere by the compounds methyl chloride (CH_3Cl), from ocean plankton, and hydrogen chloride (HCl), from volcanoes. But the greatest source of stratospheric chlorine today is from man-made chlorofluorocarbons (CFCs) – also called freons – used as coolants in refrigerators and air conditioners. Freon-11, or F-11 (CCl_3F_2) and Freon-12, F-12, (CCl_2F_2) are the most common (Kump, Kasting, and Crane 1999, 286; Fellenberg 2000, 35).

Separately, bromine is released from naturally-occurring methyl chloride (CH_3Br), which is also used as a commercial soil fumigant. Bromine also diffuses into the stratosphere in man-made chemical compounds called halons, used in fire extinguishers. The most common forms are halon 1211 (CF_2ClBr) and halon 1301 (CF_3Br) (Kump, Kasting, and Crane 1999, 288). The nitrogen, chlorine and bromine ozone-destroying cycles are regulated by reactions that also remove them from the stratosphere. For example, NO_2 reacts with a hydroxyl radical (HO) to form nitric acid (HNO_3) which drifts downward and is rained out of the atmosphere. Chlorine can react with methane (CH_4) to create HCl, which also drifts downward and washes out Bromine is rained out as hydrogen bromide (HBr) (Kump, Kasting, and Crane 1999).

The potential danger posed to stratospheric ozone by man-made compounds was reported first in 1974 in two key scientific studies. Mario Molina and Sherwood Rowland at the University of California, Irvine, hypothesized that CFCs rose into the stratosphere and released large quantities of chlorine when broken down by solar radiation (Molina and Rowland 1974). Also that year Stolarski and Cicerone of University of Michigan described in a paper how chlorine from rocket exhausts could catalyze the destruction of stratospheric ozone in the stratosphere over decades (Cicerone, Stolarski, and Walters 1974). The discovery of the ozone hole was first reported in 1985. That year scientist Joseph Farman and colleagues from the British Antarctic Survey published a study of measurements taken since 1957 of ozone above their Halley Bay station in Antarctica (Farman, Gardiner, and Shanklin 1985) that showed that starting in 1976 the stratospheric ozone layer had begun thinning and fraying each October and then healed (Kump, Kasting, and Crane 1999). Studies show that by 1985 the "ozone hole" had grown bigger than the United States. And it was getting worse. Average stratospheric ozone concentrations, measured in Dobson units (DU) – equivalent to a 0.0001-cm-thick layer of pure ozone at the surface – dropped by about half between 1957 and 1991 from the neighborhood of 325 DU to around 150 DU (Kump, Kasting, and Crane 1999). The 1985 study came as shock to the scientific community and world leaders already considering a plan to cut back on CFC use. Wrote Benedick, the United States' chief negotiator in the Montreal Protocol process:

> This unexpected revelation was quickly confirmed by Japanese and U.S. scientists rechecking their own data sets. Interestingly, it was discovered that U.S. measuring satellites had not previously signaled the critical trend because their computer had been programmed automatically to reject ozone losses of this magnitude as anomalies far beyond the error range of existing predictive models (Benedick 1998, 19).

Figuring out how the ozone hole formed was a daunting task because scientists needed to take into account a huge number of dynamic variables including temperature and weather patterns, solar forcing, budgets of myriad chemical compounds present in the atmosphere and the innumerable ways they could interact in the sky. The ozone hole appears in the polar spring, in September, when the sun begins to shine on Antarctica, and lasts through October. Scientists had established that CFCs have a long atmospheric lifetime (60 years for F-11 and 130 for F-12) and were able to measure their atmospheric concentrations using electron capture detectors coupled with gas chromatographs (Kump, Kasting, and Crane 1999). Many suspected that chlorine from CFCs broken down by solar radiation, were to blame for the hole. But other theories persisted – credible and otherwise – attributing the ozone hole to weather patterns, volcanic activity, sunspots and even "snowballs from space" (Siegel 1987; Benedick 1998). Intensive, internationally-funded research provided more breakthroughs. Writes Kump and colleagues (Kump, Kasting, and Crane 1999, 9):

> The definitive evidence was provided in 1987 when a NASA research plane flew directly into the hole. One of the plane's instruments measured chlorine monoxide, ClO, which was thought to be a main culprit in ozone destruction; another instrument measured ozone. Outside the hole, ozone concentrations were at their normal stratospheric level and ClO concentrations were very low. Inside the hole, ozone values were more than a factor of two lower, and ClO values were about 15 times higher, than the respective values outside the hole.

Subsequent research established that a seasonal circumpolar vortex – essentially giant whirlpool of wind that isolates much of the air above Antarctica – and previously unknown polar stratospheric clouds, conspire to respectively trap the chlorine compounds and serve as a platform for chemical reactions that unleash ozone-eating reactive chlorine when the sun's energy hits the continent in the spring. These polar stratospheric clouds enable heterogeneous reactions (those that occur on solid surfaces, as opposed to gas-phase reactions) that break chlorine down from more stable to more reactive forms. Kump and colleagues cite the following cloud-surface reaction, represented in Figure 3, as important:

Figure 3. Polar stratospheric cloud surface reaction

1. $ClONO_2 + HCl \rightarrow Cl_2 + HNO_3$
2. Cl_2 + photon $\rightarrow Cl + Cl$

(Kump, Kasting, and Crane 1999, 289)

In line 1, chlorine nitrate, which is not reactive with ozone in the atmosphere, is converted on the cloud surface to a chlorine molecule and nitric acid. Chlorine nitrate is the product of a reaction between nitrous oxide (NO_2) and chlorine monoxide (ClO) that under normal conditions in the stratosphere keeps chlorine concentrations in check. The chlorine molecule created on the cloud (line 1) sits high in the Antarctic darkness until the sun hits it, shown in line 2, and it splits it into two reactive ozone-destroying atoms. When the polar vortex breaks down at the end of October, new nitrogen and ozone flow back in and the hole is repaired.

Finally, to the further alarm of scientists and policymakers, satellite measurements revealed decreases in midlatitude stratospheric ozone of about 4 percent per decade between 1979 and 1991. This was determined after ruling out sources of natural variability, including sunspot activity and volcanic eruptions, which can influence ozone production (Kump, Kasting, and Crane 1999).

Ozone Policy Evolution. Painstakingly, scientists discerned the physical and chemical mechanisms that formed the hole in the Antarctic summer, confirmed the responsibility of man-made compounds for the problem, and charted the drop in stratospheric ozone at mid-latitudes. In both the ozone and climate cases, international scientific, environmental and government organizations, as well as individual national governments, each played roles in the process of drawing attention to the problems and drumming up political support to confront them on a global scale. The policy debate over stratospheric ozone began in earnest in 1974, the year of alarming findings published in the Molina and Cicerone papers. The international chemical industry wasted no time and "quickly mobilized their own research and public relations efforts to cast doubt on the theory" that CFCs could harm the ozone layer (Benedick 1998, 12). Breitmeier (1997, 101), summarizes the U.S. role in the ensuing two years:

> The United States very early politicized ozone depletion internationally. By 1975 it had already experienced a lively domestic CFC debate, and a consumer boycott had led to a temporary decrease in sales of CFC products. A 1976 NAS (National Academy of Sciences) report supported the CFC hypothesis and in 1977 the Environmental Protection Agency announced a ban on "nonessential uses" of CFCs in spray cans.

In 1977, the U.S. and United Nations Environmental Program (UNEP) convened an international science meeting in Washington on ozone depletion that produced the World Action Plan on the Ozone layer, essentially an agenda for further research. The UNEP quickly established a Coordinating Committee on the Ozone Layer, which issued annual scientific reports, laying crucial groundwork for future policymaking based on the latest available science. In 1981, the UNEP created a body called the Ad-Hoc Working Group of Legal and Technical Experts to negotiate a framework convention on research monitoring and data exchange which became the 1985 Vienna Convention on the Protection of the Ozone Layer (Luterbacher and Sprinz 2001) –

the framework agreement for what would soon produce a binding protocol for reducing CFC emissions. The convention, which was signed by 20 countries and the European Community, called on member nations take "appropriate measures … to protect human health and the environment against adverse effects resulting or likely to result from human activities which modify or are likely to modify the ozone layer" (UNEP 1985, Article 2, Section 1) but did not define them (Benedick 1998). Nonetheless, writes Benedick (1998, 45), "The Vienna Convention was itself a considerable accomplishment. It represented the first effort of the international community formally to deal with an environmental danger before it erupted."

In the two-year run-up to the Montreal Protocol, the U.S. and UNEP pushed the case for strong international controls on CFCs, sponsoring large scientific expeditions to study the Antarctic ozone hole and organizing educational workshops (Breitmeier 1997). U.S. negotiators, who had unsuccessfully pressed for cuts in CFC emissions, rejected a European Community counterproposal for a production cap as insufficient (Breitmeier 1997). The U.S. teamed up with an existing coalition of nations called the Toronto Group – including Canada, Norway, Sweden and Switzerland – which sought global CFC cuts and a ban on its use in nonessential spray cans (Wettestad 2002). On the other side, resisting control efforts, were European nations including the United Kingdom, France, Italy and Spain – all large produces of CFCs. This led to bitter disputes with other EC members as they tried to stake out a unified negotiating position (Benedick 1998). But the U.S. and UNEP kept up an intense lobbying effort, coordinating the work of diplomats, scientists and environmental organizations. A key development clearing the way for cuts in CFCs came with the collapse of the CFC industry's "transatlantic united front" when a collation of 500 U.S. CFC producing and using companies, the Alliance for Responsible CFC Policy, "unexpectedly issued a policy statement supporting international regulation of CFCs" (Benedick 1998, 32). In October, 1986, DuPont announced its support for global control measures, in a move "hailed by Natural Resources Defense Council, as 'the biggest breakthrough' since the U.S. ban on use of the chemicals as aerosol propellants in 1978" (Darst

1986). Breitmeier writes that after DuPont's statement "it became clear to other multinational companies that the global CFC market would change and that the ability to produce substitutes was necessary to maintain market shares" (1997). Wettestad notes that as alternative gases had been identified for CFCs, the development of substitutes "was largely a question of the right market incentives" (Wettestad 2002, 156). As the year wound down, both houses of Congress endorsed a call for tough international controls and bills were introduced for further unilateral domestic CFC restrictions barring a global solution (Benedick 1998). Moreover, public concern grew in wake of a November EPA report warning the ozone hole could lead to 40 million cases of skin cancer in the United States – 800,000 of them fatal – over the next 88 years (Mansnerus and Roberts 1986).

After difficult negotiations, and an eleventh hour attempt by officials in the Reagan administration to weaken the U.S. negotiation stance, the Montreal Protocol was signed by 24 nations and the Commission of European Communities (Benedick 1998). The protocol called for a freeze in CFC production at 1986 levels by 1989, a 20 percent cut in production by 1993 and a 50 percent reduction by 1998. In addition, it called for a freeze on halon production by 1992 (UNEP 1987). The combination of the convention and the protocol has created a politically-flexible organizational structure that enabled the agreement to evolve with the scientific findings about the atmosphere. It looks like this: The Conference of the Parties (COP) of the Vienna Convention meets every three years with Ozone Research Managers, a group of scientific experts that review the latest available science and monitoring data and produce reports to the COP. Before 1993, these groups met every two years. The Montreal Protocol established three expert panels to meet a year before each scientific report is given. These include a Scientific Assessment Panel, a Technology and Economics Assessment Panel and an Environmental Effects Panel. Parties to the Montreal Protocol meet once a year at a Meeting of the Parties (MOP). The secretarial functions are handled by the Ozone Secretariat based at UNEP headquarters in Nairobi, Kenya. A Multilateral Fund, created in 1990 to support CFC phaseouts in developing nations, is based in Montreal (Wettestad 2002).

Proof for the protocol's structural effectiveness and flexibility can be found in its evolution (Reisinger 2002; Benedick 1998). Under the continued stewardship of motivated political and scientific leaders, the protocol has enabled its members to respond to increasingly dire scientific findings on the ozone hole with more comprehensive cuts on CFCs, new restrictions on other chemicals, the inclusion of targets for developing nations, the establishment of the Multilateral Fund, and the steadily growing number of nations ratifying the protocol and its amendments. The protocol's first major adjustment began quickly after its adoption with the 1988 report of the Ozone Trends Panel which established "beyond a reasonable doubt" the role of CFCs and halons in creating the ozone hole and showed that from 1969 to 1986 ozone had dropped (1.7 to 3 percent) over heavily populated areas in higher northern latitudes (Benedick 1998, 110). The report prompted calls for further cuts, spurred DuPont to speed work on substitutes and announce a phaseout CFCs (Goeller 1988), and led to a call by the EPA for "complete global elimination of both CFCs and halons, plus a freeze in use of methyl chloroform, a popular industrial solvent not previously recognized as a major source of stratospheric chlorine" (Benedick 1998, 111). The findings created momentum for the 1990 London amendments, which called for a total ban on CFCs, halons and carbon tetrachloride by 2000 and methyl chloroform by 2005. It also set up an Interim Multilateral Fund to help developing nations cope with the regulations (Benedick 2001). Two major revisions followed in Copenhagen in 1992 and in Vienna in 1995, each prompted by research showing worsening conditions in the stratosphere. The Copenhagen amendments made the Multilateral Fund permanent and moved up phaseout of halons to 1994 and CFCs, carbon tetrachloride and methyl chloroform to 1996. The Vienna amendments set delayed reduction schedules for developing nations and introduced a 2010 phaseout for the soil-sterilizing pesticide methyl bromide.

As of this writing, more than 188 nations have signed the Montreal Protocol. Most recently, debate among the parties has focused on methyl bromide, with strong resistance from the U.S. government and agribusiness to the 50 percent phaseout by 2005 prescribed by the Vienna amendments. In February, 2003, the Bush administration requested exemptions for 54 companies and trade groups to use methyl bromide (Marquis 2003). In Congress, representatives from California and Southern farm states introduced a bill that would authorize the EPA to grant methyl bromide exemptions to industry even if the parties to the Montreal treaty rejected them (Revkin 2003). After an initial rejection by European Union and developing nation negotiators, the U.S. won exemptions to the 50 percent cut at the 2004 MOP in Prague (Barbassa 2004).

Table 1. Stratospheric Ozone Case Event Timeline

Year	Stratospheric Ozone Event
1974	Two key scientific studies report danger posed to stratospheric ozone by man-made compounds (Cicerone, Stolarski, and Walters 1974; Molina and Rowland 1974).
1977	Stratospheric ozone amendment to the U.S. Clean Air Act passed in response to public concern about ozone layer, enabling the Environmental Protection Agency to regulate substances that could harm the ozone layer. Separately, the United States hosts first intergovernmental meeting to address global regulation of CFCs (Benedick 1998).
1978	EPA, under Toxic Substances Control Act, "prohibits use of aerosol propellants in nonessential applications" (Benedick 1998, 24).
1982	United Nations Environmental Program organizes scientific and legal experts to prepare a global framework to protect the ozone layer.
1985	British scientists report discovery of seasonal "ozone hole" over Antarctica (Farman, Gardiner, and Shanklin 1985). Also, the Vienna Convention for the Protection of the Ozone Layer is adopted by 20 nations and the European Community Commission.

Year	Stratospheric Ozone Event Table 1 Cont.
1986	Environmental Protection Agency warns that ozone depletion could lead to 40 million cases of skin cancer in U.S. over the next 88 years, 800,000 of them fatal (Mansnerus and Roberts 1986). Alliance for Responsible CFC Policy issues a policy statement supporting international regulation of CFCs (Benedick 1998).
1987	The Montreal Protocol on Substances that Deplete the Ozone Layer is adopted. It calls for a 50 percent reduction by 1998 in CFC production and freeze on halon production by 1992.
1988	Ozone Trends Panel report proves CFCs and halons "implicated beyond a reasonable doubt" in ozone hole and shows depleted ozone (1.7 to 3 percent) over heavily populated areas higher latitudes (Benedick 1998, 110). The U.S. ratifies the Montreal Protocol, which enters into force, January 1, 1989.
1990	London Amendment to the Montreal Protocol is negotiated at the second meeting of the parties to the Montreal Protocol. It calls for a total ban on CFCs, halons and carbon tetrachloride by 2000 and methyl chloroform by 2005. It also set up an Interim Multilateral Fund to help developing nations cope with the regulations (Benedick 2001).
1991	British Stratospheric Ozone Review Group reports mid-latitude stratospheric ozone loss at 8 percent per decade. NASA says ozone over U.S. has dropped 4 to 5 percent since 1978 (Scientists Say Ozone Layer Significantly Depleted 1991)
1992	Copenhagen Amendment tightens the Montreal Protocol further, moving up phaseout of halons to 1994 and CFCs, carbon tetrachloride and methyl chloroform to 1996.
1994	Halons phased out by developed countries (Benedick 2001).
1995	The Nobel Prize in chemistry is awarded to Americans Mario Molina and Sherwood and Dutch citizen Paul Crutzen, for their pioneering research on stratospheric ozone (Allen, 1995). Separately, the Vienna Amendments set delayed reduction schedules for developing nations and introduce a 2010 phaseout of methyl bromide.
1998	London-based environmental group, Environmental Investigation Agency, reports that a sophisticated, illegal trade in ozone-depleting chemicals is flourishing between developed and developing nations. Report is released before the 10th Meeting of the Parties in Cairo in November 1998 (Bryant 1998).
2004	At Prague conference, a dozen nations, including the U.S, "won continued exemptions for use of methyl bromide, an ozone-depleting agricultural pesticide that was to have been phased out this year" (Hanley 2004).

Year	Stratospheric Ozone Event
2005	A UNEP report of the Ozone Research Managers cites studies that show stratospheric ozone levels improving and models predicting "recovery to 1980 levels" over Antarctica by about 2065, over the Arctic by about 2040 and in extra-polar latitudes by 2050 (UNEP 2005, 3)

Global Climate Change

Scientific Basis. As complicated as the science behind stratospheric ozone destruction is, the problem of global warming, or climate change is arguably even more involved. As with ozone destruction, there are many feedbacks and interactions, and scientists have struggled to accurately discern the human fingerprint on climate. Climate change, often called global warming, commonly refers to the excessive warming of the planet caused when greenhouse gases released from fossil fuel burning trap the sun's heat energy. This process is a form of solar forcing considered above and beyond the natural levels of greenhouse warming that have sustained life on the planet as we know it. Before delving into the evidence for human-caused climate change, it is useful to review some basics about the planet's climate system and the methods by which researchers determine how atmospheric composition and climate have changed over geologic time scales.

To understand atmospheric phenomena it is best to think of the Earth as a system including the atmosphere, the hydrosphere (oceans, rivers and lakes and ice), its biota (life forms), and the solid Earth (comprising the planet's core, mantle and crust). Studies of one or more of these elements figure strongly in scientific reports on climate change and, by extension in news coverage of those reports and the larger climate policy debate. Thus, it is worth a brief review of their respective roles in the climate puzzle.

The Earth's atmosphere can be described as "the thin envelope of gases that surrounds Earth" (Kump, Kasting, and Crane 1999). Its thickness relative to the planet is often compared to the skin of an apple. Without the atmosphere – which is comprised mostly of nitrogen oxygen, argon, water vapor and carbon dioxide – life would not exist as it does today. Water and CO_2 are greenhouse gases in our atmosphere along with methane, nitrous oxide, ozone, CFCs and many other gases. These gases absorb outgoing infra-red radiation from the earth and reradiate it back to the surface, raising the planet's surface temperature 33°C higher than what it would without an atmosphere (Kump, Kasting, and Crane 1999, 46). Life on land and in the oceans relies on the temperature and the balance of gases and water in the atmosphere for survival. As discussed earlier, the atmosphere also includes ozone, which is a pollutant at ground level and an essential blocker of harmful ultra-violet radiation in the stratosphere.

Like the atmosphere, the oceans – a critical part of the hydrosphere – circulate around the planet, ultimately driven by energy from the sun. Ocean circulation contributes to the distribution of energy and nutrients around the world (Kump, Kasting, and Crane 1999, 5). Ice cover also helps drive atmospheric and ocean circulation – especially the oceanic thermohaline circulation (Kump, Kasting, and Crane 1999, 250). The hydrosphere supports aquatic life including microorganisms that affect the global carbon cycle. Lakes, rivers and streams on land provide water essential for the survival of many organisms, which in turn affect the water resources. Humans, for example, are reducing fresh water on land through many activities including irrigation, deforestation and wetland destruction (Sahagian 2000, 39).

Briefly, biota are plants, animals and microorganisms on land and in the water that influence nutrient flows through aerobic and anaerobic respiration and photosynthesis. Biota affect their surroundings both chemically and physically. Some scientists hypothesize that biota collectively regulate the Earth system for their survival. Humans are altering the global system through pollution on land, in the oceans and the atmosphere. Rivers like the Indus have been overused and no longer reach the ocean (Turekian, 179). Finally, many Earth system studies concern themselves with the planet's rocky 70-kilometer thick crust, which sits above an inner core, outer core and mantle. Weathering of rocks affects the chemistry of the hydrosphere and atmosphere, ocean vents affect ocean chemistry and temperature and volcanic eruptions impact atmospheric composition and solar reflectancy (Kump, Kasting, and Crane 1999).

The Earth's climate and weather is ultimately driven by solar forcing which varies over the Earth's surface on different time scales with the planet's rotation, eccentricity, tilt and precession. The sun's energy is distributed around the globe through a dynamic processes including the temperature- and density-driven ocean Thermohaline circulation system, atmospheric winds influenced by the coriolis effect (such as trades and westerlies) and coupled ocean-atmosphere phenomena (such as the Asian monsoon and the El Nino/La Nina cycle). Without human intervention, the planet has experienced ice ages brought on by eccentricity changes on 100,000 year time scales; obliquity changes on 41,000-year time scales; and precesses with periodocities of 19,000 and 23,000 years (Kump, Kasting, and Crane 1999). In addition, researchers have theorized that natural variations in solar intensity have led to temperature variations on the scale of a thousand years including hotter weather during the Medieval Maximum and colder weather during the Little Ice Age (Eddy 1994). In addition, sulfate aerosols from volcanic emissions can cool the Earth's surface by reflecting incoming sunlight (Kump, Kasting, and Crane 1999). Big objects from space, such as the meteorite blamed for killing off the dinosaurs, can also reap havoc with the Earth's climate. How do scientists know this? An explanation here of some of the research methods is in order.

Climate researchers are able to infer conditions on Earth many years ago with the help of data from ice cores and lake and ocean sediments that serve as proxy measurements for a variety of conditions including temperature, precipitation, windiness, plant growth, glacial extent and the composition of atmospheric gas. Among the most important types of data used are isotopes, gases trapped in ice, deposits of sea salt and terrestrial dust, and pollen grains. Oxygen isotopes, found in the shells of tiny marine organisms, are indicators of ocean temperature and can help reveal past ice ages. The colder the water is, the more likely oxygen's heavy isotope ^{18}O is to be incorporated into the $CaCO_3$ in the shells of these organisms (Kump, Kasting, and Crane 1999). In addition, during times of glaciation, the concentration of ^{18}O in the ocean increases because this heavier isotope evaporates less readily. It rains out sooner than lighter ^{16}O on the journey toward the poles to become part of the glacial ice sheet. For these two reasons $CaCO_3$ precipitated in oceans during glacial times is richer in ^{18}O (Kump, Kasting, and Crane 1999).

Composition of gas in air bubbles in ice can give researchers a picture of the greenhouse capacity of the atmosphere at the time the air bubble was trapped. Low CO_2 levels in the atmosphere correlate with the glacial periods (Broecker 1987). Concentrations of dust in the ice also betray colder, windier climates. A combination of low CO_2 and high dust levels provide evidence that the Earth was in a glacial time period. Separately, studies of pollen found on land allow researchers, who know the climate suitable for the plants it would produce, to infer weather conditions at the time of that pollens production (Broecker 1987). These and other methods open a window on the past for climatologists. There is often much debate over the interpretation of these fossil records and frequent calls in the scientific literature for more data.

While there is a well documented history of natural climate change that would by itself pose a threat to humanity, scientists worry that human interference with the climate system poses a more immediate threat that might not otherwise have existed. This concern began with a paper published in 1957 by Revelle and Seuss that claimed greenhouse gases released from fossil fuel burning were not being absorbed naturally by the ocean (Vig and Axelrod 1999). Instead, they warned, "Human beings are now carrying out a large-scale geophysical experiment of a kind that could not have happened in the past nor be reproduced in the future" (Revelle and Seuss 1957, Cited in Molitor 218). Two years earlier, a geochemist at the Scripps Institute of Oceanography, Charles Keeling, had constructed an instrument to monitor concentrations of CO_2 in the atmosphere. Evidence for the buildup of greenhouse gases foreseen by Revelle and Seuss has since unfolded in two classic climate records: the "Keeling curve" record of direct measurement of atmospheric carbon dioxide concentrations atop Mauna Loa in Hawaii, and a 240,000-year record of carbon dioxide, methane and temperature measurements from the Vostok ice core in Antarctica. The records reveal that the atmospheric concentration of carbon dioxide has jumped nearly 30 percent during the past two centuries, reaching levels not seen in the fossil record for hundreds of millennia (Kump, Kasting, and Crane 1999). The ice core records show temperatures increasing almost in lockstep with carbon dioxide, which raised a disconcerting question about where global temperatures are heading in response to unprecedented burning of fossil fuels

The IPCC – the body of experts formed in 1988 by the United Nations and the World Meteorological Organization to study the science of climate change – reports most recently that the atmospheric concentrations of three important greenhouse gases – carbon dioxide, methane and nitrous oxide – have risen 31%, 150% and 16% respectively since 1750. Over that time, carbon dioxide concentrations have risen by 80 parts per million (ppm) from 280 ppm to 360 ppm (IPCC 2001). According to ice core data, rapid rises in CO_2 concentrations have occurred naturally in the past (Kump, Kasting, and Crane 1999). But the present level has not been exceeded during the past 420,000 years and likely not during the past 20 million years (IPCC Group I 2001 p. 7). Finally, a study of the observed decrease in atmospheric oxygen reveals that "the observed increase in CO_2 is predominantly due to the oxidation of organic carbon by fossil fuel combustion and deforestation." (IPCC Group I 2001, 39) The IPCC's latest scientific assessment sums up the findings in the following critical statement (IPCC Group I 2001):

> "There is newer and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities ... In light of new evidence and taking into account the remaining uncertainties, most of the observed warming has contributed significantly to observed sea level rise through thermal expansion and widespread loss of land ice."

As with stratospheric ozone research, climate researchers attempt not only to make sense of what data tell them about the past and present but also use it to predict the future, often under different emissions and development scenarios. Computer models called General Circulation Models (GCMs) are used for this purpose. They include data for upwards of 50,000 points of longitude and latitude and many layers of the atmosphere on a virtual globe. Write Kump and colleagues (1999, 265), "At each of these points the model must keep track of a number of different variables, including temperature, pressure, humidity and horizontal wind speed. A GCM also needs to account for the absorption and reflection of solar radiation by gases and by clouds and for the transfer of heat and water vapor between the atmosphere and the surface."

Importantly, climate models have demonstrated that when natural variation is factored in, observed temperature changes are consistent with the increase in atmospheric greenhouse gases. Over the 20th century, global temperatures have risen .6 °C $\pm$ .2 (1.08 °F $\pm$ .36) (IPCC Group I 2001 p. 13). Further, the IPCC projects in its 2001 report that by 2100 global mean temperatures could rise from 1.4°C and 5.8°C (2.52 °F and 10.4 °F) between 1990 to 2100 (IPCC Group I 2001, 13). Sea level could rise between .09 and .88 meters (3.5 inches and 2.9 feet) (IPCC Group I 2001, 16). The wide range of these predictions underscores the uncertainty of predicting climate change. Nonetheless, studies have made the following observations, deemed "likely" or "very likely" to be symptoms of global warming that will become more pronounced in the future:

1. Higher maximum temps and more hot days over nearly all land areas
2. Higher minimum temperatures, fewer cold days over nearly all land areas
3. Increase of heat index over land areas
4. More intense precipitation events
5. Shrinking glaciers
6. Thawing permafrost

7. Later freezing and earlier breakup of ice on rivers and lakes
8. Lengthening of mid and high latitude growing seasons
9. Poleward and altitudinal shifts of plant and animal ranges
10. Declines of some plant and animal populations
11. Earlier flowering of trees

(IPCC Group I 2001 pp. 15, 576; IPCC Group II 2001, 3)

As of this writing, the debate among scientists and policymakers has moved significantly from whether humans are causing climate change to how to best humans can change their behavior to address the problem and how bad the problem is likely to be. A January, 2006, Washington Post article puts the debate in sharper terms: "Now that most scientists agree that human activity is causing the earth to warm, the central debate has shifted to whether climate change is progressing so rapidly that, within decades, humans may be helpless to slow or reverse the trend" (Eilperin 2006). One of the more disturbing prospects, which has gained attention in scientific and political circles, is the potential for a shutdown of the global ocean circulation system – the thermohaline conveyor belt – which could lead to an abrupt climate changes on the order of decades instead of millennia. While greatly exaggerated by a Hollywood climate disaster movie (Revkin 2004), the research into the phenomenon is quite serious. Dr. Wallace Broecker, a professor of geochemistry at Columbia University and pioneer in paleoclimatology, has been warning for more than 15 years about the possibility of abrupt climate change as a result of shutting down thermohaline circulation. Recent studies give reason for concern, finding 1) the flow of water from the Nordic seas into the North Atlantic has slowed by at least 20 percent over the past 50 years and 2) the water is also getting warmer and less saline – both consistent with greenhouse gas warming and a weakened thermohaline circulation (Hansen 2001). Broecker has pointed to evidence in the geological record:

"Geologic studies suggest the Earth's climate system resists change until pushed beyond some threshold; then it leaps into a new mode of operation ... The implication of this finding for future climates in clear: The effects of the greenhouse gas buildup may come in sudden jumps, rather than gradually." (Broecker 1987 p. 75)

Broecker reports in several papers that thermohaline circulation has shut down and started back up again many times in the past – without human greenhouse gas forcing – causing rapid cooling and warming across the globe. Oxygen isotope and pollen records reveal a cooling period that gripped the Earth 11,000 years ago called the Younger Dryas. Writes Broecker, "Suddenly in as little as 100 years, Northern Europe and northeastern North America reverted to glacial conditions ... About 1,000 years later, this cold spell ended abruptly – in as little as 20 years." (Broecker and Denton 1990 p. 55) Broecker cites as evidence measurements of cadmium ion, a surrogate for the temperature revealing measure of calcium in the calcium carbonate of foraminifera. Simultaneously, pollen records show that at the onset of the Younger Dryas forests in Scandinavia and on the British Isles were replaced by Arctic grasses and shrubs (Broecker and Denton 1990) A report by the National Research Council released late 2001 sounded the same alarm, warning that human alterations of the climate system might expose the planet to "large, abrupt and unwelcome" climactic events. Commenting on the report for the *Boston Globe*, Dr. Cameron Wake of the University of New Hampshire painted a picture of the kind of world abrupt climate change could bring us: "Every day could have been a lot like the top of Mt. Washington on the coldest, windiest day of the year" (Thomson 2001).

<u>Policy Evolution</u>. Many scholars agree that the stratospheric ozone policy regime provided an example for how to approach the climate change problem (Breitmeier 1997; Benedick 1998; Molitor 1999; Layzer 2002). It makes sense also that many of the same

individuals and organizations – including the WMO and UNEP – helped coordinate global research programs and shepherd negotiations for both issues. But the United States has played an inconsistent role in the climate change policy process. As with ozone, the U.S. government supported much of the scientific research that established climate change as a serious problem, prompting calls from many nations for a global solution. But, with a few exceptions, the U.S. has acted to oppose mandatory global curbs on greenhouse emissions and has shunned the leadership role it played at the outset of the ozone policy regime (Sprinz and Weiss 2001; Paarlberg 1999; Breitmeier 1997; Layzer 2002). Writes Breitmeier, (1997, 102) unlike the ozone case, "the United States was quite reluctant to agree that climate change should be considered an important issue on the global environmental agenda. In this case, a coalition of European countries, the Alliance of Small Islands States, and some developing countries politicized the issue despite strong resistance from the United States."

The most often cited reasons for U.S. reluctance are domestic concerns about the economic bottom line and the political consequences of taxing fuel. Put simply by Sprinz (2001, 78), "... U.S. policy is conditioned by the perception that economic costs are exorbitant" – too great, that is, to generate and sustain political will in the United States to back mandatory greenhouse gas cuts in the Kyoto Protocol. Perhaps at no time was it more clear than just months before the protocol's adoption in 1997, when the U.S. Senate voted 95-0 on a resolution declaring that the it would not ratify any treaty that harms U.S. economy or does not entail meaningful participation by major developing countries (Sprinz 2001; Molitor 1999). This dealt a fatal blow to efforts by the Clinton administration to commit the United States to cuts. In an analysis of the intersection of U.S. domestic policy and climate change Sprinz (2001, 79) concludes that the United States has been "undoubtedly a strong dragger" on climate negotiations. In a similar case-study analysis, Layzer (Layzer 2002, 231) concludes:

> Domestic opposition has hampered efforts to build the support that American leaders need to pursue climate change policies. Opposing greenhouse gas reductions is a potent coalition of fossil fuel and fuel-dependent industries that have both deep pockets and strong, longstanding ties to elected officials. This coalition has lobbied intensely to ensure that members of Congress are aware of their position. They have also undertaken a costly public relations battle in which they wield a potent threat: economic collapse.

This political context, which this study explores in greater detail ahead, colors U.S. involvement throughout the history of the climate change policy regime, starting with Revelle and Seuss's 1957 conception of greenhouse gas emissions as "large-scale geophysical experiment" (Revelle and Seuss 1957, Cited in Molitor 218).

Their work prompted further research, including studies by the National Academy of Sciences in the United States and the WMO, which created an Ad-Hoc Panel of Experts on Climate Change and in 1979 held the first World Climate Conference in Geneva. That conference concluded with a cautious statement that it "appears plausible" that carbon dioxide emissions "could contribute to a gradual warming of the lower atmosphere" (Layzer 2002, 212). Scientific and political concern grew in the 1980s. In 1983, two extensive reports on climate change, one from the EPA entitled "Can We Delay a Greenhouse Warming?" and another from the National Academy of Sciences attracted a surge of news media attention in the United States. A United Press International reporter described EPA's report as "the government's first warning of dire consequences from a global temperature rise caused by the burning of fossil fuels an increase in carbon dioxide levels" (Sangeorge 1983). The report predicted hotter days by the turn of the millennium, rising sea levels that could flood coastal cities, and warned of " 'catastrophic consequences' unless the world begins planning for the shifts 'with a sense of urgency' (Leary 1983). The 500-page NSA report warned of similar problems but struck a less pessimistic tone, counseling " 'caution, not panic' and extensive studies on how to deal with them" (Leary 1983).

The 1985 Villach conference hosted by the WMO and UNEP that concluded with recommendations that states begin considering a climate convention (Bodansky 2001). Much happened in 1988 to bridge the gap between science and policy action in the climate case. Against a backdrop of public concern about a record North American drought, NASA scientists James Hansen testified to Congress that the science of climate change was sufficient to warrant policy action and noted that the "greenhouse effect" would make such droughts more likely in the future (Layzer 2002; Searles 1988). Also that summer the Canadian government hosted an important international conference attended by scientists, politicians and environmentalists who adopted a startling statement echoing Revelle and Seuss's words: "Humanity is conducting an unintended, uncontrolled globally pervasive experiment whose ultimate consequence could be second only to global nuclear war" (World Meteorological Organization 1988, cited in Molitor 221). The conference called for a global 20% cut in CO_2 emissions by 2005; UN General Assembly calls climate change "common concern of man" (Bodansky 2001, 25). Finally that year, in a move recognized by scholars as central to spurring policy action, the UNEP and WMO formed the IPCC: "The creation of the IPPC, a panel of climate experts entrusted with the task of assessing and summarizing the state of scientific knowledge on climate change, represented an attempt to centralize and formalize the interaction between science and politics, and to put governments in charge" (Raustiala 2001, 112). The IPCC is comprised of three groups, each charged with assessing and reporting on a separate dimension of the climate change issue: Group I reports on latest science and level of consensus among researchers; Group II examines the environmental and socioeconomic impacts of climate change; and Group III explores strategies to mitigate and adapt to climate change. Since its inception, the IPCC has released three sets of assessment reports in service of the UN-led climate policy regime, the most recent in 2001. A fourth report is underway.

In 1990, the IPPC's First Assessment report confirmed that human activity was raising greenhouse gas concentrations and that global mean surface temperatures had risen by 0.3 to 0.6

degrees over the past century, both consistent with climate models, but also within the range of natural variability. Delegates to the Second World Climate Conference in Geneva were unable to reach consensus on either the human role in changing climate or targets to cut emissions (Molitor 1999). Nonetheless, the United Nations that year created the Intergovernmental Negotiating Committee (INC), charged with managing negotiations for a climate change convention.

Fifteen months of negotiations led to the creation of the United Nations Framework Convention on Climate Change (UNFCC), which called for "Stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (United Nations 1992, Article 2). It was signed by154 governments, including the United States, at UN Conference on Environment and Development in Rio de Janeiro in 1992.

It is worth noting here that both the climate change and stratospheric ozone regimes apply the *precautionary principle* (Benedick 1998; Layzer 2002; Reisinger 2002) embodied in Rio Declaration which reads in part, "Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation" (United Nations 1992). While the United States embraced this philosophy in the ozone regime, the administration of George H.W. Bush reluctantly signed onto the UNFCC and "with the understanding that it intended to encourage, but not mandate, emissions reductions" (Layzer 2002, 218). That was indeed the case. Recognizing that developed nations were responsible for the vast majority of greenhouse emissions, the Convention requested that a list of 38 industrial countries, including some members of the former Soviet Bloc, return their emissions to 1990 levels. But the task, which carried no deadlines was voluntary (Molitor 1999; United Nations 1992). These 38 nations are listed an Annex I of the Convention and are so-called "Annex I" countries. To add to the confusion, they are listed in "Annex B" of the Kyoto Protocol and sometimes go by that name, too. In the years following the convention, the science and scope of the climate change problem grew more certain and it became clear that a majority of

Annex I nations, including the United States, were not progressing toward their voluntary emission reduction goals. President Clinton, who had chided Bush in the 1992 presidential campaign for failing to back tougher greenhouse gas limits sought by the Europeans, announced his support for the UNFCC reductions but failed himself in 1993 to win support in Congress for an energy tax – the so-called BTU (British Thermal Unit) tax –intended to help meet its goals. Instead, the White House presented a Climate Change Action Plan based on voluntary measures (Molitor 1999; Layzer 2002). In 1995, at the first Conference of the Parties (COP) of the UNFCC, convention parties adopted the Berlin Mandate to negotiate binding emissions reductions. The following year, the IPCC issued its Second Assessment Report which concluded "the balance of evidence suggests a discernable human influence on global climate" (IPCC cited in Raustiala 2001) and at the second COP in Geneva, U.S. negotiators announced their support for binding emissions (Cushman 1997).

The stage was then set for an enormous and costly fight in the United States between scientists and environmentalists on the one hand, and industry on the other, over whether and to what extent the country would commit to an international policy regime to cut greenhouse gases. Writes Layzer (Layzer 2002), "Both sides launched all-out public relations campaigns, recognizing that whoever succeeded in defining the problem was likely to dictate the solution." Groups such as the Environmental Defense Fund and Natural Resources Defense Council called for the U.S. to lead the climate change effort and amplified concerns of prominent American scientists, including James Hansen and many members of the National Academy of Sciences. The coal, oil and automobile industries fought back through the Global Climate Coalition which worked steadily before and after Kyoto to influence public opinion against U.S. participation (Paarlberg 1999; Layzer 2002). As noted earlier, in addition to the mantra that greenhouse gas cuts would hurt the nation's economy, the fossil fuel industry argued with the help of skeptical scientists that the science was unreliable, and that a treaty that exempted China and India from cuts would be unfair and harmful to Americans. Moreover, as to cover all bases, a coal industry group and an economist argued that a warmer planet would be beneficial to humans, especially in North America (Layzer 2002). The battle was joined in 1998 by the Pew Charitable Trust's Center for Global Climate Change – whose mission is to bolster the credibility of climate change science – and some large supporters in the business of energy and using energy, including American Electrical Power, U.S. Generating Company, Toyota, Boeing and Lockheed Martin (Layzer 2002).

Declaring before a Special Session of the United Nations that "the science (of climate change) is clear and compelling," President Clinton pledged "to bring to the Kyoto conference a strong American commitment to realistic and binding limits that will significantly reduce our emissions of greenhouse gases" (Molitor 1999, 222). In December in Kyoto, Vice President Al Gore presided over negotiations that resulted in binding emission cuts for Annex I nations by 2008-2012 and committed the United States to reducing its emissions to 93 percent of 1990 levels (United Nations 1997; Molitor 1999). Compared to the 7 percent cut required of the United States, Europe committed to 8 percent, Japan to 6 percent and 21 other nations to 5.2 percent. Of the outcome, Layzer writes it "embodied the United States' worst case scenario: it went beyond the original target for U.S. reductions but provided no mechanism for making developing countries reduce their emissions" (2002, 225).

The Protocol was designed to be flexible. It assigned Annex I nations a target to reduce greenhouse gas emissions using any combination of a "basket" of six gases: carbon dioxide, methane, nitrogen oxides, perflurocarbons, hydroflurocarbons and sulfurhexafluride. Nations could mix and match up to five general policy options to meet their target (Molitor 1999; United Nations 1997):

1. Use policies and regulations to actually lower national emissions.
2. Enhance carbon sinks such as forests (Article 3).
3. Trading emissions credits with other eligible nations. (Article 17).

4. Earn credits, as an Annex I nation, for lowering emissions with projects in other Annex I nations. This is known as Joint Implementation (Article 6).
5. Earn credits for lowering emissions in other *developing* nations. This is called the Clean Development Mechanism (Article 12).

The United States signed the Kyoto Protocol the following year, joining 150 other nations. But well aware the Senate would not support the treaty, Clinton did not submit it for ratification. At the Fourth Conference of the Parties in 2000, the United States sought permission to meet its Kyoto obligations through forest and land management practices instead of emissions reductions. Eleven days of negotiation failed as several European nations, chiefly Germany, rejected the approach. In 2001, shortly after his election, President George W. Bush reversed a campaign pledge to regulate carbon emissions from power plants and officially walked away from the protocol on the familiar grounds that it would harm the U.S. economy (Lindlaw 2001; Associated Press 2001; Hebert 2001). He declared in a February, 2002 speech:

> The approach taken under the Kyoto protocol would have required the United States to make deep and immediate cuts in our economy to meet an arbitrary target. It would have cost our economy up to $400 billion and we would have lost 4.9 million jobs. As President of the United States, charged with safeguarding the welfare of the American people and American workers, I will not commit our nation to an unsound international treaty that will throw millions of our citizens out of work.

Two public opinion polls taken in July, 2001 underscored concern in the United States about climate change. A New York Times/CBS News Poll found more than half of those surveyed said the nation should abide by the Kyoto Protocol and 72 percent thought that immediate steps were needed to counter global warming (Layzer 2002) while a Gallup poll found that 79 percent of people surveyed thought energy conservation is extremely important. But the Gallup poll also pointed up an important contradiction: 70 percent believe increased oil and gas production equally critical. Observed one energy consultant to a UPI reporter, "What we have here is a classic collision of two diametrically opposed agendas" (Martin 2001). As an alternative to joining the protocol, Bush in 2002 presented his Global Climate Change Initiative, designed to cut greenhouse gas intensity by 18% over 10 years. Greenhouse gas intensity is the ratio of greenhouse gas emissions to economic output. Using tax incentives and voluntary measures, Bush proposed to lower the nation's rate of emissions from an estimated 183 metric tons per million dollars of Gross Domestic Product (GDP) in 2002, to 151 metric tons per million dollars of GDP in 2012. Critics decried the strategy of linking greenhouse gas cuts to economic growth as a false solution.

European leaders chastised Bush for abandoning the Kyoto Protocol but proceeded with negotiations nonetheless, with the United States largely on the sidelines. At COP 7 in Marrakesh, parties agreed to specific rules for implementing the treaty, including trading provisions and enforcement measures for non-compliance, clearing a major hurdle to the treaty's ratification (Max 2001). But The U.S. rejection lengthened odds of the protocol's success considerably, given that it required ratification by 55 industrialized nations accounting for at least 55 percent of global greenhouse gas emissions in 1990. The U.S. alone accounted for 36 percent of carbon emissions (Isachenkov 2004) and major emitters, including Canada, Japan and Russia were still holding out. That year the IPCC released its Third Assessment Report with a more certain and dire conclusion: "There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities." (IPCC Group I 2001, 10). Through a series of concessions and difficult negotiations, Canada and Japan ratified the treaty in 2002, and Russia – aided by a "post-Soviet industrial meltdown has left emissions some 30 percent below the (1990) baseline" ratified it in 2004 (Isachenkov 2004). The protocol entered into force on February 16th, 2005 (United Nations 2006).

Despite the Bush administration's abandonment of the protocol, domestic political support for mandatory cuts in carbon emissions appears to be growing. New England governors and Eastern Canadian Premiers adopted a Climate Change Action Plan to meet UNFCC goals, noting that it would require long-term reduction of 75-85 % below current levels (New England Governors/ Eastern Canadian Premiers 2001). The following year, New Hampshire passed a law to regulate greenhouse gas emissions to conform to the plan and, separately, California passed a law to regulate carbon dioxide emissions from cars. In 2004, 44 senators voted for a bipartisan global warming bill introduced by John McCain and Joseph Lieberman which would require the nation to cut carbon dioxide to 2000 levels by 2010 and 1990 levels by 2016 (Associated Press 2003; Whipple 2004). Also that year, a coalition of eleven northeastern states petitioned a federal appeals court force the EPA to regulate greenhouse gas emissions (Gillespie 2003). An excerpt from a New York Times editorial supporting the McCain/Lieberman bill summed up the shift in the national political attitude toward climate change since the Senate's 1997 rejection of a binding international treaty and the status pf the climate change issue in the country as of this writing (2003):

> Though it's hard to predict how this will play out, there has clearly been a major attitudinal change, even among Republicans, since 1997, when the Senate approved a resolution expressing doubts about the direction the Kyoto talks were then taking. Many legislators are deeply troubled by reports of shrinking glaciers, dying coral reefs and other ecological changes linked to warming. And many of these same lawmakers – not least Robert Byrd of West Virginia, a co-sponsor of the 1997 resolution – have lost patience with Mr. Bush's let's-wait-for-more-research stance.

Following the timeline below of major events in the climate policy regime, this section concludes with a brief synopsis of reasons scholars see for the success of the Montreal Protocol process and failure of the Kyoto process in the United States.

Table 2. Climate Change Case Event Timeline

Year	Climate Event
1957	Revelle and Seuss claim greenhouse gases released from fossil fuel burning were not being absorbed naturally by the ocean and warn, "Human beings are now carrying out a large-scale geophysical experiment of a kind that could not have happened in the past nor be reproduced in the future" (Revelle and Seuss 1957, cited in Molitor 218)
1979	The World Meteorological Organization (WMO), which created the Ad-Hoc Panel of Experts on Climate Change, holds first World Climate Conference in Geneva (Molitor 1999).
1983	The EPA releases a voluminous report entitled "Can We Delay a Greenhouse Warming," described by UPI as "the government's first warning of dire consequences" from climate change (Sangeorge 1983). A National Academy of Sciences report underscores concerns but notes there is time to adapt to the changes (Leary 1983).
1985	Conference, held by WMO and UNEP in Villach, Austria finds climate change highly probable and recommends states begin considering climate convention (Bodansky 2001).
1988	IPCC is formed by WMO and UNEP as "a panel of climate experts entrusted with the task of assessing and summarizing the state of scientific knowledge on climate change" (Raustiala 2001, 112); Toronto Conference, Organized by Canada, calls for global 20% cut in CO_2 emissions by 2005; UN General Assembly calls climate change "common concern of man" (Bodansky 2001, 25).
1989	Noordwijk Conference, organized by Netherlands, is "first high-level intergovernmental meeting focusing specifically on climate change issue." Conferees conclude that industrialized nations should stabilize CO_2 as quickly as possible. Year 2000 is agreed on by many (Bodansky 2001, 25).

Table 2 Cont.

Year	Climate Event
1990	IPCC First Assessment Report WMO and UNEP finds global mean temperatures likely to increase by about .03 C per decade under business as usual scenario; Second World Climate Conference in Geneva unable to reach consensus on human role in climate variability (Molitor 1999); Establishment by the UN General Assembly of the Intergovernmental Negotiating Committee (INC) for a Framework Convention on Climate Change (Bodansky 2001).
1991	Intergovernmental Negotiating Committee holds first of five negotiating sessions, following the model set the stratospheric ozone process, to draft the Framework Convention on Climate Change (FCCC) (Molitor 1999).
1992	FCCC is adopted at the United Nations and signed by 154 governments at UN Conference on Environment and Development in Rio de Janeiro. It calls for "Stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (United Nations 1992, Article 2)
1994	Framework Convention enters into force. Annual Conferences of Parties (COP) begin the following year (Molitor 1999).
1993	President Clinton fails to win support in Congress for an energy tax – the so-called BTU (British Thermal Unit) tax –intended to help meet its goals. Instead, the White House presents a Climate Change Action Plan based on voluntary measures (Molitor 1999; Layzer 2002).
1995	Ad hoc Group on the Berlin Mandate (AGBM) holds first of eight separate meetings to negotiate a binding protocol. The final meeting was at the 1997 COP in Kyoto.
1996	IPCC Second Assessment Report concludes "the balance of evidence suggests a discernable human influence on global climate." (IPCC cited in Raustiala 2001); At COP2 in Geneva, U.S. negotiators announce intention to seek a binding international agreement on fossil fuel emissions (Cushman 1997).
1997	Kyoto Protocol adopted at COP3 by 150 nations. The protocol specifies binding reduction of greenhouse gases, including carbon dioxide, methane and nitrous oxide, by 39 industrial nations. U.S. is required to reduce greenhouse emission to 93 percent of 1990 levels by 2008-2012. Reduction commitments do not include developing nations (United Nations 1997; Molitor 1999); In Washington, the Byrd-Hagel Resolution passes by 95-0 vote in US Senate, declaring that the Senate would not ratify any treaty that harms U.S. economy or does not entail meaningful participation by major developing countries (Sprinz 2001; Molitor 1999).

Year	Climate Event Table 2 Cont.
2001	IPCC Third Assessment Report concludes: "There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities." (IPCC Group I 2001, 10) Reversing campaign pledge, President George W. Bush tells Congress he will not regulate carbon dioxide emissions from power plants and walks away from the Kyoto treaty, (Lindlaw 2001; Associated Press 2001; Hebert 2001); New England Governors/ Eastern Canadian Premiers adopt their Climate Change Action Plan to meet UNFCC goals, noting that will require long-term reduction of 75-85 % below current levels (New England Governors/ Eastern Canadian Premiers 2001).
2002	California passes a law to regulate carbon dioxide emissions from cars. Automakers say they will sue (Jablon 2002).
2003	Bipartisan global warming bill introduced by Senators McCain and Lieberman falls short of passage with 44 votes (Whipple 2004); A coalition of eleven northeastern states, concerned about the health effects of air pollution, petition a federal appeals court force the EPA to regulate greenhouse gas emissions. The EPA claims it lacks authority from Congress to regulate greenhouse gases (Gillespie 2003).
2004	Russia's ratifies the Kyoto Protocol ensuring the global climate pact will take effect (United Press International 2004). The protocol enters into force on February 16th, 2005 (United Nations 2006).

Case Comparisons

The preceding case histories of U.S. involvement in the international stratospheric ozone and climate change policy regimes offer a description of the conditions under which the Montreal Protocol process emerged successful and the Kyoto Protocol process failed in the United States. The following is a brief summary of reasons cited by scholars for these two very two different outcomes. These observations from the literature can provide a point of comparison for the findings of this study about what arguments in American news reports say about the Montreal success and Kyoto failure. For consistency's sake, the scholars' comments are organized into categories created for the coding system used in this study – each category representing one of five dimensions of the policymaking process – called policy issue criteria (Howland, Becker, and Prelli In Press). The authors describe these as criteria of "effective" policymaking because, they argue, each must be addressed and adjudicated during public policy formation (Lasswell 1971; Brewer and deLeon 1983). The criteria include (1) the establishment of an accurate definition of the policy problem, (2) the proposition of a policy solution appropriate to the defined problem, (3) the acquisition of necessary support for the policy, (4) the technical feasibility of the proposed policy and (5) the establishment of accountability for carrying out the solution.

First is the *problem* definition criterion. As noted earlier, stratospheric ozone and climate change are similar in big ways: Both are human-caused global atmospheric environmental problems with potentially profound consequences for society. But scholars argue that in the United States the ozone hole was established more quickly and with greater certainty than climate change as a problem worthy of corrective action. Paarlberg notes that at the time of respective adoptions of the Montreal and Kyoto Protocols, the scientific consensus on climate change was not yet as good – and not strong enough "relative to the significant economic cost of taking action to reduce greenhouse gas emissions" (Paarlberg 1999, 248). As noted earlier, opponents to limits on greenhouse gas emissions, exploited scientific uncertainty (Paarlberg 1999; Layzer 2002) and the news media amplified it (Zehr 2000; Boykoff and Boykoff 2004). Moreover, the public perceived the stratospheric ozone problem as a bigger, more immediate threat (Reisinger 2002; Ungar 2000). The sudden discovery of a so-called hole in the sky and the sunburn or cancers it could cause were more easily understood than the long-term potential effects of planetary warming and melting icebergs. Writes Breitmeier, (1997, 96)

> The greater complexity of the climate issue made it much more difficult to popularize and politicize the issue. In contrast, the possible impacts of spray can emissions on the ozone layer was easy to understand and could be explained to nearly everybody, although it wasn't even clear [before 1982] whether the hypothesis was valid.

Another strike against climate change, writes Reisinger, is that its effects "may be the least discernible in the short to medium term" (Reisinger 2002, 5) which works against generating political will for a solution.

On the second criteria, proposing a *policy* solution appropriate to the defined problem, many argue that while there is always room for improvement the Montreal Protocol and its amendments are doing what they were intended to do – cut off the emissions of CFCs and begin healing the ozone layer (UNEP 2000; Benedick 1998; Reisinger 2002). By contrast, as difficult as it has been to win ratification, the Kyoto Protocol is widely acknowledged as unequal to its task. Only a year after its adoption in 1997, IPCC Chairman Bert Bolin acknowledged it would be "far from what is required to reach the goal of stabilizing the concentration of CO_2 in the atmosphere" (Layzer 2002, 227).

Much has been written that is relevant to the third criteria, the acquisition of necessary *support* for the policy. The stratospheric ozone regime won the necessary blessings, though not always wholehearted, of the administration and Congress to achieve the necessary adoptions and ratification. The Kyoto pact did not do so in large part because of a concerted industry campaign against it appealing for its defeat to the public and politicians on multiple grounds, including the science that informed it and the economic and societal consequences of following through on the treaty. The relative intractability of fossil fuels to daily life, compared to CFCs, also bears upon this point. Americans were not greatly inconvenienced by the replacement of CFCs with substitutes. Reisinger observes, however, that "the concept of reducing greenhouse gas emissions is equated with a loss of comfort, mobility or productivity," despite arguments that it doesn't have to be so (Reisinger 2002, 4). In its reaction to the Kyoto Protocol process, industry worked hard to solidify this impression. The broader campaign to derail U.S. efforts to join the climate change treaty included systematic efforts to influence public opinion. Among them was a campaign by the Washington-based Coalition for Vehicle Choice, to persuade 1,300 American small business, labor and civic groups that limiting emissions would be "bad for America" (Paarlberg 1999, 246). In addition to industry, organized labor also opposed the Kyoto treaty (Paarlberg 1999; Bryson Hodel 1999). While the chemical industry in the United States resisted initial efforts to regulate CFCs, it relented after helping to establish with government scientists the nature and extent of the problem (Benedick 1998).

In the criteria of the technical *feasibility* of a solution, the ozone regime had a significant advantage. The solution to halting the destruction of stratospheric ozone rested in producing substitutes that did not harm the ozone layer. These were available and, as noted earlier, required only proper market incentives to develop. Writes Reisinger, (Reisinger 2002, 3)

> Perhaps most importantly, CFCs were specifically manufactured for a limited and clearly defined range of industrial uses, whereas greenhouse gases are ubiquitous byproducts of almost every form of energy production, industrial, agricultural or transport process. It is therefore not easily possible to invent "substitutes" for greenhouse gases – their generation is an accident of civilization, not part of a specific industrial process.

Finally, on the matter of *accountability*, Montreal also had a solid advantage. The Montreal Protocol negotiations were able to secure the cooperation of developing nations early on, ensuring as the treaty process moved forward that growing nations would not take up the bad habit of using ozone destroying compounds. For their trouble, the protocol's wealthier parties created the Multilateral Fund to assist developing nations with the transition to more benign chemicals. Five years later in 1995, developing nations signed up for delayed cuts of their own. This was possible, writes Paarlberg, "because production of CFCs was concentrated within a relatively small number of wealthy industrial countries ... and because the proposed limits on CFC production has little projected impact on the welfare of those countries or on the future economic growth potential of the developing countries" (Paarlberg 1999, 248). By contrast, a major plank in domestic anti-Kyoto platform has been the reluctance of developing nations to take on binding greenhouse reduction commitments. Writes Reisinger, "Experience from the Montreal Protocol seems to indicate that the early setting of an entry point and long-term emissions target for developing nations, even if far into the future, may enhance the willingness of industrialized countries to implement solutions that go beyond no-regrets actions" (Reisinger 2002, 4).

Equipped now with background and a comparison of both policies, this chapter now shifts to an examination of the theoretical frameworks that underlie the dissertation.

Theoretical Frameworks

This section breaks down into three parts. The first, *Research Orientation*, examines some of the theoretical literature used to inform this dissertation's fundamental approach. The second section, *Economic Paradigms*, explores two fundamental and competing economic philosophies – neoclassical and ecological economics – and their relevance to environmental problems and problem solving. The third, *Environmental Discourses*, builds on this by describing a variety of competing visions, or discourses, for conceptualizing and addressing environmental and global commons issues. This section concludes with a brief discussion of the author's own observational standpoint.

Research Orientation

Methodological Context. In research methods vernacular, this dissertation can best be described a *case study comparison* that draws on both *qualitative* and *quantitative* methods to answer *descriptive* and *interpretive research questions* grounded in theoretical literature in four general and sometimes overlapping areas of study: 1) The way groups wield values in a social and political process to achieve their goals, 2) The myriad societal conceptualizations of and approaches to environmental problems and policy making, 3) the news media's influence on public opinion and policy making, and 4) the effective analysis of news media content. Important concepts from the first two bodies of literature are introduced in this section. Concepts from the second two, which are more critical to the news media content analysis, are examined in the following chapter.

A brief explanation of the italicized terms above can aid in understanding the research approach taken for this study and the reasons behind it. First, this study is a *case study comparison* because it examines two cases – the evolution of the ozone hole and climate change policy regimes – and compares them. Definitions of the terms "case study" and "cross-case analysis," provided by Creswell (1998, 61), capture the intent of this study's approach:

> … a case study is an exploration of a "bounded system" or a case (or multiple cases) over time through detailed in-depth data collection involving multiple sources of information rich in context. This bounded system is bounded by time and place, and it is the case being studied – a program, an event, an activity or individuals.

In this study, the case is bounded by topic, place and time: arguments on ozone and climate change (topic), published in the mainstream American news media (place), between 1980 and 2004 (time). It also involves multiple sources of information rich in context: the news reports themselves, interviewees, and scholarly articles. Creswell says multiple case studies typically include a description of each case and themes within them, called a "within-case analysis," and include a "cross-case analysis," which compares themes across cases (1998, 63). Themes within and across the cases in this study are described side by side in each chapter. The research questions used to capture those themes are both *descriptive* and *interpretive* and not *theoretical*. The three concepts are described succinctly by Maxell as follows:

> Descriptive questions ask about what actually happened in terms of observable (or potentially observable) behavior or events. Interpretative questions, in contrast, ask about the meaning of these things for the people involved: their thoughts, feelings and intentions. Theoretical questions ask about *why* these things happened, how they can be explained (1996, 59).

Among the research questions enumerated at the end of the chapter, the set of questions posed of the content analysis (Table 3B) are descriptive. For example "In what proportion are the arguments international or domestic, and economic, political, social or environmental in nature?" However, questions posed of interviewees (Table 3C) cross into interpretive territory. For example, "What you think are the strengths and weaknesses of each policy effort – climate change and/or ozone?" and "What would you recommend, if anything, be done to improve them?" Importantly, these questions are not hypotheses. Maxwell (1996, 53) describes the difference,

> Research questions are not the same as research hypotheses. Research questions state what you want to learn. Hypotheses, in contrast, are a statement of your tentative answers to these questions – what you think is going on. The use of explicit research hypotheses is often seen as incompatible with qualitative research.

"Qualitative" is a term Schwandt identifies as a "not-so-descriptive adjective" attached to a variety of types of social inquiry including "ethnography, case study research, naturalistic inquiry, ethnomethodology, life history methodology, narrative inquiry and the like" (1997, 129). Research questions, rather than hypotheses, were chosen for this study because they invite a wealth of description about the *process* of social phenomenon which Maxwell calls "the real strength of a qualitative approach" (1996, 59). While hypotheses are sometimes used in qualitative studies, they are traditionally found in "quantitative" studies, described by Schwandt as "any design (e.g., experimental, survey) or procedure (e.g., statistical) that relies principally on the use of quantitative data" (1997, 129). Hypotheses deal less with questions of *process* than of *variance* – which explore whether results were causally related to one or another variable and to what extent (Maxwell 1996, 59). Maxwell notes that a major drawback of formulating explicit hypotheses to understand social process is that they can act as blinders, preventing you from seeing what's going on." In doing so, a researcher might lose sight of the forest for the trees. Finally, a major concern with any methodology is its validity. This dissertation subscribe to a definition of validity that Schwandt (1997) calls "fallibilistic validity": "Here validity is understood as a test of whether an account accurately represents the social phenomena to which it refers. Yet no claim is made that ... a valid account is absolutely certain. Defenders of this view hold that one can have good reasons for accepting an account as true or false, yet an account is always fallible" (Schwandt 1997, 169). The content analysis portion of this study's methodology is statistically tested for reliability, the details of which are explained in Chapter 2.

<u>Groups, Arguments and Systems</u>. As stated in the title, this dissertation is concerned with arguments in the news media about the ozone hole and climate change. A good deal has been written about how and why individuals and groups in society wield arguments and how that process can be conceptualized. This section explores some of the theory on this broad topic that informs the work herein.

One of the fundamental assumptions of the primary analytic framework used in this study – the Policy Sciences Analytic Framework of Harold Lasswell – is called the *maximization postulate*, which says that "living forms are predisposed to complete acts in ways that are perceived to leave the actor better off than if he had completed them differently" (Lasswell 1971, 16; Clark 2002). The basics of this framework will be discussed shortly and in greater detail in the Methods chapter. Separately, Clark introduces readers to the concept of Myth, or shared belief, that he describes as "the glue that holds groups and society together" (2002, 21). Myth includes three fundamental components: *doctrine*, or the philosophy that "functions to affirm the perspectives of the group"; *formula*, the "prescriptive norms of conduct that must be followed"; and *miranda*, which includes "lore, stories, popular legends, poems, heroes and other symbols" (2002, 22). Clark notes that myth is an essential concept for researchers in "understanding and operating effectively in policy processes" because it serves to "provide the background, backdrop, or frame of reference, whether explicit or implicit, for our rational, political and moral judgments, intuitions, or reactions" (2002, 22). He cites as examples of myth in modern society, the myths of science, capitalism and environmentalism, which can have their own sub-myths. Myth underlies arguments made by individuals and groups active in the ozone hole and climate change debates – be they scientists, industrialists, environmentalists or members of the diverse and concerned public. In his book, The Politics of Earth, political scientist John Dryzek introduces a framework for analysis of myths and sub-myths unique to debate about the environment. Dryzek does not use the term *myth* but refers instead to *discourses* which he defines accordingly:

> A discourse is a shared way of apprehending the world. Embedded in language, it enables those who subscribe to it to interpret bits of information and put them together into coherent stories or accounts. Each discourse rests on assumptions, judgments, and contentions that provide the basic terms for analysis, debates agreements and disagreements (Dryzek 1997, 8).

Dryzek defines four major environmental discourse categories – Limits, Problem Solving, Sustainability and Green Radicalism – and contrasts them with the dominant discourse of our time, Industrialism. Within each of the four environmental discourses are two or more sub categories, themselves discourses with their own distinct characteristics. Similar to doctrine, formula and Miranda, Dryzek describes four components of each discourse (1997, 53): 1) basic entities recognized or constructed by discourse adherents (e.g., in the industrialist Promethean discourse, these are markets, prices, energy, technology and people. Nature is nothing but "brute matter"), 2) Assumptions about Natural Relationships (e.g. humans are hierarchically over all else) 3) Agents and their motives (e.g. everyone is motivated by self interest), 4) Key metaphors and other Rhetorical devises (e.g. machines, trend lines). In the section to follow and in the *Discussion and Conclusions* chapter, Dryzek's discourse approach is discussed in greater detail, providing a useful frame of reference for sorting and discussing the many arguments examined in the ozone and climate cases.

Of course, myths and discourses do not operate in a vacuum. They are created, shaped and disseminated and reinforced over time by elites, parents, teachers, the mass media, governments and interest groups of all stripe (Dryzek 1997; Clark 2002). It is no small undertaking to study the interaction of groups and their arguments – reflections of their myth and discourses – around a complicated policy issue. To do so effectively requires contextuality, defined here succinctly by Brewer and deLeon as follows: "Contextuality means understanding the relationship between the parts and the whole of a problem. It also means having a clear sense and appreciation of the past, present and future of events as they interact and change through time" (1983, 13). It is fair to say the concept of contextuality is analogous to that of the systems thinking approach, which Senge says "lies in a shift of mind: seeing interrelationships rather than linear cause-effect chains, and seeing processes of change rather than snapshots" (Senge 1990 P. 73). Systems thinking is a practical way of apprehending the world and its complex systems – such as the interactions between the Earth oceans and atmosphere or, again, the process of trying to protect them. Kauffman writes that complex systems are often one of more or the following:

Self-stabilizing – like a thermostat

Goal seeking – such as the economy

Program following – such as a cook following a recipe

Self-reprograming – like a football coach taking a new strategy to avoid mistakes

Anticipating – like a dog salivating in advance of a meal

Environment Modifying – like a beaver damming a pond

Self replicating – as in biological reproduction or the spread of a McDonald's food chain

Self maintaining and repairing – such as a nation changing its government

Self programming – More advanced than self-replicating, this requires inventing new goals and programs to achieve them (Kauffman, 29-32)

Two specific strategies for exploring complex systems within the systems thinking discipline are *system dynamics* and the *ecosystem approach* (Munn 1993; Systems Dynamics Society 2002; Senge 1990). Systems dynamics, often referred to by the more generic term "systems analysis," is a methodology that focuses on studying and managing feedbacks within complex systems. It centers on identifying and tracking stocks and flows – of information, material, gases, power etc. – within systems to better understand and in some cases predict behavior of that system. It has applications in many fields where researchers are interested in understanding and modeling complexity; among them, the Earth sciences, medicine and public policy (Kump, Kasting, and Crane 1999; Meadows 1992; Systems Dynamics Society 2002; Senge 1990; Kauffman). The ecosystem approach focuses on protecting the integrity of natural systems that have distinct ecosystem boundaries, often through a combination of behavioral changes and technical solutions (Williams 2002). A good example is the cross-border cooperation between government and citizens groups to protect the Great Lakes River Basin, which has begun shifting the mindset about pollution from reaction to prevention (Becker 1996; Francis and Regier 1995; MacKenzie 1993). Both the systems dynamic and ecosystem approaches are useful and often complimentary.

To sum up, the foregoing literature spells out the importance of understanding the words and arguments of groups in the context of their myth and discourses, and appreciating their role in a larger system. Apprehending and mapping this with contextuality, and with relevance to the making of policy, requires a powerful unifying analytic framework. The next section outlines the framework chosen for the task – the policy sciences analytic framework of Harold Lasswell.

A Unifying Framework. –The policy sciences analytic framework of Harold Lasswell, is described by Clark (2002, 4) as "a set of integrated concepts or conceptual tools for framing thought and action and for guiding analysis, interpretation and resolution of any problem." The framework defines many worthwhile targets of observation and inquiry – many which fall into two general categories – the *social process*, which focuses primarily on the interactions and effects of people and groups who shape the policy process, and the *decision process*, which accounts for the process by and institutions through which policy decisions are made and carried out (Brewer and deLeon 1983; Lasswell 1971; Clark 2002). These are discussed in greater detail ahead. It is important to first understand that the framework is grounded in three fundamental guiding principles – the principle of *contextuality*, described above, the principle of having a *problem orientation,* and the use of *multiple methods*. Problem orientation refers generally to the commonsense concept of taking time to understand a problem, before diving in to solutions. Clark writes that often, especially in the area of natural resources, people are too quick to offer solutions to a conundrum.

> Being conventionally "solution minded" rather than effectively "problem-minded" means that we tend to make assumptions about people's goals, pay too little attention to what has happened in the past and what might happen in the future, and focus uncritically on possible solutions (Clark 2002).

To avoid this pitfall, policy scientists like Clark find it useful to engage in five "Intellectual Tasks of Problem Orientation" (2002, 87) to lead them to a better understanding of what solutions might work. These include 1) Clarifying Goals (establishing what goals are sought by all involved) 2)

Describing Trends (talking stock of the history of the problem and noting key trends, 3) Analyzing conditions (examining the underlying conditions that created the trends, 4) Projecting Developments (Given the present state of affairs, extrapolate what is likely to happen in the future and consider several scenarios), 5) Inventing, evaluating and selecting alternatives (these are evaluated in terms of the goals defined in the first step).

The third bedrock principle of the policy sciences framework, using *multiple methods*, simply encourages a variety of research approaches to accomplish these tasks. This avoids the problem described by Brewer and deLeon (1983, 15):

> Any method has blind spots that focus attention on highly selected aspects of a problem while blocking it out for others. A policy analyst must understand this and counteract it by viewing problems with a variety of different methods or approaches and then working to assemble their partial insights into something approximating a composite whole.

Lasswell and colleagues believed in using many approaches, including the content analysis of media messages (Lasswell 1968). Depending on the nature of the policy problem studied, and the goals of the researcher one might use any combination of methods and tools, among them, case studies, prototyping, policy exercises, decision seminars, focus groups, surveys, polls, and the nominal group process (Clark, Perez-Trejo, and Allen 1995; Barrow 1997).

Another major facet of the policy sciences analytic framework is the definition of *base values* – described by Clark as the "medium of exchange in all human interactions … that is, the things and events in life that people desire, aim at wish for or demand" (2002, 25). Values can be sought, possessed and wielded. They are: Power (which refers to participation in decision making, e.g. voting, or leadership); Enlightenment (the accumulation of knowledge); Wealth (the control of resources); Well-being (Safety, health and comfort); Skill (the exercise of talents); Affection (love intimacy and friendship); Respect (recognition, freedom of choice and equality); and

Rectitude (the participation in forming and applying norms of responsible conduct) (Brewer and deLeon 1983; Clark 2002; Lasswell 1971). Clark argues that to be effective, policy consultants need to be aware of their own *observational standpoint*, which includes an accounting of their base values, biases, critical thinking skills and position relative to their task. To that end, the author, a former news reporter and editor, will briefly discuss his own observational standpoint at the end of the following section on environmental discourses.

Equipped with an understanding of contextuality, problem orientation, multiple methods base values and observational standpoint, the policy analyst turns to the categories of observation and inquiry outlined in the framework's *social* and *decision* processes. Mapping these processes – defined below from the works of Lasswell, Clark and Brewer and deLeon – empowers the execution of the five tasks of intellectual problem solving.

Clark (2002) broadly defines *social process* as the interaction of individual and organized interests in society that form the context within which all policy problems exist. It includes an accounting of participants (the stakeholders in the policy problem), their perspectives (what they think about it), situations (in what situations they interact), base values (those sought or used to pursue their goals), strategies (used to achieve their goals), outcomes (the short-term changes in distribution of values) and effects (long-term institutional or value changes) (Brewer and deLeon 1983; Lasswell 1971). The *decision process* comprises seven activities of decision making, including intelligence gathering (essentially planning, the collection and processing of information for policymaking), promotion (the promoting of, lobbying for policies), prescription (the establishment of the rules), invocation (the enforcement of the rules), application (the process of shaping and keeping the prescription and invocation in check, e.g. through appeals or lawsuits), appraisal ("the assessment of a decision process as a whole and of the success of particular prescriptions in achieving their goals" (Clark 2002, 68)), and termination ("the repeal or large-scale adjustment of a prescription" (Clark 2002, 69)).

One of the policy sciences framework's greatest attributes is its comprehensiveness. But researchers are by no means required to equally emphasize or complete all five problem orientation tasks or investigate all elements of the social in decision process. This study, for example, used the analytic framework primarily to map trends and conditions in social and decision process – and the base values of participants – as they appear in news reports. It does, however, keep in mind the larger principles of contextuality, multiple methods, which demand and empower a big-picture view appropriate to the subject.

Economic Paradigms

As demonstrated in the brief histories of the ozone and climate change regime, economics plays a central role in the course of environmental policy. As important as it is to understand the basic environmental science that propelled these issues onto the global policy agenda, is it is equally important to understanding the economic principles at work – and often at conflict – in the efforts to address the problem. To that end, this section examines two broad and competing schools of economic thought – the neoclassical and ecological economic paradigms – and how they relate to environmental problems. This includes a description of ethical criteria and many theoretical concepts embodied in the paradigms' analyses of natural resource problems – including the topics of sustainability, cost-benefit analysis, substitutability, present value calculation, dynamic efficiency, the precautionary principle, intergenerational equity and innovation. It also discusses some approaches by different economists to address the problem of climate change. It is useful background for the section to follow on environmental discourses and for placing many economic arguments in news articles in context.

In the policy arena, the question of how to go about achieving the goals of the Kyoto Protocol, or even whether they are worthwhile pursuing falls under the purview of economists who struggle to weigh the costs and benefits of action and inaction. Recall that the uneven circulation of heat energy across the Earth's surface – an artifact of geography, weather patterns and the changing tilt and orbit of our planet – ensures that climate changes are far from uniform let alone predictable (Kump, Kasting, and Crane 1999; IPCC Group I 2001). Research shows that different changes in climate in different regions can create "winners" and "losers." For example warmer weather might bring flooding to one region while it could enable the growing of new and more lucrative crops in another (O'Brien and Leichenko 2000). In addition, given the centuries' long residency of carbon dioxide and other greenhouse gases in the atmosphere, the symptoms of climate change will be slow to heal. Together this uncertainty and delay constitute a nagging problem for economists tying to find ways to assess and ameliorate the problem with their pocketbooks. Weyant sums up some of the challenges facing economists:

> Projecting the costs of reducing carbon emissions is difficult because many assumptions must be made about how the world will evolve over a very long period of time with and without a control program. Typically, some of these assumptions, like population growth, are taken from outside sources. Other factors, like the response of energy demand to changes in economic output or energy prices, are the result of modeling the behavior of economic actors in response to exogenous stimuli. Considerable uncertainty exists about both the exogenous factors and the best way to model the behavioral responses. (1993 p. 27)

<u>Two economic camps</u>. When it comes to sorting out issues concerning the environment and natural resources, economists are often divided between two camps – the neoclassical and ecological camps (Goodstein 1999). Goodstein provides one of the most accessible explanations of their differences:

> *Neoclassical economists* view natural and created capital as substitutes in production. They are technological optimists, believing that as resources become scarce, prices will rise, and

human innovation will yield high-quality substitutes, lowering prices once again. More fundamentally, neoclassicals tend to view nature as highly resilient; pressure on ecosystems will lead to steady, predictable degradation, but no surprises ... By contrast, *ecological economists* argue that natural and created capital are fundamental complements – that is, they are used together in production and have low substitutability. Technological pessimists, ecologicals believe that as the sinks and sources that make up our stock of natural capital are exhausted, human welfare will decline. Fundamentally, ecologicals view natural systems as rather fragile. (1999 p. 81)

A central theme of concern for economists of all stripes is sustainability – how to keep the economic world turning – and it offers a point of departure for comparing the two camps. One definition of sustainability widely quoted in science and policy circles appears in the landmark 1987 report of the Brundtland Commission, which declares: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Vig and Axelrod 1999, 7; Nordhaus). Neoclassical economists argue sustainability can be measured by comparing the material benefits of growth against the environmental costs in dollar terms. They argue further that the growing market economy has seen a steady rise in benefits over costs along with a rise in welfare for the median individual. They conclude then that society is "thus, by definition, living in a sustainable economy" (Goodstein 1999, 84). By contrast, Herman Daly, considered a father of modern ecological economics, rejects the notion that growth-driven economy is sustainable, and calls for the world to move toward a "steady state economy" in which material growth (the steady increase of energy/matter moving through an economic system) is replaced by development (the qualitative improvement of that matter) (Daly 1996). He says that fundamental to this task is the recognition that human and manmade capital are not substitutes but complements.

"The complimentarity of man-made and natural capital is made obvious at a concrete and commonsense level by asking. What good is a saw-mill without a forest, a fishing boat without fish, a refinery without petroleum deposits an irrigated farm without an aquifer or river?" (Daly 1996 p. 77)

Roy Darwin and colleagues echo this viewpoint with their characterization of ecological economics:

> A basic premise of ecological economics is that the world economy is embedded in and dependent upon Earth's ecosystem. Because land is a basic source of mass and energy throughput in all terrestrial ecosystems, land use and cover represents an integrating element in ecological economics. (Darwin et al. 1996 p. 157)

Cost Benefit Analysis. A substantial area of disagreement between neoclassical and ecological economists centers on *cost-benefit* calculations. Recalling the maximization postulate, everyone does cost-benefit calculations in their head when they make a decision. In economics, the involves choosing what should belong in the cost and benefits columns, placing dollar values on them and reaching a conclusion about what it means for the economy. A classic example of this is national Gross Domestic Product, a widely used measure of costs and benefits in the market economy that has been used historically as a proxy for societal welfare. Ecological economists argue that for this purpose the measure leaves out a lot of important things from both columns. For example, in the benefits column, non-market production (e.g. parenting and household labor) is ignored. The cost column is missing the depreciation of man-made and natural capital used in production (e.g., forests, fossil fuel reserves, minerals) and the damage done to the environment and human health (e.g. air and water pollution) in the process (Goodstein 1999; Cobb, Halstead, and Rowe 1995). These missing items, which are external to most measure of economic growth, are often referred to as "externalities." Realizing these shortcomings, some ecologically-minded economists have looked for more inclusive measures of well-being – including the Genuine Progress Indicator and the Index of Sustainable Economic Welfare. While imperfect, these measures are intended to draw broader attention to societal and environmental effects of the market system (Cobb, Halstead, and Rowe 1995; England 1998). Neoclassical economists argue that mainstream economic indicators demonstrate that society is living sustainably. But ecological economists argue that this is made possible with the help of three fundamental and controversial assumptions:

1. Natural and created capital are substitutable (meaning that society will never run out of resources to keep the economy going).
2. Natural capital, particularly non-renewables such as minerals and oil deposits, are worth more in the present than in the future (meaning it makes more sense to use resources now than save them for future generations).
3. Using discount rates can be used to achieve efficient distribution of resources between the present and future. (Harris 2002; Goodstein 1999; Daly 1996)

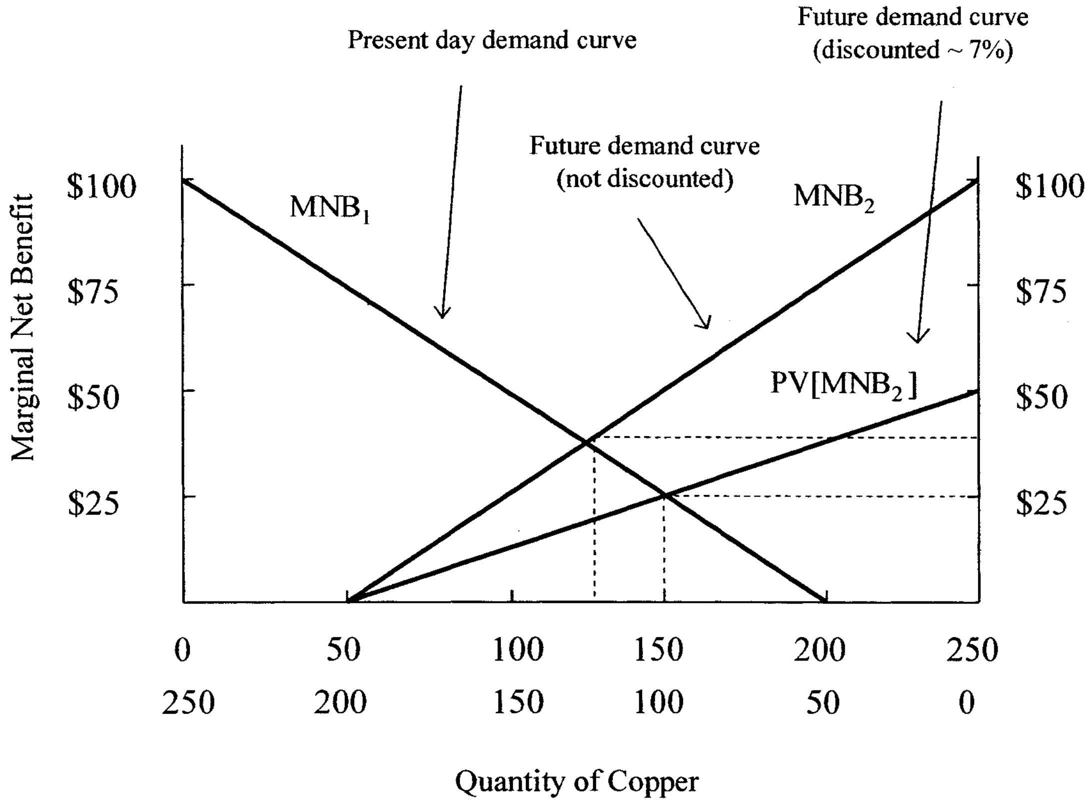
Substitutability. Ecological economists worry that by following the neoclassical model, society is whittling down its natural resources – nonrenewable sources and pollution sinks – to its peril (Harris 2002; Daly 1996; Goodstein 1999). But convinced of the principle of substitutability, neoclassical economists disagree. Goeller and Weinberg, declare this in an article entitled "We are Cornucopian." The authors took an inventory of essential minerals and metals and conclude that with recycling and substitution, humankind will basically never run out of resources (Goeller and Weinberg 1978). Sagoff (1997 quoted in Ehrlich, 1999) concurs:

It is simply wrong to believe that nature sets physical limits to economic growth – that is to prosperity and the production and consumption of goods and services on which it is based ... Although raw materials will always be necessary, knowledge has become the essential factor in the production of goods and services.

Goodstein notes that ecological skeptics of this view, including Malthus, have been accused of crying wolf after predictions of rising mineral prices and declines of natural resources that failed to materialize. Angus Maddison, a Cornucopian, says capitalist economies owe their success to innovators, who infuse new energy into the markets with new products. Writes Maddison, "the entrepreneur is thus the hero of economic development, and his heroism is all the more legitimate because in each wave new men emerge as the function of the entrepreneur itself cannot be inherited." (Maddison 1991 p.21) Speaking for those worried about natural limits squelching this cycle, Goodstein writes: "While ecologicals stretching back to Malthus have indeed done their share of crying wolf," write Goodstein, "this does not, of course, mean that the wolf won't yet come." (Goodstein 1999 p. 122)

Present value calculation. Cost-benefit analysis sometimes begs the question of how much to value the future. Mainstream economic practice places more value on a bird in hand today than a bird in hand in the future. This is put into practice using *present value calculations*, which are basically the mirror image of a compound interest calculation (Harris 2002; Goodstein 1999). For example, a present value calculation might answer the question: "How much would a million dollars given to me 10 years from now be worth in today's dollars?" To answer this you need a "discount rate." At an annual discount rate of 7 percent, that million would be cut in about half – to \$508,349 – over 10 years. The formula for calculating the discount rate is $N_t + N_0 (1+r)^t$ where r is the discount rate, t is time in years; N_0 is the million; and N_t is the discounted amount (Goodstein 1999, 92). When it comes to basic market transactions such as a mortgage to buy a home, discounting makes sense because living in that home now is worth the expense of paying more later. But economists stretch this logic over much larger spatial and temporal scales to the point of placing a value on future generations. A zero discount rate values the present and future equally. Any discount rate higher than zero values the future less. The standard economic practice of discounting is crucially relevant to national investment in mitigation or adaptation programs to address climate change, which involves policy decisions on scales of hundreds of years. In an essay on the topic, economist William Nordhaus provided a sharp hypothetical example to highlight the danger of using economic discounting alone to guide policy. He noted that a strict interpretation of the discounting rule would lead policymakers to write off spending money today to prevent an asteroid from hitting Florida in 200 years. The logic is as follows: If Florida is worth $2 trillion today, the mandated 7 percent discount rate on goods would put the state's worth at about $3 million in 200 years. If a space mission to deflect or blow up the asteroid costs more than $3 million today, it would not make economic sense to try to save the state. Thus, even an ardent mainstream neoclassical economist, which Nordhaus is, can agree that discounting has its limits (Nordhaus 1999).

Dynamic Efficiency. An extension of the present day value mindset leads to the concept of *dynamic efficiency*. Mainstream economists are focused on achieving the most efficient use of resources and have devised a way to divide the pie of a finite non-renewable resource between present and future generations using discount rates. An example of this is illustrated below in a graph modified from Harris that shows the efficient amount of a resource (e.g. copper) to use today is determined by crossing the demand curves of the present and the future time periods (projected as mirror images) of over an X axis representing the total quantity of the resource. (Harris 2002).



(Modified from Harris 2002, 67)

Figure 4. Dynamic Efficiency

Note that without regard to the future, mining companies today could efficiently take a quantity of copper up to 200. Using a discount rate, they arrive at the curve PV[MNB_2], which is half that of the present day demand curve MNB_1. By factoring in the needs of the future, reduced by a discount rate, economists decide that it's most efficient to hold off mining those extra 50 units of copper today and saving it for the future. Writes Harris:

> We can justify using up copper today so long as the benefits from doing so outweigh user costs imposed on future citizens. But once the user costs become higher than the benefits from consumption today – in our example, at any level of present consumption above 150

units – we reduce total economic welfare by our excessive present consumption. (Harris 2002 p. 68)

In practice, shifting the quantity from 200 to 150 creates a new supply curve, and in Harris' example the distance between the old and new supply curve is $25. We have effectively shifted the market equilibrium by internalizing the cost of taking copper from future generations. This new equilibrium is called *dynamic equilibrium* (Harris 2002). The process described here is what Goodstein refers to when he says neoclassical economists try to achieve the maximum net national welfare over time, a goal known as *dynamic efficiency*.

Ecological Sustainability. The concepts above aid in a closer look at the economic sustainability debate – the starting point for exploring disagreement between the neoclassical and ecological camps. In his book *Beyond Growth*, Herman Daly calls for a shift from the neoclassical economic norm of *quantitative* expansion, or growth to a concept of *qualitative* expansion. He says society should strive for a state of *strong sustainability* – where man-made and natural capital are treated as complements and kept in fixed proportion. Daly says the neoclassical model essentially ignores the value of natural capital:

> In the standard economic textbook view, we consume only that value which we have added to natural resource flows. And then we add it again to the same indestructible building blocks, and consume it again, add it again, etc. in the celebrated circular flow (1996, 63).

On the climate change question, Daly countered economists who argue that climate change would have little effect on the U.S. economy because only agriculture – which represents about 3 percent of GDP – is sensitive to climate. "Evidently," wrote Daly, "it is the value added to seeds, soil, sunlight and rainfall added by labor and capital that keeps us alive, not the seeds, soil and sunlight themselves" (1996, 63). The critique of Daly and others who warn of wasting finite resources is grounded in the laws of *thermodynamics*, which bares a short explanation. The first law, the law of mass/energy conservation, states that all matter/energy is conserved in an isolated system. The universe is considered an isolated system. Energy and matter change form and they may dissipate, but they never disappear (England 1994; Natural Step 2002; Silberberg 2000). The second law describes entropy: a measure of the disorder or randomness, which in an isolated system always increases. Another way of thinking about entropy, formulated by economist Georgescu-Roegen, is to understand that "[I]n an isolated system, ... the available energy continuously and irrevocably degrades into unavailable states." The laws of thermodynamics demonstrate that many of the minerals used and fuels burned are finite stocks because their waste products and dissipated heat cannot be put to identical use again. Waste can pollute the land and poison the water and air.

Acknowledging the importance of natural capital to ecological economists, Nordhaus responds that ecological economists lack an approach to sustainability when it comes to truly strapped resources.

> Ironically, the sustainability paradigm has particular difficulty dealing with situations where a society has a finite stock of an essential resource and must allocate it over time. In such a situation, the criterion of maintaining capital intact is unattractive because the only sustainable (capital-intact) path is immediate and permanent starvation. A more attractive path would be one in which the resource is gradually reduced as the stocks run down while society hunkers down to await a rescue from a technological breakthrough. (Nordhaus, 320)

In addition to criticizing the unsustainability of the growth paradigm, ecological economists accuse neoclassical colleagues of oversimplifying the world by assuming perfect information in their models. They argue that rather than a machine that can be reduced to its parts and understood like a clock, the world is a complex and dynamic system and that underestimating this can lead to dangerous environmental problems (Norgaard 1984). Consider the non-linear nature of the earth's climate system and potential for abrupt changes discussed earlier.

Intergenerational Equity. Borrowing a page from the discipline of systems thinking, Norgaard introduces the concept of *co-evolution*, where natural and manmade systems evolve in unforeseeable ways. He says humans live in a world of both positive (self-amplifying) and negative feedbacks and writes: "Negative feedback mechanical systems facilitate prediction and prescription, thereby empowering their users, like neoclassical economists, with special authority." He says we need to "correct the environmental catastrophe this view creates." (Norgaard 1984, 82) He cites two examples: the rapid development of resistance by insects to pesticides that resulted in more environmental harm than the insect populations they were intended to eradicate; and the extinction of species and habitat and social systems with the introduction of industrial agricultural in the Amazon (Norgaard 1984). Recall that the *precautionary principle* is geared to avoid such problems (Harris 2002). This is a akin to the *safety standard*, which emphasizes human safety over efficiency as determined by cost-benefit analysis (the *efficiency standard*) (Goodstein 1999). As it relates to climate change, Lave and Dowlatabadi say the precautionary principle "states that humans should act to minimize the chance that Earth will be spoiled for future generations" (Lave and Dowlatabadi 1993 p. 1968). With this they have identified another key concept in the toolbox of ecological economists – *intergenerational equity*. Recalling the discussion on discounting, many environmentalists and some ecological economists find it unethical to place a lower value on future than present generations. Dartmouth economist Richard Howarth rejects the practice of equating the discount rate with the return to private capital because, he argues "greenhouse gas emissions abatement constitutes a type of insurance mechanism that reduces the risk that future generations will bear the impacts of catastrophic climate change." (Howarth 2001 p. 22)

Economic approaches to climate change. Economists propose many solutions to the problem. One of the offerings from the neoclassical camp comes from Nordhaus who has constructed a computer model intended to show the effects of certain climate change strategies on the nation's economy (Nordhaus 1999). The Dynamic Integrated model of Climate and the Economy (DICE) is structured on some familiar neoclassical assumptions among them: potential emissions are dependent upon current GDP and current state of technology, an opportunity cost today because of the diversion of scare resources from commodity production, and a 3 percent annual discount rate (England 2001). Nordhaus uses his DICE model to compare the price tags and global temperature change that could result from four approaches climate change over the next 500 years: 1) lowering the overall discount, 2) lowering only selected discount rates, 3) targeting spending directly to stabilizing the Earth's temperature and 4) seeking to stabilize a so-called intermediate variable such as greenhouse gas concentrations or emissions (Nordhaus 1999). He compares the results of these approaches with a baseline economically "optimal" approach in which the marginal costs and benefits of emissions are balanced. The optimal approach – which Nordhaus says allows temperatures to rise to unacceptably high levels – calls for expenditures of "$10 billion annually in the near term followed by $50 billion after a couple centuries" (1999). He concludes after running his model that the greatest progress against climate change with the lowest cost to the economy can be achieved by setting out to lower the Earth's temperature. The worst results came from an overall reduction in the discount rate. Nordhaus calls the results "sobering," because they demonstrate there is no easy way to use discount rates to efficiently meet long-term objectives. He concedes that climate change has thrown a wrench into the machine of cost-benefit analysis using present value calculations. He concludes (1999):

> When economic analyses cannot appropriately capture all the costs and benefits, the temptation is to turn to turn to simple solutions such as differential discount rates or

intermediate objectives. Just as trade sanctions are unlikely to be a powerful weapon for human rights, so are these makeshift proxies unlikely to be efficient ways of meeting long-term objectives. We are better served by looking at the ultimate objective – in this case, global climate change – and setting our policies with this objective in mind.

In a response from Nordhaus's own camp, Hasselmann said that the difficulty of calculating costs and benefits associated with climate change should not be a reason to abandon the approach but a challenge to incorporate uncertainty into future cost-benefit analyses (Hasselmann 1999). Others, like Pielke, Klein and Sarewitz say that given what they perceive as great uncertainties about the causes and effects of climate change, the most efficient approach is to invest in adaptation, not mitigation (Pielke, Klein, and Sarewitz 2000; Pielke 1998; Sarewitz and Pielke 2000).

Other economists, like economist Robert Ayres, say much stronger measures are needed. In the September/October 2001 issue of Word Watch, Ayres made a case for government restrictions on access to cheap, oil, coal and natural gas to spur the development of cleaner technologies. He faults the Bush administration for adhering to the principles of "conservative economic ideology" embodied in the work of Nordhaus, and writes that Bush's new energy policy was built on the virtually unquestioned assumption "that the only way to keep the U.S. economy healthy is to greatly increase supply – and consumption – of coal, oil, and natural gas." Noting that Bush had backed out of the Kyoto process, Ayres argues that the administration has ignored the logic of the IPCC's findings on climate change, and replaced it with neoclassical economic thinking, which argues that "the costs of any government inspired actions aimed at reducing greenhouse emissions will greatly exceed the discounted present value of the future benefits." (Ayres 2001, 14)

Ayres says that to help save the world from climate change, the nation must develop the next generation of energy technologies that rely on renewable sources – such as solar, wind and hydropower – delivered by non-polluting fuel cells or similar methods. Reminding readers that necessity was the mother of inventions such as fossil fuel use and its related technologies, Ayers says it should be so with a new generation of cleaner energy products. But – and this is where he splits with neoclassical thinkers – given the slow and hidden nature of climate change, he argues that government should create the necessity by cutting back access to cheap coal, oil and gas (Ayres 2001). Bryner notes that the concept of forcing the development of new technologies has been partially tested by the Clean Air Act, which by imposing new tailpipe emission standards, resulted in the development of air pollution control technologies such as the catalytic converter. But Congress has seldom pushed industry to innovate beyond what company experts say is technically feasible and thus "technology forcing has often meant forcing the more widespread use of already existing technologies required to meet stringent standards." (Bryner 1995)

Beyond setting total emission targets, the Kyoto Protocol has no mechanism for forcing new technologies, only incentives for sharing technology. Economists Warwick McCabe and Peter Wilcoxen say the protocol's emissions permit trading system is highly inefficient and could harm the world economy by altering the balance of trade. They propose an alternative system that combines attributes of permit trading and taxation to allow for significant greenhouse gas cuts while protecting nations from large shocks to their economy. The method relies on the assumption that when it comes to abating climate change, the marginal cost curve of abatement is steep while the marginal benefits are relatively flat. That is because it costs a lot in the short term to cut back on emissions and few benefits are realized until much later. Given this, the authors argue for a system of fixed emissions permits – their number geared toward specific emission reductions – that could be traded internationally. In the event the market prices climbed to an agreed-upon ceiling deemed economically dangerous, national governments could introduce temporary permits – say, good for only one year – at the high ceiling price. These annual permits could reduce the shock to economies as they work their way painfully (but not fatally) toward meeting set goals (McKibben and Wilcoxen 2002). They argue that beyond standardizing permit prices and ceilings, national participation should be voluntary. They also do not specify reduction targets. They say it would end the debates about political sovereignty and high costs of abatement and also provide a more flexible tool for nations to address the uncertainty of climate change (McKibben and Wilcoxen 2002).

Environmental Discourses

As is clear from the comparison of neoclassical and ecological economics traditions, debate about the environment is often wrapped up in competing opinions about humanity's place in the world and competing notions of progress, ethical behavior and the needs of society. The divisions described in the previous section are only the tip of the iceberg, as environmentalism comes in many forms. This section explores a variety of environmental discourses as identified in Dryzek's elegant typology in his book The Politics of the Earth, mentioned earlier in the chapter. Understanding the scope and origins of environmental viewpoints can be useful. Beyond an intellectually satisfying exercise, it can enable people to bridge disagreements and find common ground to address social and ecological problems. In this study it serves to provide a broader social and historical context for arguments that appear in the news media about the ozone hole and climate change. It enables, if only informally, the gauging of the wider relative prevalence of discourses in the news media's coverage – in other words, a look at which school of thought is getting its message across louder in the press. This section briefly summarizes four major categories of discourses defined by Dryzek – Limits, Problem Solving, Sustainability and Green Radicalism – and the nine discourses within them. To the best of the dissertation author's ability, they are summarized along the lines of their doctrine (underlying philosophy), formula (norms of conduct) and Miranda (symbols). The nine discourses are not mutually exclusive, that is, a person's environmental views likely comprise two or more of the nine philosophies presented here. Not included in that number, though represented in different ways by several of the nine discourses, is the dominant discourse of modern society: industrialism. Dryzek writes that industrialism "may be characterized in terms of its overarching commitment to growth in the quantity of goods and services produced and to the material well-being which that growth brings" (1997). He writes also that host of "isms' – liberalism, conservatism, socialism, Marxism and fascism – all subscribe to industrialism. In the United States it is safe to say that it is the status quo. The table below outlines the structure of Dryzek's category system and includes his chapter titles, which correspond to the gist of each discourse.

Table 3. Dryzek Environmental Discourses

(Table assembled from Dryzek 1997)

Category	Discourse	Catchphrase
Limits	Survivalism	"Looming Tragedy" (1997, 21)
	Promethean	"Growth Forever" (1997, 45)
Problem Solving	Administrative Rationalism	"Leave it to the Experts" (1997, 63)
	Democratic Pragmatism	"Leave it to the People" (1997, 84)
	Economic Rationalism	"Leave it to the Market" (1997, 102)
Sustainability	Sustainable Development	"Environmentally Benign Growth" (1997, 123)
	Ecological Modernization	"Industrial Society and Beyond" (1997, 136)
Green Radicalism	Green Romanticism	"Save the World through new Consciousness" (1997, 155)
	Green Rationalism	"Save the World through New Politics" (1997, 172)

Limits. The limits discourse embodies the two sides of the debate about the limits of natural resources, including sources of raw materials and sinks for pollutants, discussed in the preceding section on economics. The discourse of *Survivalism* holds that people are using up the world's limited resources at a rate that will bring disaster upon humanity. It is summed up beautifully in the words of Karl-Henrik Robert, a Swedish cancer researcher, who founded The Natural Step, a non-profit consulting company that promotes sustainable practices: "As we busy ourselves with tearing down more than we rebuild, we are racing toward world-wide poverty in a monstrous poisonous garbage dump" (Robert, 11). Dryzek notes that the survivalism discourse has its roots in the work of systems thinking computer modelers who sounded the alarm about the growth in resource use in the early 1970s in a popular book called Limits to Growth. The 1992 sequel to the work, Beyond the Limits, concludes:

> "Human use of many essential resources and generation of many kinds of pollutants have already surpassed rates that are physically sustainable. Without significant reductions in material and energy flows, there will be in the coming decades an uncontrolled decline in per-capita food output, energy use, and industrial production (Meadows 1992, xvi)

The doctrine of the survivalist discourse is limits. Its warnings are echoed in the words of many ecological economists, such as Herman Daly, who are concerned with the welfare of future generations. Its miranda includes the exponential curve of growth and the warning of Garrett Hardin's "Tragedy of the Commons" – an archetype in which common resources (such as fish in the sea) are exhausted by takers motivated by their individual wants and oblivious to the need for a communal solution to manage scarce or renewable resources (Senge 1990; Dryzek 1997). Dryzek sums up the formula of survivalism as "think globally, act globally" (1997, 41)and argues that beyond raising awareness – itself a critical function – discourse lacks a clear plan of action.

The antithesis of survivalism, the *Promethean* discourse, is also about limits – it sees none. This discourse, which Dryzek says views natural resources as inexhaustible brute matter, reflects the technological optimism of the neoclassical economists quoted in the previous section. Dryzek sums up Promethean doctrine as follows:

> In Greek mythology, Prometheus stole fire from Zeus, and so vastly increased the human capacity to manipulate the world for human ends. Prometheans have unlimited confidence in the ability of humans and their technologies to overcome any problems presented to them, including what can now be styled environmental problems.

Promethean miranda includes markets, technology and competitive entrepreneurs. Dryzek cites the "anti-government market-oriented" stance of the Reagan administration as an embodiment of Promethean ideals. Reagan appointees James Watt and Anne Gorsuch Buford, Interior Secretary and EPA Administrator, respectively, carried out the formula: "Watt favored rapid development and disposal of public lands and justified his approach to Congress by saying that he saw no point in preserving lands because he 'did not know how many future generations we can count on before the Lord returns'" (Layzer 2002, 240). Of Buford, Dryzek charges she "turned policymaking over to the polluters the EPA was supposed to regulate" (1997, 55).

Problem Solving. The problem solving category and its three environmental discourses encompass mainstream approaches to problem solving within the status quo of industrialism and liberal capitalism, which serve as their doctrine. Briefly, the *Administrative Rationalism* discourse is partial to the strategy of leaving environmental problem solving to elites and agency bureaucrats. Its formula is bureaucracy and miranda the concerned but reassuring expert. The discourse of *Democratic Pragmatism* leans in the opposite direction, encouraging public and community participation in environmental matters. The concept of citizen participation is central to doctrine, formula and miranda of this discourse. The Economic Rationalism discourse is a distillate of the Promethean discourse that advocates wide scale privatization of natural resources

– including land, air, water and even wildlife – and is characterized by "unremitting hostility to environmental management on the part of government administrators" (Dryzek 1997, 102). The discourse holds that privatization can help solve environmental problems. Tradable pollution permits, such as those used in the U.S. today for sulfur dioxide and proposed in the Kyoto agreements, make sense to economic rationalists provided the market is left to determine the price of clean air or clean water. Its formula is the market and its miranda evokes freedom from onerous government regulation.

Sustainability. Recall from the previous section that the Brundtland Commission defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Vig and Axelrod 1999, 7; Nordhaus). Many of the concepts of this discourse were addressed in the previous section on economics. Its doctrine shares many of the same fears as the survivalism discourse and derives from the systems-thinking, systems-dynamic perspectives. But instead of calling for drastic cuts in global resource use, sustainability proposes a more appealing middle path. Its appeal is reflected in the political success of the 1992 United Nations Conference on Environment and Development at which world leaders representing 98 percent of the world's population in 1992 signed on to Agenda 21. The non binding agreement has been described as "the principal global plan to confront and overcome the economic and ecological problems of the late 20th century" that provides a "comprehensive blueprint for humanity to use to forge its way into the next century by proceeding more gently upon the Earth." (Sitars 1993 p. 1) Agenda 21 includes general strategies to encourage efficient use of natural resources and protection of global commons such as the oceans and atmosphere.

Dryzek divides sustainability into two discourses – *Sustainable Development* and *Ecological Modernization*. He labels the concept of Sustainable Development "Environmentally Benign Growth" (1997, 123). As with survivalism, its doctrine is grounded in global limits and its miranda the healing of interdependent ecosystems. But Dryzek criticizes the discourse for offering an appealing goal with little or no concrete formula and summarizes sustainable development's promise as a promise that cannot be kept: "We can have it all, economic growth, environmental conservation, social justice and not just for the moment but in perpetuity. No painful changes are necessary" (1997, 132). Others who subscribe to the sustainability moniker might find this characterization overly general and unfair. Robert, a leader in the global sustainable development movement, has articulated a four-step formula that is comprehensive and certainly not without pain. It includes conserving mineral resources and cutting back on fossil fuels, substituting unnatural compounds with others that break down more easily, using land more efficiently with fewer impacts, continuing to meet basic human needs while "using resources efficiently, fairly and responsibly" (Natural Step 2002). One concrete manifestation of the sustainability discourse is the ecosystem approach, through which policy professionals and resource managers work with myriad stakeholders, including everyday citizens, to protect the integrity of natural systems with distinct ecosystem boundaries – often through a combination of behavioral changes and technical solutions (Williams 2002). A good illustration of this can be found in the ecosystem management approach used in the Great Lakes Basin, which encouraged local citizen participation in the messy international and regional problem of polluted lakes, rivers and streams (Becker 1996).

If the Sustainable Development is generalist, the discourse of ecological modernization is more specific and centered around economics. Writes Dryzek, "The storyline of ecological modernization is that the capitalist political economy needs conscious reconfiguring and far-sighted action so that economic development and environmental protection can proceed hand-in-hand and reinforce one another" (Dryzek 1997, 143). The concept of pollution is equated with wasting money, and so ecological modernization stresses the logic of avoiding pollution problems today to save money in the future. Citing the work of Peter Christoff, Dryzek notes that the discourse can be divided into two categories: a "weak" or "techno-corporatist" version which emphasizes technological solutions to environmental problems in developed nations dominated by economic, scientific and political elites; versus a "strong" version that seeks broad structural changes to economic and social institutions worldwide while emphasizes democratic citizen participation in the process (Dryzek 1997, 147).

Green Radicalism. The discourse category of Green Radicalism includes the discourses of *Green Romanticism* and *Green Rationalism.* Unlike the previous discourses Dryzek notes that these reject, to a varying degree, principles of the Enlightenment – "the Eighteenth-century movement which renounced, religion, myth and traditional social order in the name of reason" (1997, 153) – largely taken for granted by the other foregoing discourses. Both "agree that technology wielded in human arrogance have meant massive environmental destruction, along with profound human costs" (1997, 153). Dryzek writes that Green Romanticism rejects anthropocentrism and Enlightenment values and generally has no use for government institutions. It encompasses a wide array of environmental philosophies that include deep ecology, cultural eco-feminism, eco-theology and eco-communalism. Among its most well known subscribers are members of Earth First!, known for raucous direct action including demonstrations, camping in trees, and sabotage of equipment used in projects deemed damaging to the environment.

By contrast, Green Rationalism is a more politically and institutionally engaged discourse that includes members of the European Green party, environmental justice movement and advocates of animal rights (Dryzek 1997). The doctrine of both recognizes global limits and the interconnectedness of ecosystems, but the rationalist formula includes working to change the system from within. Both find ways to draw attention to environmental matters and green messages are found in news coverage of the ozone hole and climate change. Finally, the miranda of greens is varied. Many romantics embrace a view of the earth as a living, self regulating system – as captured in the Gian hypothesis. In The Monkeywrench Gang, author Edward Abbey's character, Hayduke, litters the roadside with empty beer cans, capturing the attitude of some romantics that once developed, land is no longer worth keeping clean. Dr Seuss, takes a more rationalist approach in his classic environmental tale, The Lorax. Mourning a life spent in an industrial wasteland created by his greed, the Once-ler offers a warning to a young boy who hears his story: "UNLESS someone like you cares a whole awful lot, nothing is going to get better, it's not" (Dr. Seuss 1971).

Author's Observational Standpoint. Recall that Clark emphasized the importance to policy practitioners – and in this case, researchers – of being aware of their observational standpoint. An author's experiences and opinions inevitably color their work to a degree. In the interest of transparency, I will briefly shift to the first person to note two of the more important aspects of my observational standpoint – proverbial grains of salt with which readers can take this study's findings. First, as a former full-time news reporter and editor for more than ten years – three with The Associated Press in Boston – I am approaching this study as an insider. This has its pros and cons. On one hand, having reported complicated environmental stories on a daily deadline for many years and moved copy on international wires, I know first-hand the skills and pressures involved in producing my primary data source. Some of my own articles were automatically culled in the sampling of the original 21,000 stories on climate change. On the other hand, I cannot be accused of being an objective evaluator of journalistic standards. But my work on this study – including a review of literature on the press and policy – has sensitized me to some of the practices and institutional biases of the profession. These include striving to balance controversial stories with "the other side" – no matter how off-base the other side may be – and giving heavy preference to "expert" over lay opinions. Both of these practices have come in for criticism from scholars studying the media's coverage of climate change. The second important aspect of my observational standpoint comes from the study of earth system science, which has made me a firm believer that the ozone hole and climate change are enormously serious environmental problems. I believe that that climate change requires a global political solution that includes immediate and extensive cuts in the use of fossil fuel in developed and developing nations and a serious commitment to renewable energy. It should be done at a pace that can ensure that basic human needs, human rights and human dignity are preserved.

Research Products and Questions

In the pages ahead, this study examines a quarter century of news reports by three of the nation's biggest news outlets – The AP, United Press International and The New York Times – to see how the debate evolved in the press in both cases. The study takes notes on who said what, when, where and why to understand to what extent and where support or opposition to either policy exists in news content. In the process, the study seeks to describe and map the evolution of arguments relevant to the policy making process made by common participants in both debates – scientists, politicians, industry officials and environmentalists, among others. Further, the study keeps tabs on environmental discourses that underlie and sometimes drive those arguments. Apart from the foregoing case synopses, specific products of this research effort include:

1. Rhetorical landscape maps created using an original content analysis categorical system designed to systematically and transparently examine a data set of more than 1,000 news articles. The content analysis system and its place in the literature are described in detail in Chapter 2 (Methods) and its results are found in Chapter 3 (Coding Results).
2. A summary of structured interviews with seven participants in the policy process (including the environmental news reporters, a member of the US Congress and world-renown leaders in the scientific, industry and environmental communities) to help place the results in context. This comprises Chapter 4 (Interviews).
3. A synthesis of the study's coding, interview and discourse analysis results with literature on the U.S. role in the ozone and climate policies collectively geared to describing

conditions and trends that likely affected the current outcomes of U.S. position on both treaties and may affect it in years to come. This and the following two items are found Chapter 5 (Discussion and Conclusions).

4. A critique of the news media's reporting on the issues including recommendations for reporters and readers of this critical message source – including the study's seven participant groups.
5. A brief evaluation of the larger study – how it evolved, what it has helped accomplish, what its limitations are, and how it might be used in the future.

The table below, divided into four sections, provides a complete list of the research questions. It is intended to serve as a useful reference and a reminder of the progression of the overall study. The next chapter details the methods for answering these questions and includes a description of the original content analysis categorical system developed to examine the news articles.

Table 4. Research Questions

A. Overall Guiding Questions (Chapters III, IV & V)

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1. How have the sources, structure and content of arguments carried by mainstream American print media about the ozone hole and climate change evolved from 1980 to 2004?
2. What do the trends in social and decision process emerging from this analysis reveal about the relative success of the Montreal Protocol in the United States versus the failure of the Kyoto Protocol?

B. Coding Questions – from analysis of 1,076 news articles (Chapter III)

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1. Are the arguments supportive or opposed to the goals and/or principles of the policy?

2. In what proportion are the arguments international or domestic, and economic, political, social or environmental in nature?

3. What stakeholder groups are main sources/ subjects of the arguments?

4. What are the arguments' relevance to one or more of five policy issue criteria?

5. What are the trends over time in the above categories?

C. Interview Questions – posed to stakeholders (Chapter IV)

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1. What is your experience with climate change and/or ozone issues?

2. What role do you think your group has played and will play in the future with regard to US involvement in the climate change and/or ozone regimes?

3. What role do you think the news media has played and will play in the future with regard to US involvement in the climate change and/or ozone regimes? [Everyone gets this question but news reporters who've already answered it]

4. What do you think are the strengths and weaknesses of each policy effort – climate change and/or ozone. What would you recommend, if anything, be done to improve them?

5. Please describe what globalization means to you and mention a few ways, if any, you think it has affected and/or will affect US involvement in either policy effort.

6. What do you think the future holds for each policy?

D. Policy Sciences Analytic Framework Synthesis (Chapter V)

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1. What conditions and trends, both overall and within each cases' main participant/stakeholder groups, have led to the current outcomes? What direction are these trends pointing in the future?

2. What discourses are most prominent within and among the participant/stakeholder groups and in the news media coverage as a whole and how might that relate to outcomes?

3. What lessons do these findings hold for news reporters and editors and consumers of news?

4. What are the greatest strengths and weaknesses of this dissertation's methodology? How might it be improved and used in the future?

CHAPTER II

METHODS

Introduction

This chapter breaks down the methodology used to answer the research questions summarized at the end of the background chapter. The methodological centerpiece of this dissertation is its original categorical content analysis coding system, designed to systematically find and describe arguments in news reportage and characterize their relevance to the policy making process. As noted earlier, the data from this exercise – both qualitative and quantitative – can be used to help describe social and decision process surrounding a policy problem using the policy sciences analytic framework. The first section of this chapter, under the heading *Basic Methodology*, is devoted to describing in detail the coding system and how it can inform a policy sciences investigation. The text under this heading is a copy, with some minor formatting and organizational edits, of an article in press at *Policy Sciences* by the author and his advisers, professors Mimi L. Becker and Lawrence J. Prelli, entitled "Merging content analysis and the policy sciences: A system to discern policy-specific trends from news media reports." The article places this dissertation's analysis system in context with the literature on content analysis, the policy sciences approach, and content analysis methodology specific to studies of ozone and climate change news coverage.

The second section of this chapter describes some methodological adjustments and updates needed to move from the smaller pilot study described in the *Policy Sciences* article – an examination of 90 news stories about the stratospheric ozone problem written between 1980-1987

– to this dissertation's much larger case study comparison of 25 years of ozone and climate change coverage ending in 2004. This includes a description of a sampling strategy used to pare down a sample of more than 21,000 news articles on the climate issue, and some additional tools for note-taking while coding. Also described is a separate research protocol for the larger study: structured interviews with experts on the ozone and climate change problems and the news media's coverage of them. Finally, the general approach used to integrate the data from the news content analysis, the interviews and relevant published literature is discussed.

Basic Methodology

As noted above, the text under this heading is in press at the journal *Policy Sciences*. It is copyrighted by Springer, and until publication can be cited as follows:

Howland, Dave, Mimi L. Becker, and Larry Prelli. In Press. Merging content analysis and the policy sciences: A system to discern policy-specific trends from news media reports. *Policy Sciences*.

Abstract

In this article we set out to bridge a surprising methodological gap between two time-honored research traditions – news media content analysis and the policy sciences analytic framework. Lasswell, a recognized pioneer of both the method and the framework, discussed the mutual benefits of each decades ago. But few researchers, if any, have formally linked the two. To that end, in this article we 1) make the case for using news media content analysis to inform research studies using the policy sciences analytic framework; 2) introduce an original content

analysis categorical system for that purpose; 3) demonstrate that system with a study of 90 national news articles about the stratospheric ozone hole; and 4) compare our system to others used to examine news content. We report that our system, used by human coders, is well geared to describing and mapping trends in the social process surrounding the development of the Montreal Protocol ozone treaty during the intelligence gathering and promotion phases encompassed by our data sample. We argue that other content analysis systems fall short – in structure and purpose – of meeting the promise ours holds to the policy scientist.

Overview

Harold Lasswell, whose varied contributions to the social sciences spanned many disciplines, is well known for his pioneering work on communication theory and quantitative content analysis methodology (Danielson and Lasorsa 1997; Lasswell 1972, 1968; Neuendorf 2002). Lasswell (1971) is also recognized for establishing the policy sciences analytic framework, described by Clark (2002, 4) as "a set of integrated concepts or conceptual tools for framing thought and action and for guiding analysis, interpretation and resolution of any problem." Despite Lasswell's renown for his work in both the communications and policy sciences fields, studies explicitly merging content analysis with the policy sciences framework – apart from Lasswell's own writings – are hard to find. This methodological gap is surprising, given the utility of content analysis for policy research and the power of Lasswell's policy sciences analytic framework, which welcomes the use of multiple methods.

The purpose of this article is to introduce an original content analysis categorical system designed to bridge that gap on at least one front, drawing upon one of Lasswell's favorite data sources – the national news media (Danielson and Lasorsa 1997). Geared to writing an immediate first draft of history, news accounts are rich in description about the present and they both reflect and influence public opinion and policy formation (Bengston, Fan, and Celarier 1999; Huebner, Fan, and Finnegan 1997; Jamieson and Campbell 1988; Lang and Lang 1983; Nelkin 1995; Neuendorf 2002; Trumbo 1995; Wanta, Golan, and Cheolhan 2004). Our content analysis system – which produces maps of what we call the rhetorical landscape of policy formation – is designed to aid the policy scientist in the description of trends in social and decision processes surrounding a policy. Specifically, it enables human coders to do the following: identify arguments in news articles bearing upon a specific policy problem and solutions to solve it; assess the direction of the arguments relative to a specific set of policy goals and principles; categorize the content of the arguments; note the stakeholders linked to the argument; and sort the arguments for relevance to one or more of five dimensions of the policymaking process [noted in the previous chapter] that we call policy issue criteria. We could find no content analysis methodology with similar structure or purpose and none that unified the above elements of coding for direction, substance, stakeholders and relevance to dimensions of the policy process.

Within the policy sciences analytic framework, recall that Clark (2002) defines social process as the interaction of individual and organized interests in society that form the context within which all policy problems exist. It includes an accounting of participants, their perspectives, situations, base values, strategies, outcomes and effects. The decision process comprises seven activities of decision making, including the gathering and processing of information (Lasswell's intelligence gathering function) and the promotion of policies (the promotion function). To illustrate and test our method, we conducted a content analysis of 90 news articles about the stratospheric ozone hole written by the New York Times, The Associated Press and United Press International. We sought out and coded arguments relative to the goals and principles of the treaty forged to address the problem – the Montreal Protocol. We chose to examine the rhetorical landscape during the policy's intelligence gathering and promotion phases and thus selected articles written between 1980 and 1987 – the year the protocol was adopted. Our content analysis was driven by four basic research questions enabled by our coding categories:

1. Are the arguments supportive or opposed to the goals and/or principles of the policy?
2. In what proportion are the arguments international or domestic, and economic, political, social or environmental in nature?
3. What stakeholder groups are the main sources/ subjects of the arguments?
4. What are arguments' relevance to one or more of five policy issue criteria?

The answers to these questions provide a map that enables valuable understanding of the rhetorical structure and tenor of news reporting relative to the protocol. By analyzing combinations of these variables and their evolution over time, we can relate mapped trends to social and decision processes surrounding the development of the protocol. As we shall show, maps of the rhetorical landscape can inform policy related decisions and processes. Table 3 provides an overview of our approach that can serve as a useful reference throughout the article.

Table 5. Overview of model

1. Collect relevant news articles

News accounts about a policy problem are collected using online databases. Studies show news media reports both reflect and influence public opinion and policy making.

2. Code news articles

Through our categorical content system we:

- Identify specific arguments relevant to a policy problem and solutions to solve it
- Code those arguments for direction relative to goals and/or principles of a specific policy
- Describe the substance of those arguments

Table 5 Cont.

- Identify stakeholders linked to those arguments
- Match arguments to one or more of five dimensions of the policy process

3. Use coding results to inform elements of policy sciences analytic model

Analyzing empirical coding data and content of coded arguments enables description of:

- Social Process – (particularly) participants, perspectives, situations, base values and strategies
- Decision process – (particularly) intelligence gathering and promotion
- Trends – in each of the our content analysis categories and above policy sciences elements

We argue that our categorical system stands out in the content analysis literature as uniquely suited for our task of analyzing and describing policy-relevant news media accounts. We begin by showing the need for a categorical system that can help integrate content analysis methodology and the policy sciences. Second, we articulate that categorical system. Next, we report the results of our sample study using that system to address the four research questions outlined above. We then discuss the advantages and limitations of our proposed system for informing policy analysis using the policy sciences analytic framework.

Content analysis and the policy sciences

In an examination of the evolution of Lasswell's writings on content analysis, Danielson and Lasorsa (1997, 104) note that Lasswell and colleagues believed humans lived in a "symbolic environment," an "environment of words and images … of meanings that surround us from our earliest moments of existence." Lasswell clearly thought content analysis was a useful method for mapping that symbolic environment as it was manifested in particular cases. For example, his 1927 dissertation applied content analysis to World War I recruitment posters and pamphlets that were dropped from airplanes and balloons. During World War II, he worked to describe and predict Nazi communication activity using content analysis of German newspapers, among other methods, to provide an important window on enemy morale (Neuendorf 2002). As Naisbitt (1982,3) reported:

> The strain on Germany's people, industry, and economy began to show up in its newspapers … Over time, it was possible to piece together what was going on in Germany and to figure out whether conditions were improving or deteriorating by carefully tracking local stories about factory openings, closings, and production targets, about train arrivals, departures, and delays and so on.

After the War, Lasswell developed methods including a precursor to computer-assisted coding while heading a program at the Hoover Institute and Library on War at Stanford University, Revolution and the Development of International Relations. He and his colleagues painstakingly transferred codes onto punch cards to run through a counter/sorter machine, all the while working to establish scientific standards for assessing applications of content analytic methodology. According to Danielson and Lasorsa (1997, 104):

> The methods they used to study the flow of symbols are not unlike those many researchers use today: They sampled text over time. They established the reliability and validity of their coding techniques. They counted the occurrence of key symbols in political documents and in the press. They counted what they called themes (i.e. symbolic condensations of textual units). They applied statistical techniques to describe their findings.

Based on this work, Lasswell is seen as a pioneer who developed "methods of pilot testing, coder training and reliability assessment that served as early models of current sound practice" (Neuendorf 2002, 36).

Lasswell also was interested in using the tools of content analysis to understand and solve policy problems. In at least two papers, Lasswell (1968; 1972) discussed how content analysis could augment studies of the policy process using his policy sciences analytic framework. This framework emphasizes problem-oriented inquiry centered around five intellectual tasks: clarifying goals, describing trends, analyzing conditions, projecting developments and inventing, evaluating and selecting alternatives (see also Brewer and deLeon 1983; Clark 2002; Lasswell 1971). Conducting this sort of inquiry requires an understanding of both the social and decision processes at work. Lasswell's social process model requires an inventory of the participants, or stakeholders, in the policy process; their perspectives, situations, base values and strategies; and the outcomes and effects of their actions. His decision process model focuses on institutional context: how information is gathered and ideas promoted, what solutions are prescribed, how they are enforced, how resulting disputes are resolved and how the entire process is evaluated and ultimately terminated (Brewer and deLeon 1983; Clark 2002; Lasswell 1971). Clark (2002, 9), an expert user of the policy sciences framework as applied to natural resources and environmental policy problems, underscored the importance of Lasswell's policy sciences analytic framework: "Just as we need maps to locate ourselves spatially in an ecosystem and to carry out management activities, we need realistic maps of the policy process in which we participate."

Lasswell (1968) thought those maps could be generated by sampling the flow of communication throughout society to disclose policy-significant trends. He proposed dividing the types of communication examined into eight base values categories within his social process model: "Power (e.g. Government, law and politics); Enlightenment (Language, science and communication); Wealth (Agriculture, industry and finance); Well-being (Safety, health and comfort); Skill (Education, arts, vocations); Affection (Family, fraternities); Respect (Classes, castes); and Rectitude (Religion, ethics)" (Lasswell 1968, 60). Lasswell (1968, 62) also presented as a "model of communication" the seven category social process model of the policy sciences analytic framework discussed above – participants, perspectives, situations, base values, strategies and outcomes (Clark 2002). Lasswell (1968, 62) related these categories to content analysis, observing that the seven elements together posed the question: "who, with what intentions, in what situations, with what assets, using what strategies, reaches what audiences, with what result?" This focus on communication as a process is one of Lasswell's most enduring contributions to the communication field, as well as a powerful methodological emphasis for policy analysts.

Four years later, Lasswell (1972, 307) challenged communication researchers to take a more active role in society as "a third, disinterested voice to supply a competing appraisal of the images spread by self-serving sources." He urged them to "report on the adequacy of flows of information that enter into policymaking, as well as on the functioning of the policy process at all stages" (1972, 301). He also demonstrated how each of the decision process functions are open to study and assessment using standards attached to each by the policy sciences framework. For example, researchers could appraise the intelligence gathering function for its "dependability, comprehensiveness, selectivity, creativity and openness" (Lasswell 1972, 308). He offered this approach as a way for communication researchers to "take some of our destiny in hand" and chided them with this closing remark: "I therefore pose the question: Do you think that you will get on with it?" (Lasswell 1972, 310).

Structure and uses of content analysis. To provide context for the methodology described in this paper, we now take a broader look at the use of content analysis today and the many forms it takes. Communications researchers, social scientists, psychologists, and commercial analysts study a wide array of messages – ranging from news accounts (e.g. Bengston, Fan, and Celarier 1999; Jordan and Page 1992; Zehr 2000) to academic and popular journals (e.g. Henslin and

Roesti 1976; Malone and Orthner 1988) and transcripts of hearings and interviews (e.g. Taber 1992; Korsmo 1990) to movies (e.g. Stern 2005), advertising billboards (e.g. Mastro and Atkin 2002) and Web sites (e.g. Musso, Weare, and Hale 2000). In addition, the studies explore a variety of dimensions of communication ranging from the structure of the message alone to characteristics of its source and the impact of the message on its receivers.

Today, many studies, whether funded by government agencies or by the private sector, examine message content to inform policy making and governance. In the 1970s, the U.S. Bureau of Alcohol, Tobacco and Firearms and the Department of Health, Education and Welfare funded separate content analysis studies in Michigan as part of efforts to gauge the effects of alcohol advertising and children's television programs respectively (Neuendorf 2002). Taber (1992), a political scientist, conducted a content analysis of Congressional Record documents to build a model to anticipate decisions of policymakers to specific events, including an invasion of South Korea by North Korea. Huebner and colleagues (1997) conducted a study of news articles written over a year's time to gauge the impact of media coverage on public opinion surrounding President Clinton's universal health insurance proposal. In a study supported by the U.S. Department of Agriculture's Forest Service, Bengston et al. (1999) analyzed online news articles about U.S. national forests to measure changes in public opinion about the recreational, commodity, ecological and aesthetic values of forests. Musso and colleagues (Musso, Weare, and Hale 2000) analyzed 270 municipal Web sites in California against a theoretical framework for management and government designed to evaluate the performance of local governments. These are but a few examples of how the method of content analysis can be used for policy-relevant research. Lasswell understood the potential of content analysis to better understand the policy process, specifically, using his policy sciences analytic framework.

Neuendorf (2002) offers a useful integrative model of content analysis that enables us to classify content analysis studies according to whether they focus on one or more of the following qualities: the source of the message; the message and channel it follows; and the receiver of the message. One limitation of content analysis is that it can only "describe message characteristics or identify relationships among message characteristics … " (Neuendorf 2002, 53). Content analysis cannot substitute for other methods, such as polls, surveys, and interviews used to understand communication. But in combination with one or more of these other methods, content analysis methodology can help researchers study relationships between messages, senders, and receivers. Neuendorf (2002, 66) cites the work of Gottschalk et al. as an example of studying message senders. Gottschalk and Fronczek analyzed the content of subjects' reports of dreams and then combined this data with physiological measures of the subjects taken at three different levels of consciousness to reach conclusions about their "cerebral representations of hopefulness and hopelessness" (Gottschalk, Fronczek, and Buchsbaum 1993, 14).

In the field of mass communications, agenda setting research often combines news media content analysis (the message) with survey data to draw conclusions about the effects of news coverage on public opinion (the receiver) (e.g. Wanta, Golan, and Cheolhan 2004). An ambitious study by Trumbo (1995) outlines a method to map synergistic effects between the media, public opinion, and policymaking – wherein each plays a role as source and receiver. Simpler, but no less informative, are some studies that examine message content alone without linking data to source or receiver. Dixon and Linz (2002) do this in an analysis of news coverage of pretrial publicity of criminal defendants in Los Angeles that focused on the relationship between reported race of the defendants and the amount of prejudicial information – as defined by the American Bar Association – contained in newscasts. They found that blacks and Latinos were twice as likely to be associated with prejudicial statements.

News articles as data. Of all the sources of messages available for analysis, Lasswell and his colleagues working at the Hoover Institute put a premium on newspaper reports, which they found "accessible and rich in the vocabulary of political ideology current among the elite at any given time" (Lasswell, Lerner, and Pool 1952, 17). Studies show that the news media reflect and also influence both public opinion and policy making. Bengston, Fan and Celarier (1999, 187) report: "Analysis of the content of news media has repeatedly been shown to produce results that are remarkably similar to attitude surveys and opinion polls." Conversely, research on agenda setting theory shows that mass media "not only highlight important issues to consider but also provide interpretive frameworks that influence individuals to think about issues in certain ways but not others" (Huebner, Fan, and Finnegan 1997, 254). Further, Jordan and Page (1992, 227) report that analyses "have indicated that U.S. foreign policy corresponds with what a majority of Americans favor, and that "changes in collective public opinion are followed by congruent changes in policy about two thirds of the time." Such findings are summed up well by Nelkin (1995, 72), who writes: "It is the media that creates the reality and sets the public agenda, directly influencing policy decisions."

International news media, according to Schrondt (2001), resemble "professional intelligence services in both function and structure." Schrondt concurs with Whaley (Whaley, 1973 cited in Schrondt 2001) who wrote of news services: "They ferret out, collect, collate, evaluate, analyze, summarize and report vast quantities of information, and they do so with an organization comprising correspondents in the field with their local networks and stringers." Given the comprehensive nature of news accounts, a sizable sample of articles can yield much information about a policy issue. We turn now to our method, illustrating it at all stages with our study of news coverage about the stratospheric ozone problem.

A new category system for mapping the rhetorical landscape

Finding articles to code. The news media was and continues to be integral to the Montreal Protocol policy process. Wrote Benedick (1998, 28), a principal architect and chief U.S. negotiator of the protocol:

The U.S. media played an important role in keeping the issue before the American public through press and television coverage of the scientific theories and warnings over use of CFCs. After the diplomatic negotiations began in 1986, media attention intensified; the ozone threat was featured in such widely circulated magazines as Time and Sports Illustrated.

We selected articles from three news sources for our study: The AP, UPI, and The New York Times. The AP and UPI are international news wire services and the New York Times is a daily newspaper distributed internationally in print and worldwide on the Internet. We chose these organizations because of their ability to reach millions of readers in the United States and around the world; the accessibility of their articles via archives on the Internet; and their consistent and relatively high ethical standards (The Associated Press 2003; United Press International 2002; The New York Times 2003).

We accessed news articles from the Lexis-Nexis database, requesting stories from The AP, UPI, and New York Times written between 1980 and 1987 – the eight years leading up to the enactment of the Montreal Protocol – that contained in their body the terms "stratospheric ozone" or "ozone hole" or "Montreal Protocol." To avoid duplicates of the same wire service articles, we selected only AM (morning) and BC (both news cycle) stories. BC stories are essentially identical stories that run in both the morning and evening news cycles. This process yielded 90 articles for us to code, with the bulk of stories written in 1986 and 1987.

Unlike the Bengston and Huebner methods, which rely on computer programs to identify and code phrases, our method used the judgment of human coders. Scholars on argumentation and persuasion (Bitzer 1959; Woodward and Denton 2000) have long contended that important elements of arguments are often implied rather than explicit in statements made within a text. We believe human coders are more alert to those implied elements as they read arguments in their context. Thus, whatever our method lacks in relative speed of analysis and quantity of articles analyzed, it makes up in quality of analysis. In some cases, text is best analyzed by humans because, as Stone put it, "somewhere embedded in the analysis is a very human judgment" (Stone 1997, 47).

Our coding scheme can be accomplished on pencil and paper but we use a qualitative analysis program (Atlas.ti 2003) that allows us to load our articles in text format onto a computer screen, electronically highlight passages, and assign our codes to them. We can easily search and sort our results using an electronic search function. Separately, we record the presence or absence of codes using ones and zeros in a computer spreadsheet program which enables us to make graphic charts of our findings.

Researchers code the articles by following four steps: (1) identify statements to be coded; (2) assign each statement one or more of 16 codes to establish the direction and substance of the argument relative to the proposed policy (these codes can only count once per article); (3) assign each statement one or more of five policy issue criteria codes; (4) note the source/subject of each statement and assign it a corresponding code (i.e. a statement by a scientists would be coded "scientist").

Identifying arguments in articles. Researchers seek out statements in news articles that bear upon (1) the destruction of stratospheric ozone by manmade chemicals called chlorofluorocarbons (CFCs) and/or (2) proposals to solve the problem of stratospheric ozone depletion. Statements qualify for coding if they comprise both a claim and data. These elements of argument, drawn from Toulmin's theory of argument (Toulmin 1958; Toulmin, Rieke, and Janik 1979), constitute the "main proof line" (Brockriede and Ehninger 1960), which Hauser (1986, 178) succinctly explains as follows: "Data answers the question, 'What have you got to go on?' ... Claim is the inference drawn as a conclusion from the data. It is where we are going with the argument." Consider the elements of two example arguments, which we will refer to as we describe our coding steps. Note first that both arguments are relevant to either our policy problem or the proposed solution.

Claim: "Dr. Joseph M. Steed, a DuPont scientist, said, 'discussion of the possible effect on ozone from chlorofluorocarbons alone is unrealistic and does not reflect real world conditions.'" Data: "He said new computer calculations made at the Lawrence Livermore National Laboratory suggest there will be no change in the ozone layer over the next century when the combined effect of several chemicals are considered" (Connell 1982).

In this case, the underlined claim is supported by "new computer calculations." Those calculations are what Steed, in the words of Hauser, has "to go on."

Claim: "Ms. Ehrsam said McDonald's products would continue to be sold in foam packages, but they will be manufactured with hydrocarbon-based blowing agents. Data: "She said these agents are considered environmentally safe by federal authorities. 'We don't anticipate any added costs to our customers, she said in a telephone interview'" (Goeller 1987).

Here the claim that McDonald's will continue using foam packages is supported by two forms of data: the contention that the new foam packages are environmentally safe and that using them will likely not cost more. Often claims and data are lumped closely together, but sometimes they are in separate parts of the story. Transition words like "because," "thus," and "therefore" are good indicators of data and claims but they are not always present, as with the first example above. Sometimes several claims made in one article rely on the same statement or statements of data. Here again we see the necessity of human evaluation to detect connections between claims and data.

Coding the Direction and Substance of Arguments. Before we can code an argument about stratospheric ozone depletion for its relevance to the Montreal Protocol, we must more narrowly define what we mean by the Montreal Protocol. This is necessary to ensure focus and consistency. Thus, for coding purposes, we define the Montreal Protocol by its most basic goals and principles, which we distilled from the original 1987 document. The goals are to freeze CFC emissions in 1989 at 1986 levels; reduce emissions by 20 percent in 1993; and by another 30 percent by 1998. The principles comprise the 244-word preamble to the original protocol (UNEP 1987 reprinted in Benedick, 353).

Having identified an argument, coders then proceed to code it for both rhetorical substance and direction relative to the goals and principles of the Montreal Protocol. Direction refers to whether the argument is opposed or in support of the protocol. For example, an article might contain several arguments against cutting back the production of chlorofluorocarbons (CFCs) to halt the worldwide destruction of stratospheric ozone. If the proposed policy being studied is the Montreal Protocol, which calls for just that, then these statements would be coded as arguments "Against" the proposed policy that are international or transboundary. Substance refers to two sets of criteria: First, whether the argument is economic, political, social, or environmental (we use the more inclusive but slightly less intuitive term "natural"); and second, whether it is international or domestic in scope. For example, if opposition to the protocol is based on, say, the exorbitant cost to transnational corporations, the substance of the argument would be coded "Economic," rather than "Social" or "Political." It would also be coded "Transboundary," rather than "Local." An argument that is determined to be "For" the Montreal Protocol and is "Social" and "Transboundary" gets the code "FST."

In all, this approach yields 16 potential code combinations for direction and substance. Eight are "For": FEL, FET, FPL, FPT, FSL, FST, FNL, FNT. And eight are "Against": AEL, AET, APL, APT, ASL, AST, ANL, ANT. We provide some examples below. Let's code our first sample argument from the DuPont scientist. Because the Montreal Protocol aims to correct the problem of stratospheric ozone depletion by eliminating CFCs, we can conclude by reviewing our criteria and the goals and principles of the protocol that this statement is "Against" the protocol.

The data are grounded in scientific research on the environment and so we code the argument "Natural." Finally, the argument is concerned with a transboundary phenomenon – the destruction of ozone – and so we code it "Transboundary." The result is the three-letter code: ANT.

Now to the second argument, which qualifies for more than one code. McDonald's has announced that it is giving up on packaging containing CFCs and switching to products that do no not harm the ozone layer. This is clearly in line with the goals and principles of the Montreal Protocol and so we code it "For." The data, again, are concerned with environmental quality and so we code it "Natural." However, a case could be made that this argument is also "Economic" because the data indicates that environmentally safe substitutes are commercially available. Is it Transboundary or Local? On this, the two codes split. Environmentally, it's a transboundary issue, because CFCs know no borders. Economically, it's a local issue, because elsewhere in the article the McDonald's spokesperson said the packaging changes would take place first only in the United States. So we code this argument both FNT and FEL.

Coding Arguments for Relevance to Policy Issue Criteria. In the next step, the coders determine which of five criteria of effective policy making are put at issue by the arguments. These criteria include (1) the establishment of an accurate definition of the problem, (2) the proposition of a policy solution appropriate to the defined problem, (3) the acquisition of necessary support for the policy, (4) the technical feasibility of the proposed policy and (5) the establishment of accountability for carrying out the solution. It is possible for an argument to be relevant to just one or several of these categories at once. We call these criteria of "effective" policymaking because we believe each must be addressed and adjudicated during public policy formation (Lasswell 1971; Brewer and deLeon 1983). For example, news articles might contain statements contesting the theory that CFCs destroy ozone. This relates to the issue of whether the policy is based on an appropriate definition of the problem. Another statement might refer to the logistical difficulties of pulling off such a ban, which would clearly relate to the issue of feasibility. In sum, these five criteria enable us to envision the overall range of possible issues a proposed policy faces and get a sense of that policy's potential to resolve these issues.

Our sample DuPont argument is primarily relevant to the first of the five criteria: Does the argument relate to whether the policy problem is defined appropriately? Our McDonald's argument was coded twice. The first code, FNT, is relevant to several of the criteria: the definition of the problem, support for the policy, and the feasibility of the policy. The second code, FEL, is relevant to support for the policy and the policy's feasibility.

Identifying Stakeholder Groups. The final step in the coding process records the stakeholders (i.e. scientists, environmentalists, the public, and industry officials) that are explicitly linked to coded arguments. By explicitly linked we mean that the stakeholder is either the clearly identified source of an argument or a clear topic of the argument. For example, an argument by an environmentalist deriding industry's position on CFCs would be coded both "environmentalist" and "industry." Codes to identify stakeholder groups should be created only after completing the task of coding all arguments in the sample for direction, substance, and policy issue criteria. After examining the claims in this study, we created seven categories for stakeholders that appeared most often in the arguments: "scientists," "U.S. government," "industry," "environmentalists," "United Nations" and "Europe." This is a somewhat subjective process that depends not only on the content of the sample's arguments but the level of detail the researcher wishes to consider. Once the codes are defined, assigning them is relatively straightforward. Arguments that do not have explicitly named stakeholders are left without a stakeholder code. Allowing that stakeholders can wear more than one hat, a single source in an argument can be assigned more than one code. For example, our example statement by the DuPont scientist was coded "industry" and "scientist." Many arguments contain multiple stakeholders. The example below was coded "U.S. government," "industry," and "scientists."

"NASA, which will provide most of the money, will be joined in the effort by at least three other Federal science agencies; the Chemical Manufacturers Association; scientists from Harvard University, the University of Denver, and the University of Washington, and the governments of Argentina, Chile, France, New Zealand and Britain" (NASA team plans to investigate ozone hole above the Antarctic 1987).

Intercoder Reliability. The true value of our descriptive policy model lies in its potential to be effectively replicated and used by others. In their article on assessing and reporting intercoder reliability in mass communication content analysis, Lombard, Snyder-Duch and Bracken (2002, 589) define intercoder reliability as "the extent to which independent coders evaluate a characteristic of a message or artifact and reach the same conclusion." They note that when intercoder reliability is not established, the data and its interpretations of the data "can never be considered valid" (2002, 589). As noted earlier, in this study, we subscribe to a definition of validity that Schwandt (1997) calls "fallibilistic validity": "Here validity is understood as a test of whether an account accurately represents the social phenomena to which it refers. Yet no claim is made that … a valid account is absolutely certain. Defenders of this view hold that one can have good reasons for accepting an account as true or false, yet an account is always fallible" (Schwandt 1997, 169).

We tested our method by having two senior undergraduate students and an author/researcher independently code a subset of our sample (49 of the 90 articles) after undergoing five hours of training – which included coding five separate articles each – to familiarize themselves with the method and calibrate their judgment. After coding the five test articles, the team discussed the results and compiled some additional guidelines to help handle "tough calls" specific to their subject matter. The coding results discussed in this paper are those conducted by the researcher alone on the 90 article sample.

Lombard and colleagues (2002, 588) note that "there are few standards or guidelines available concerning how to properly calculate and report intercoder reliability" and few established standards for what constitutes acceptable intercoder reliability. To measure intercoder reliability, we chose both the commonly used percent agreement and the more rigorous Cohen's kappa test. For both measures, .00 = no agreement and 1.00 = perfect agreement. Percent agreement "is the percentage of all coding decisions made by pairs of coders on which the coders agree" (Lombard, Snyder-Duch, and Bracken 2002, 590). A kappa score is "a measure of agreement between two observers taking into account agreement that could occur by chance (expected agreement)" (*Kappa* 2000). Because of this, kappa scores, which are more conservative, are consistently lower than percent agreement scores. Given Lombard's definition of intercoder reliability, cited earlier, we can conclude that high scores indicate coders understand the coding categories in a similar way and apply them to get similar results.

There are few hard and fast rules for what constitutes an acceptable level of reliability. For percent agreement, we concur with "rules of thumb" from several methodologists compiled by Neuendorf (2002, 143) who writes that "coefficients of .90 or greater would be acceptable to all, .80 acceptable in most situations, and below that there exists great disagreement." She notes that more liberal criteria are used for more conservative measures, including kappa. We chose the following criteria by Landis and Koch (1977, 165) for interpreting the results of kappa tests: Poor = .0-.19; Fair = .2-.39; Moderate = .4-.59; Substantial = .6-.79; Almost Perfect .8-1. In Table 4 we report the percent and kappa scores for the level of agreement between our student coders and between the researcher and each student respectively for two categories of rhetorical direction; six categories of rhetorical substance; the aggregate direction and substance; and the aggregate policy issue criteria.

Table 6. Summary of Intercoder Reliability Results

		Coder 1/Coder 2		Control/ Coder 1		Control/ Coder 2	
	Code	Kappa	Percent	Kappa	Percent	Kappa	Percent
Direction Across eight variations of each code (N = 392)	For	0.66	0.85	0.65	0.84	0.73	0.88
	Against	0.45	0.94	0.39	0.91	0.34	0.92
Substance Across four variations of each code (N= 196)	Economic	0.37	0.90	0.43	0.90	0.46	0.92
	Political	0.38	0.80	0.47	0.80	0.58	0.83
	Social	0.79	0.93	0.65	0.90	0.66	0.90
	Natural	0.86	0.94	0.79	0.91	0.85	0.94
Substance Across eight variations (N= 392)	Local	0.11	0.92	0.34	0.93	0.33	0.93
	Transboundary	0.71	0.87	0.62	0.83	0.71	0.87
Direction & Substance (N = 784)	Above eight categories	0.66	0.89	0.62	0.88	0.68	0.90
Policy Issue Criteria (N = 245)	Combined five policy issue categories	0.56	0.78	0.55	0.78	0.55	0.77

(We did not test intercoder reliability for identifying stakeholders groups because it is found in explicit content and requires little, if any, judgment.) Note that the scores for direction and substance codes are based on a more thorough test of all of their possible combinations, as opposed to a more basic test of their individual presence or absence in the 49 articles. For example, the kappa and percent score for the code "For" collectively tests results for: FEL, FET, FPL, FPT, FSL, FST, FNL and FNT. Thus, the sample size is 392; that is eight possible combinations multiplied by 49 news articles. Likewise, scores for Economic codes are based on a test of all four possible combinations: FEL, FET, AEL and AET. The sample size here is 196; four possible code combinations multiplied by 49.

On the aggregate or overall direction and substance of arguments, the kappa test revealed a "substantial" level of agreement among all three coders. By our criteria, percent agreements were well within the "acceptable" range. Agreement among coders on the overall set of policy issue criteria was in the "moderate" range. Neuendorf lists four broad factors that can threaten reliability: a poorly executed coding scheme, inadequate coder training, coder fatigue and the presence of a rogue coder. We took care to avoid all of these by practicing, limiting our coding time to 90 minutes with breaks, and familiarizing ourselves with our own environmental biases.

Fair to moderate kappa scores and percent agreement in the low 80s reveal a need for improvement in the Political category. In the Economic and Local categories, we also netted only fair to moderate kappa scores but very high percent scores. This split is an artifact of the relative dearth of Economic and Local arguments in our data set and the kappa statistic formula itself. Kappa requires not only a demonstration that coders can agree when something is not present in the data but that that they also can agree when it is. In our case, the coders agreed overwhelmingly that Economic and Local arguments were absent from many articles in our data set. Because the sample of possible matches for present Economic and Local arguments was quite small, any mismatches in detecting the presence of these arguments carried a greater weight given how the kappa statistic is computed. The remedy for this could be more training on a data set richer in these types of arguments. However, to the extent news coverage is focused away from one or more of our substance categories and heavily on something else – as reports on specific topics are likely to do – this effect may again appear in our kappa scores. The more coders train and the wider variety of arguments they encounter, the more likely they will agree.

<u>Coder Orientation</u>. Though the coders follow the same instructions, they are also making subjective judgment calls which could be influenced by personal beliefs about the environment

and how humans interact with it. Dryzek notes that everyone subscribes to one or more environmental discourses. Because coders' varied environmental discourses have the potential to skew our intercoder reliability results, we had the students and researcher rate their agreement or disagreement – on a scale of 1-10 – with summaries of Dryzek's nine environmental discourses (Dryzek 1997).

For the purposes of our analyses in this paper, we identify our two student coders as "Coder 1" and "Coder 2," and the researcher as "Control." To assess the similarity between the raters' endorsement of Dryzek's nine discourses, a Pearson r (SPSS, 2003) was performed on the nine scores for each pair of coders with the following results: Coder 1/Coder 2 = .602; Control / Coder 1 = .878; and Control/ Coder 2 = .831. Overall, there is pretty high consistency among all three coders in preference levels for the nine discourses. We conclude from this that it would be hard to link any differences in news article coding outcomes to different environmental discourse preferences.

Policy-relevant "maps" of news reportage about the Montreal Protocol

Our categorical system yielded useful maps of the rhetorical landscape of the Montreal Protocol as manifested in news reporting. Here are the leading features of these maps. Are the arguments supportive or opposed to the goals and/or principles of the policy? In all, we identified and coded 294 arguments. Of those, the vast majority (79 percent or 231arguments) were "For" the Montreal Protocol's goals and principles. The remaining 21 percent (63 arguments) were coded "Against." In what proportion are the arguments international or domestic, and economic, political, social, or environmental in nature? We found that scientific and environmental (natural) arguments supporting the protocol's goals and principles predominated, followed closely by political and social arguments. Results were as follows: "Natural" (39 percent, 114 arguments), followed by "Political" (31 percent, 91 arguments), "Social" (19 percent, 56 arguments) and then "Economic" (11 percent, 33 arguments). International arguments outnumbered domestic arguments more than five-to-one and largely focused on the environmental consequences of the policy problem. "Transboundary" arguments (84 percent, or 247 arguments) predominated, as opposed to "Local" arguments (16 percent, 47 arguments). This was not surprising because our study examines a transboundary environmental problem. What stakeholder groups are main sources/ subjects of the arguments? The analysis identified principal stakeholder groups in our sample listed here in order of their relative prevalence as a percent of total arguments to which they are linked: scientists and researchers (35 percent, 113 arguments), U.S. Government officials and agencies (29 percent, 92 arguments), industry officials (10 percent, 32 claims), European officials (9 percent, 29 claims), the public in general (7 percent, 22 claims), the United Nations (7 percent, 22 claims), and environmentalists (3 percent, 10 claims). We also identified relationships between arguments and policy-related issues: definition of the problem; appropriate solutions; political support; technical feasibility; and accountability for implementation. Recall that more than one policy issue criteria code can be assigned to a single argument. Thus the percentages for the five categories of the whole sample (294 arguments) do not add up to 100. The percentage distributions follow: problem (59 percent, 172 claims), policy (35 percent, 103 claims), support (31 percent, 92 claims), feasibility (20 percent, 58 claims), and accountability (2 percent, 5 claims).

When examining these results it is useful to look at the distribution of substance codes (Economic, Political, Social and Natural) across each policy issue category to understand which kinds of arguments are more relevant to each respective policy issue criteria. Figure 1 shows the raw number of arguments between 1980 and 1987 that fell into each of our five policy issue criteria categories by direction and substance.

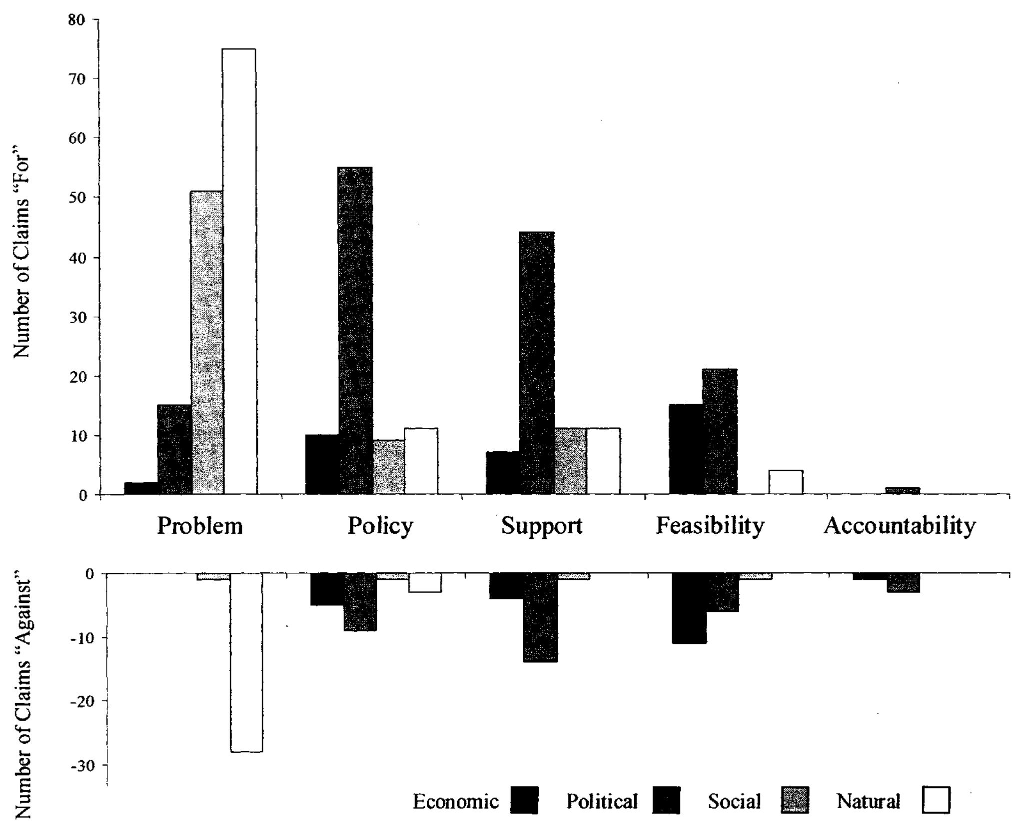


Figure 5. Policy issue criteria by direction and substance of arguments in news reports

We can ask, for example, if a discussion about the policy problem is mostly about economics or about natural science. We find that it is mostly about natural science. It is also useful, in some instances, to know what percent of a given substance category comprises the data assigned to a particular criterion. For example, a stack of economic arguments in the feasibility category might seem relatively small at first glance, but it represents the largest concentration of economic arguments among the five policy issue categories. We can claim that economic arguments are more closely tied to feasibility than any of the other issue criteria. Let's examine what the data tell us about each of the five policy issue criteria.

A majority of the arguments in the news reports were focused on the policy problem itself. Within that category arguments were predominantly about the natural environment (60 percent of 172 arguments) and cancer risks to society (30 percent of 172). When we examine the number of Natural and Social claims in the problem category as a percentage of the total number of each in our data the percentages jump to 90 and 93 respectively. In other words, more than nine out of 10 claims in both the Natural and Social categories have relevance to the policy problem. In contrast, Political arguments predominated on the policy issue (62 percent of a total 103 claims), followed by Economic and Natural arguments (15 and 14 percent, respectively of 103). Political arguments predominated on the support issue (63 percent of 92 claims), followed distantly by Economic and Natural arguments. Economic and Political arguments virtually tied on the issue of feasibility (45 percent and 47 percent respectively of 58 claims). The importance of Economic arguments to feasibility issues becomes clear when we consider that 26 of 33 Economic arguments in the entire data set are linked to feasibility. Put another way, more than three out of four Economic claims were relevant to feasibility. We found very few arguments (5 claims) related to accountability issues. The near absence of arguments related to that issue might be explained by the fact that the policy was new and that implementation monitoring and enforcement had not been initiated during the period of the study. It might also reflect a relative lack of interest in these matters on the part of the news media.

Discussion

We contend that our methodology for mapping the rhetorical landscape of policy-relevant news reportage (1) has utility for users of the policy sciences analytic framework, (2) improves upon other category systems and (3) raises important methodological issues. We shall discuss these in turn.

Utility for users of the policy sciences framework. The data appearing on our rhetorical landscape map can be used to chart an understanding of the social and decision processes surrounding the Montreal Protocol. Our system can inform understanding of at least five of the seven elements of the social process as defined by Lasswell and colleagues: (1) Participants: these are the people and organizations with a stake in the policy; (2) Perspectives: the varied viewpoints of these stakeholders; (3) Situations: the situations in which the stakeholders interact; (4) Base Values: assets used by stakeholders to pursue their goals (power, wealth, enlightenment, skill, well-being, affection, respect and rectitude); (5) Strategies: the approaches stakeholders use to achieve their goals (Clark 2002, 33-34). We do not list the sixth and seventh elements of the social process – the short-term "outcomes" and long-term "effects" – because our study is limited to news accounts written during the run-up to the actual adoption of the Montreal Protocol and the months just after its approval. We chose this time frame because we wanted to observe the social process during the policy's development. Our data therefore has little to say about outcomes and nothing to say about long-term changes. For the same reason, the demonstration of our method in this article is limited to the first two of the seven decision process elements: (1) Intelligence gathering: how information is obtained to make decisions, and (2) Promotion: defined by Clark as "recommending and mobilizing support for policy alternatives" (Clark 2002, 61). As the policy itself progresses, we can expect news reports to say more about the remaining five decision process categories: prescription, invocation, application, appraisal and termination.

To demonstrate the utility of our data for informing the social and decision processes, we will focus primarily on the largest group of participants (stakeholders) in our sample – scientists. Scientists took the lion's share of the media spotlight, appearing in 113 arguments, or 35 percent of the total. A quick review of these arguments shows that scientists represented a wide array of institutions, including universities in the United States and abroad, U.S. government agencies such as NASA and NOAA, and associations such as the National Science Foundation and the United Nations' World Meteorological Organization. A minority of scientists quoted in news reports worked for the chemical industry. Figures 2 gives data about the perspectives of our five biggest stakeholder groups over the entire sample period – from 1980 to 1987 – by tallying the direction and substance of the arguments to which they are linked.

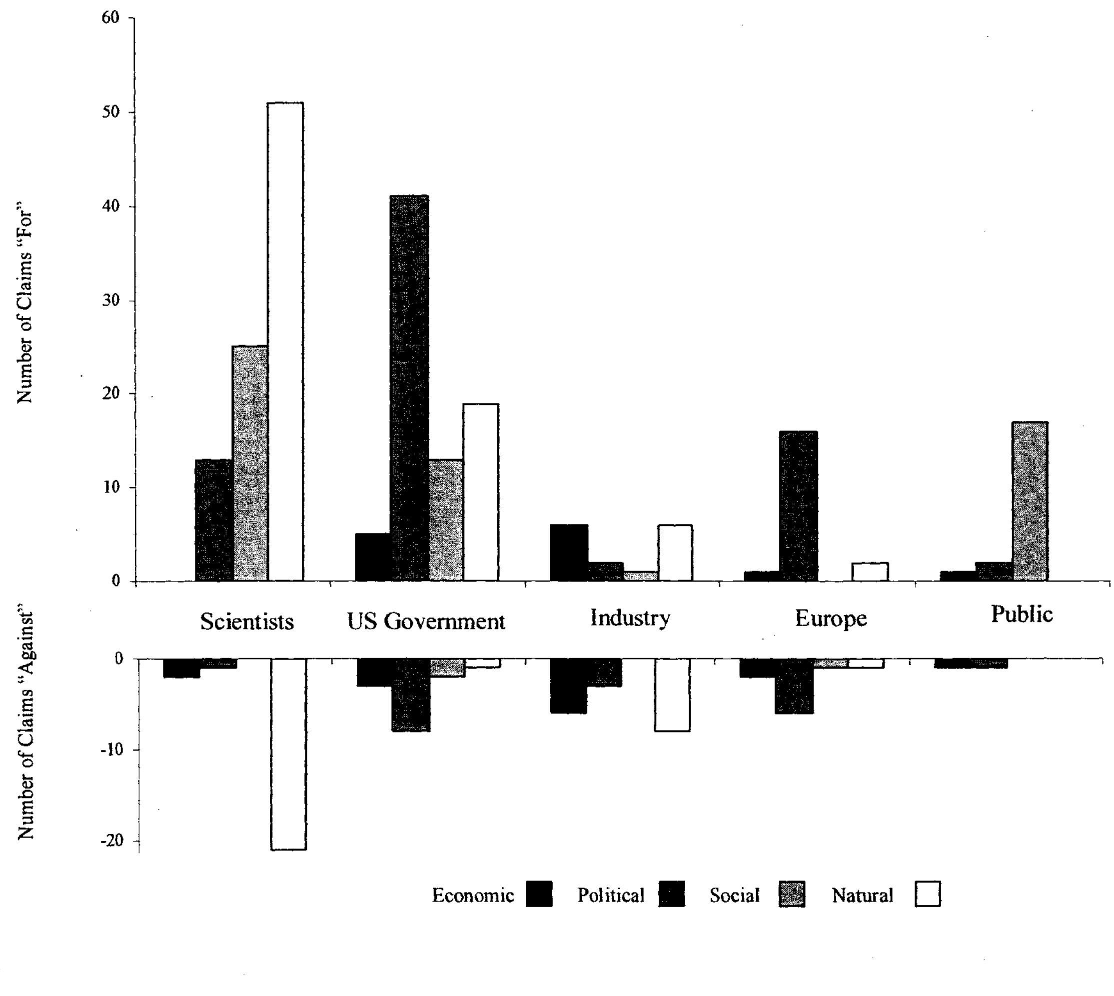


Figure 6. Stakeholders' arguments by substance in news reports on the ozone hole 1980-1987.

We can see immediately that the scientist profile in Figure 2 is a very close match in structure and size to the "problem" profile in Figure 1. Scientists' arguments were overwhelmingly, and understandably, grounded in research on the environment. By more than a two-to-one margin, their arguments supported the protocol's aims, whether manifested as direct quotes or as boilerplate background statements. This tells us much about the intelligence gathering function in the decision process. The following argument was typical:

> Scientists have strongly suspected for a decade that chlorine, and particularly the chlorofluorocarbons used in refrigeration, aerosols and other commercial applications, destroys ozone molecules and thus depletes the stratospheric blanket that filters out most ultraviolet radiation from the sun (Freudenheim, Clarity, and Mansnerus 1986).

Scientists' arguments coded "Against" the protocol typically presented alternative theories to ozone destruction or urged a wait-and-see approach, both of which run counter to the protocol's goals of quickly cutting back CFCs. By searching the code combination "scientists" "Against" "Natural" "problem" – we can focus on specific arguments and explore the reasoning behind them. The above search combination gets 22 hits, among them a claim from a Clarkson University professor that wind patterns were to blame for ozone destruction. The data we coded as backing this claim provides useful information: "'The observed 40 percent decline in Antarctic column density of ozone between 1979 and 1985 can be caused by a 16 degree Celsius (29 degrees Fahrenheit) cooling in the lower stratosphere. Such a temperature change has in fact occurred,' he said" (Darst 1987).

The data we've examined so far also can tell us a good deal about the situations of our stakeholders disclosed through the arguments. Scientists, for their part, mostly presented research results while politicians debated and promoted policy. Figure 3 shows that government officials were linked in far greater proportion than scientists to arguments relevant to policy and support – codes that collectively provide a gauge of the promotion function in the decision process.

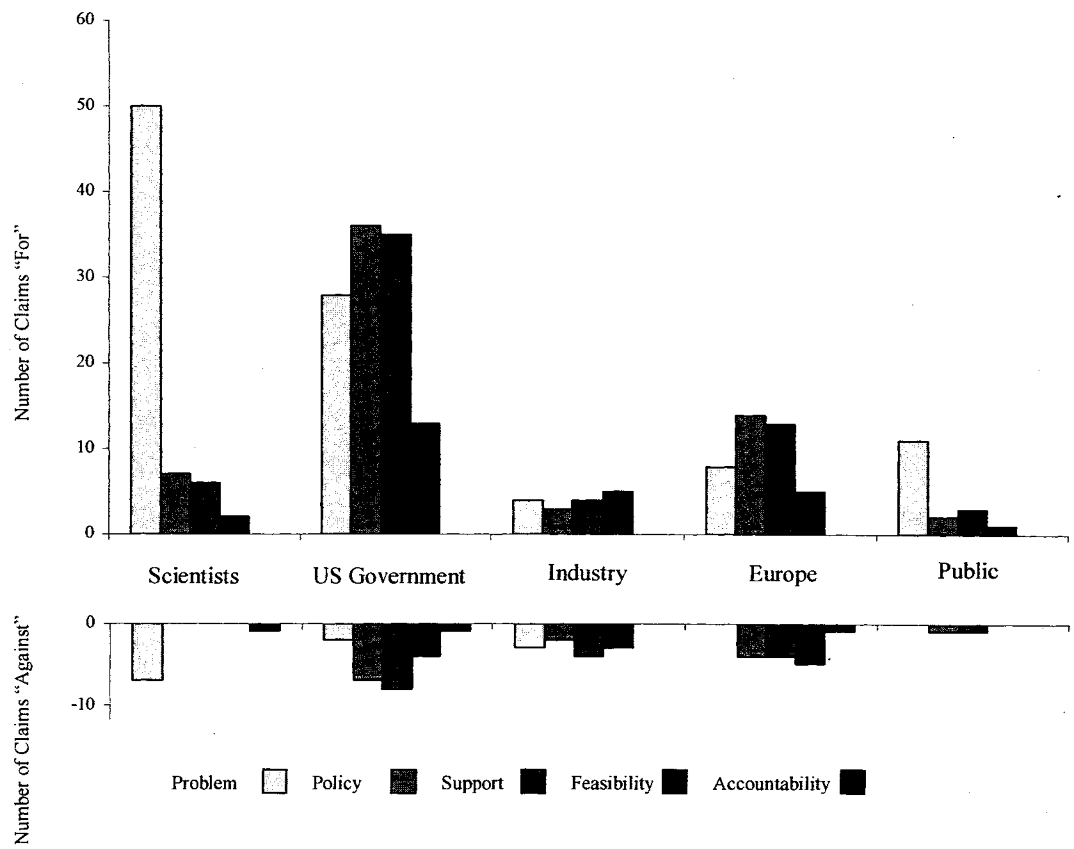


Figure 7. Top five stakeholder arguments by policy issue criteria in news reports 1987.

Figure 3 also shows some exceptions among scientists. By searching the corresponding code combination – "scientists" "For" "Natural" "policy" – we find that Sherwood Rowland, a pioneer in CFC-ozone research from the University of California-Irvine, urged U.S. senators at a hearing a month after the Montreal Protocol's approval to do more: "We need to act now and impose severe restrictions on CFC emissions immediately if we want to bring the chlorine concentrations in the atmosphere under control by early in the next century" (Goeller 1987). Our methodology enables us to focus in on Rowland's remarks, while our results tell us that among his peers his stance was the exception and not the rule – a rare example of policy promotion among scientists quoted in the news media.

While reviewing arguments, we can often discern the context or situation in which our stakeholders interacted. Scientists' efforts and opinions were a constant staple of news coverage. They often were cited in the release of new research findings or at the launching of research studies. Scientists also spoke at Congressional hearings and in interviews from research stations. As a whole, they were portrayed as busy, systematic, pursuers of data using high-flying airplanes, satellites, and computers in an effort to save the planet. We also find that some research scientists find themselves in a competitive situation. "'People always disagree with the competition,'" chemist Igor Eberstein told The AP in a story entitled "Theory Blames Ozone Loss on Snowballs from Space." Said Eberstein, who devised the theory with colleague physicist Maurice Dubin, "Like many new theories, it generates hostility from people who have established views" (Siegel 1987).

Examining the context of claims also provides insight into the base values of our stakeholder groups. Our data show that scientists command the bulk of news media attention regarding the stratospheric ozone problem, and that is an important form of power – the power to make one's message heard. Because of scientists' enlightenment about atmospheric chemistry and their skill at researching the problem of ozone destruction, they had the ear of policy making bodies, including Congress, which financed much of their research. Their wealth is in the form of government grants to pay salaries, launch and operate satellites, and sustain expeditions at the South Pole. Rectitude is apparent among scientists to the extent their comments reflect the ethics of their profession – such as not rushing to conclusions on limited data. Rowland, for his part, broke with convention by recommending a policy of "severe" cutbacks in CFCs. This was motivated by his concern for public Well-being. While doubtless important to scientists, little is mentioned in our problem context about the remaining base values of respect and affection.
The strategies element of the social process is difficult to illuminate with our data, but we can see political maneuvers used to capture the media's attention. Several stories in our sample focused on a controversial suggestion by Interior Secretary Donald P. Hodel that the U.S. government

consider promoting use of hats and sunglasses as an alternative to an ozone treaty and the reaction to it: "Environmentalists and members of both parties in Congress denounced the purported plan Friday as irresponsible and absurd" (Darst 1987).

On the other hand, we could not find (as did Benedick 1998, 5) the close collaboration between politicians and scientists, "who were drawn out of their laboratories and into the negotiation process," credited with raising the knowledge base about the ozone problem and communicating the need for a solution to the public. Benedick reports that this coordination was central to large media and diplomatic campaigns by the U.S. government and the UNEP for a global ozone treaty, but we found no explicit reference to this coordination. However, our data do show strong support for the protocol among scientists and government officials that certainly comports with Benedick's observations. Our data reveal elements of the social and decision processes, but also can, to some extent, conceal manifestations of those elements. For example, absent entirely from news accounts are voices of lay citizens. Instead, they are referred to by scientists and politicians as potential victims in sweeping statements about the public welfare and health of "Americans." For this, we created the stakeholder category entitled "public." Our data shows the public was overwhelmingly invoked in arguments favoring the protocol about the "problem" and "Social" danger of skin cancer. Environmentalist-related arguments barely registered in news reports. (They were attached to three percent of the claims.) The relative absence of these groups says much about who the news media chooses to listen to and who to ignore.

Let's now consider some of the policy-related trends disclosed in our data. We know that on balance the news reporting is overwhelmingly supportive of the goals and principles of the Montreal Protocol. More than half of all the arguments were about the problem. The problem is defined in the media as CFCs causing the ozone hole, leading to a human skin cancer risk. The bulk of articles (exactly two-thirds) were published in the busy last year of our sample, 1987. Examining the data over time, we see that spikes in news coverage – and by extension, spikes in rhetorical arguments – correspond with big news events such as international policy conferences, reports of scientific expedition results, and political controversies.

A plot of all arguments in 1987 – again, the busiest year of our sample – shows spikes in rhetorical arguments relevant to the protocol in March, May, September, and December. A review of these arguments enables us to assemble a timeline of what happened. In March, American scientists reported results from a large expedition to the South Pole. In May, a convergence of events attracted media attention, among them a UNEP conference in Geneva to negotiate a stratospheric ozone protocol, a Senate hearing on potential ozone regulations, and the fracas over Interior Secretary Hodel's "hat's and sunglasses" approach to ozone policy. September was the month of the Montreal Protocol's adoption. December turned to reporting on U.S. efforts to comply with the protocol. Against this backdrop, we can ask what the evolution of scientists' public rhetoric looked like in terms of direction and emphasis on the issues of policy formation and prescription.

Figures 4a and 4b show us a map of the evolution of scientists' rhetoric in 1987. Figure 4a displays the total number of claims by policy issue criteria without direction. Figure 4b displays direction as a differential between "For" and "Against" claims, leaving us with a single landscape where peaks indicate cumulative arguments "For" and valleys indicate cumulative arguments "Against." Together, these figures confirm that throughout 1987 scientists' public rhetoric was consistently focused on the problem and strongly in favor of the protocol throughout the events of May, March, and September.

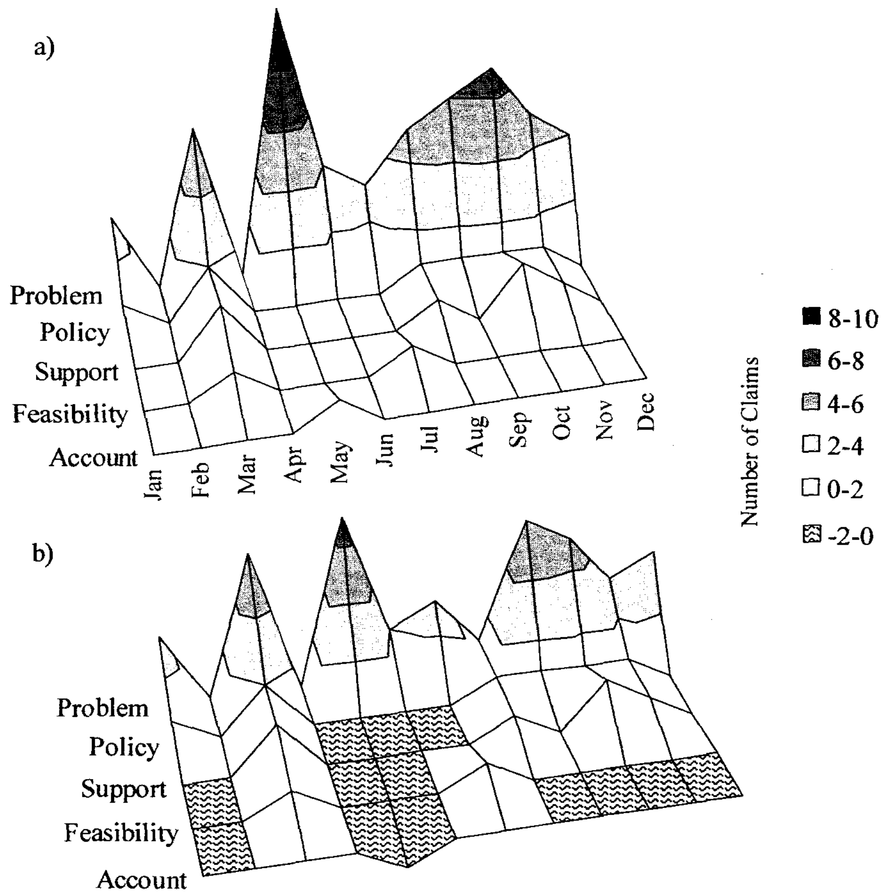


Figure 8. Scientists' arguments 1987 a) in aggregate b) as a differential ("For" – "Against")

In Figure 4a, an additional peak is visible in October. A look at the coded arguments reveals why we see a dip for that month in Figure 4b: Scientists warned at a Senate hearing that the ozone hole was worsening and that the newly minted Montreal Protocol was not up to the task of fixing it. Reported the New York Times: "The atmosphere's protective ozone layer is so depleted over Antarctica in the springtime that there is cause for concern about the safety of scientists and support personnel there" (Sullivan 1987). Thus, we can focus in on peaks and valleys to understand what they mean and match them with a timeline. What emerges is a picture of the evolution of a specific participant groups' role in the social process as captured in news media reports. It can be compared with those of other groups and placed in context with larger trends in the data source. This format for visualizing the data can be useful, especially when comparing arguments across actors and substance categories. For example, in our study, politicians' arguments in 1987 were heavier and more evenly divided by direction, and had a greater emphasis on policy solutions.

These findings can help a policy practitioner understand who is getting across what message and when, and what structure the messages take relative to a set of policy goals and principles. For example, in our study arguments from scientists skeptical of the theory linking CFCs to stratospheric ozone destruction were overwhelmed by those who backed it. We can see when, where and by how much. As noted above, the substance of these competing arguments and their context – how they are justified and where they were presented – yields much information about the intelligence gathering process. The same is true for policy promotion. This is not surprising, we have noted, because our sample is focused on the intelligence gathering and promotion phases of the Montreal protocol process. But policy practitioners can use this data to reassess and make better decisions about their own intelligence gathering and promotion efforts relative to the public debate on specific issues of interest. For example, policymakers opposed to efforts to ban CFCs would see that science debunking the argument that CFCs destroyed ozone was overwhelmed by reports to the contrary, and they would also see that their promotion efforts were also lagging. Environmental groups backing a tough treaty might despair to see themselves quoted so little in the news reports. But they would know from the data that the balance of public rhetoric in the news media is on their side. It might serve as a gauge of their behind-the-scenes efforts to influence the news media and public opinion. The group of collaborating scientists and government officials referred to by Benedick would also see that their public efforts are paying off. Additionally, these interests could see how they are doing relative to one another on a monthly basis and adjust their strategies accordingly.

Separately, analysts could use maps of the rhetorical landscape to test out their own policy goals and guiding principles against recent news coverage. Or they could revisit past policies to conduct a post mortem. For example, a much smaller pilot study of a sample of articles about the Clinton administration's ill-fated BTU (British Thermal Unit) tax proposal found that arguments "Against" the proposal outnumbered those "For" nearly three-to-one, and were centered on concern about the domestic economy (Howland, Becker, and Sahagian 2001). A closer look at the arguments chosen for coding revealed confusion across Washington about the purpose of the policy itself: Was it a deficit reduction tool or a cure for global warming? For the policy practitioner in the heat of making recommendations, this method could help illuminate such problems before they have a chance to make trouble. It might also help light the way to better strategies for finding and implementing solutions.

A comparison of category systems. A variety of research approaches have been taken to content analysis ranging from highly qualitative and interpretive studies to quantitative hypothesis tests. There is less-than-universal agreement among researchers about what constitutes "content analysis." Weber (1990, 9) writes: "Content analysis is a research method that uses a set of procedures to make valid inferences from text." By contrast, Neuendorf (2002) contends that to qualify for the moniker "content analysis," a content analysis system should meet the standards of the scientific method" which include establishing intersubjectivity, an a-priori design, reliability, generalizability, and replicability. Our method meets these standards, but our interest in studying the policy process does not involve hypothesis testing. Rather, we purse research questions that disclose policy-relevant patterns and trends in our data.

To compare our approach with other content analysis methods, we identified studies that examined news coverage of global environmental issues using categorical coding systems similar to our own. Most examined global climate change which has similarities with the stratospheric ozone problem. We contrasted the methods used in these studies with our own according to purpose and structure. While we argue that our category system is best suited for the purpose of informing research studies using the policy sciences analytic framework, we make no claim that it is superior to others given their distinctive, respective purposes. Given our purpose, however, we have formulated a category system that maps argument structures in terms of their substance, direction, and especially their relevance to issues in the policy process.

Limned throughout this comparison are the issues of sample size and intercoder reliability. Comparing reliability measures across studies is not always easy. The studies we will examine all report reliability results at varying levels of rigor. For example, Bengston and colleagues (1999) and Wilkins (1993) report percent measures only, one of them for a computer coding program. Others by McComas and Shanahan (1999) and Trumbo (1996) report measures using Scott's Pi, similar to the kappa we use because it accounts for chance agreement. The fact that these studies report intercoder reliability results at all reflects well on them as recent research shows between one third to half of content analysis studies in mass communication are published without them. Lombard and colleagues' study (2002) of 200 research reports published in the communication literature between 1994 and 1998 found that only 69 percent of studies using content analysis reported intercoder reliability results. Of these the lowest reported score was .40 and the mean minimum acceptable reliability level was .75. Our test of three coders exceeded this minimum (by percent) in all coding categories.

The method used by Trumbo (1996, 270) to examine headlines and leads in news articles about climate change sought to understand "who gains access to media representation; and what overall themes emerge in the media treatment of an issue." The study examined 252 articles written between 1985 and 1994 in the Washington Post, LA Times, Christian Science Monitor, and the Wall Street Journal. The researchers identified relationships over time between three groups of claims makers – scientists, politicians, and interest groups – and the principal news frame of each story, defined as "the claim that is being made by the media at the top of the inverted pyramid" (Trumbo 1996, 271). Four recurrent themes were found: 1) defining problems, 2) diagnosing causes, 3) making moral judgments, and 4) suggesting remedies. Additionally, the study discerned from the data three phases in the news coverage – pre-controversy, controversy, and post-controversy.

Trumbo concludes, among other findings, that scientists were largely associated with the problem and causes frames. Further, he found that "scientists found themselves sharing a shrinking proportion of growing news media attention during an important part of the public debate over climate change" (Trumbo 1996, 281). For intercoder reliability, the study reports a Scott's Pi score of .78. Like ours, this method provides a way to monitor the activity of a stakeholder group relative to news media content and it features some categories similar to our own. But for our purposes, it is a comparatively incomplete and blunt instrument. Unlike our system, it cannot focus on the content's direction relative to a specific policy. It has far fewer substance categories – four versus 21 – and is used only to examine headlines and leads. We can assign multiple substance codes to a single article. This method assigns only one per story. Thus, our categorical system yields more finely scaled maps of the rhetorical landscape.

Bengston and colleagues monitored "the social environment for natural resource management" using a computer content analysis of 30,000 online news articles (Bengston, Fan, and Celarier 1999, 181). They coded articles for words and phrases associated with recreational, commodity, ecological, and aesthetic values of forests and then graphed the frequency of expressions in each category to map trends by quarter between 1992 and 1996. Their computer program successfully coded phrases between 85 and 87 percent of the time. The researchers found that expressions in the recreational and aesthetic categories trended upwards. Similar to our study, this one plots trends in the news media over time in predetermined categories. The size of their data sample, made possible by use of computer algorithms, is impressive. The key difference is that this method codes only for four mutually exclusive substance categories. The method does not compare content relative to a specific policy and does not take into account direction, stakeholders, or the policy process. Again, our categorical system exposes more dimensions of the rhetorical landscape.

In a study of news articles about climate change, McComas explores whether "narrative factors explain change in media coverage of global warming over time" (McComas and Shanahan 1999, 38). The study of 312 articles, written between 1980 and 1985 in the New York Times and Washington Post, records the presence of eight "themes." Three of them – international relations, economics/costs of remedy, and domestic politics – match three of our substance categories. In addition, the authors kept tabs on two "consequences" of climate change: change in temperatures predicted and the time range predicted for changes to occur. In an extensive accounting of their efforts to ensure intercoder reliability, the authors report scores of .6 for coding themes and .79 for consequences using Scott's Pi. Themes and consequences were compared to the frequency of climate change news coverage in the sample.

The study found, among other things, that during a phase of increasing news coverage, stories focused great attention on the consequences and implied danger of climate change. "From a narrative standpoint," wrote the authors, "news coverage in the late 1980s had set up an atmosphere in which global warming was an imminent disaster" (McComas and Shanahan 1999, 52). The discussion considers the implication that such prediction could discourage media attention to the issue. This approach is useful for gauging the tenor of news coverage surrounding a policy problem. In the case of its "consequences" categories, and themes related to research and science, it is capable of providing very specific information on intelligence gathering efforts. That said, this system, like the others discussed so far, is not designed for evaluating the direction of arguments specific to a policy's goals. Moreover, apart from a theme that explicitly tracks "controversy among scientists," the method has no means of discerning other participants and so cannot be used to comprehensively map the rhetorical landscape that is relevant to the policy sciences framework's social or decision processes.

A study by Wilkins (1993) analyzed U.S. news stories about climate change from 1987 to 1989 to discern values that help frame news about the greenhouse effect. The author billed this study as a "qualitative analysis with (quantitative supporting information)" (Wilkins, 1993, 75). A wide array of information was collected:

> Coding categories included the media outlet, the month and year the story was produced, whether the stories were news, feature or opinion, the number and type of sources cited, the news peg, the amount of coverage devoted to the greenhouse in each story, the metaphors used, whether the story discussed the future, and how politics was treated in each piece (Wilkins 1993, 75)

In all, 1441 articles from the New York Times, LA Times, Washington Post, The AP and Time Magazine were coded with intercoder reliability measured at .85 using a straight percent measure. The study concluded that three yet unexplained values help frame news coverage of climate change: progress, the institutionalization of knowledge, and innocence. The sample size and scope of information collected for this study by human coders is considerable. In addition to enabling an analysis of themes, this approach seems to have potential for describing social process within the coverage, for example, by comparing actor data with news pegs and metaphors. But it's unclear from the article whether these can be linked, as Trumbo's study linked news frames with actors. Like the previously described methods, this one is not designed to seek and code arguments focused on any selected policy. Moreover, it does not enable layered coding of these arguments to describe or link them to the policy process.

In a study of news coverage of climate change from 1986 to 1995, Zehr (2000, 85) reports that the news media used the theme of scientific uncertainty in climate change reports "to create an exclusionary boundary between 'the public' and climate change scientists" which "delegitimated lay knowledge." Unlike the previous studies, the methodology here is not thoroughly explained. Codes are not listed and no measures of reliability are reported. By contrast, we stress transparency, and have adhered as much as possible to the standards outlined by Neuendorf.

Finally, we want to address the methodology of news media trend analysis that has gained widespread attention in the popular press and in the for-profit analysis market. Often cited is the work of Naisbitt (1982), whose systematic analysis of news media content sparked an industry of trend analysis of economics, government, and society to the benefit of decision makers. Fundamental to this approach is monitoring what appears in the "news hole" – that essentially fixed amount of space the news media has to fill with reports.

> In this forced-choice situation, societies add new preoccupations and forget old ones. In keeping track of the ones that are added and the ones that are given up, we are in a sense measuring the changing share of the market that competing social concerns command (Naisbitt 1982, 4)

Merriam and Makower (1988, 4) explain that trend watching using this approach is essentially taking measure of "what the public is learning, what it wants to know, and what it chooses to ignore." It is essentially a modern adaptation of the approach taken by the military in World War II, with Lasswell's help, to understand the Germans. Taking for granted the fact that what appears in the "news hole" reflects and influences public opinion, our approach applies additional, original filters for disclosing what is relevant to a specific set of policy goals and principles. That makes our approach unique and valuable for policy analysis. Further, our method is not proprietary. It is an open source code for all to use and it is highly transparent.

In sum, the above studies demonstrate an array of coding systems that encompass elements of our approach. Each system is highly appropriate for its respective task. But each falls well short of providing a category system that fulfills the purpose for which we designed our method: to describe and map trends surrounding the development of specific policies using the categories of Lasswell's policy sciences analytic framework.

Methodological issues. The introduction of our categorical coding system would not be complete without an accounting of the difficult issues that have arisen in light of our experience with this application. We provide responses to those issues here as a vehicle for further exploring our method's assumptions and limitations.

News articles are not an objective form of data. They are subjective. We have collected our data from news organizations with experienced reporters, codified ethical standards, and a wide audience. However, regardless of whether their prose is objective, we are interested in the arguments contained within them, which, beyond being biased, are capable of directly influencing policy (Nelkin 1995) and, thus, are essential to any conclusions an analyst might reach about the rhetorical landscape. Content analysis neither gets at excluded positions nor is sensitive to the possibility that positions on issues are represented disproportionately in journalistic accounts. Indeed on some occasions, journalists, in the laudable name of objectivity, promote as equal in size less popular positions in an effort to give balance to alterative views on issues (Jamieson and Campbell 1988).

News media articles offer only a limited sample of information and opinions. We are engaged in what qualitative researchers call "purposeful" or "criterion-based" sampling. Maxwell (1996, 70) describes it as "a strategy in which particular settings, persons or events are selected deliberately in order to provide important information that cannot be gotten as well from other choices." While the world is full of people with good ideas, we are interested in those who are getting them across to shape policy. One of our assumptions is that in a democratic society with competitive markets and press freedoms many of those voices and ideas do appear in the news media. This question, however, points up an import blind spot in our data. News stories generally say nothing of the extent of campaigns by interest groups to gain favorable coverage. Recall that in the course of making stratospheric ozone policy, U.S. government agencies worked to press their case through the news media to educate the public and build the political will for a solution (Benedick 1998). Efforts by sources to pitch stories or spin news coverage are often reflected in the final product but as often are not explicitly discussed in the stories themselves along with other factors that influence reporters' and editors' choices behind the scenes. This is often left to an ombudsman – when media outlets have one – to explain in the wake of particularly controversial stories. This observation is based on one of the author's experience as a professional news reporter, editor, and freelancer.

Your findings can be manipulated (wittingly or not) by the selection and sample size of your articles. For example, if you sample media in a nation opposed to the protocol, you might get a very different picture. This is a valid point. Our method is geared to enable analysts to draw conclusions about an international policy's potential for success or failure within a particular country – thus the distinction between "Local" and "Transboundary" arguments. Our data sources – The AP, UPI, and New York Times – are based in the United States but provide international coverage. A similar study could be conducted using French media – Le Monde and Agence Press France, for example – with "Local" meaning within France's borders. The conclusions would speak to the potential for the protocol's success in France. This is where the reliability, and more importantly, the complete transparency of our method is crucial. Our sampling and individual coding decisions are there for all to see, question, and debate.

Your method is rigged to reduce complex ideas into neat little boxes for analysis. But the real world is not a series of "for" and "against" statements in such boxes; there is a lot of gray. Natural and social systems are dynamic and complex but that is no excuse for avoiding the use of systematic methods to characterize their complexity. Far from reductionist, our method embraces the notion that arguments can overlap and interact over time and space. It is up to the analyst, who has freedom to reason about what the data are telling him or her, to draw conclusions about its significance.

Human coding is slow. Coding can be time consuming, but what our method lacks in efficiency, it makes up in thoroughness and transparency. Guidelines for researchers and coders are explicit and the product of their work at all stages – from article selection, to coding decisions, to conclusions drawn from the data – can be made available for scrutiny.

Future Research Directions

Beyond these issues, we hope our approach inspires others to use news media content analysis to inform policy sciences investigations. As many studies have affirmed, content analysis as a methodology has a place in informing policy decisions, and news reports are an ideal source of data rich in context and consequence for both public opinion and policy making. In this article, we introduced a systematic, transparent and rigorous news media content analysis system to take advantage of this potential, specifically, for use with the policy sciences analytic framework. A review of content analysis literature shows that a combination of assets sets our approach apart – in both structure and purpose – from other methodologies.

We are extending this study on the Montreal Protocol to articles written up to the end of 2004 and are working on a parallel study of news coverage relevant to the Kyoto Protocol of the international climate change policy regime. These efforts include structured interviews with news reporters and policy makers involved with both protocols to place our findings in deeper context. So far, the younger Kyoto accord has failed to win acceptance by the U.S. government and we are interested to know what differences exist between the rhetorical landscapes surrounding each policy. Hidden here, in the elements of social and decision processes that we can extract from our data maps, are lessons about what has made the Montreal Protocol a relative success in the United States and the Kyoto Protocol a failure.

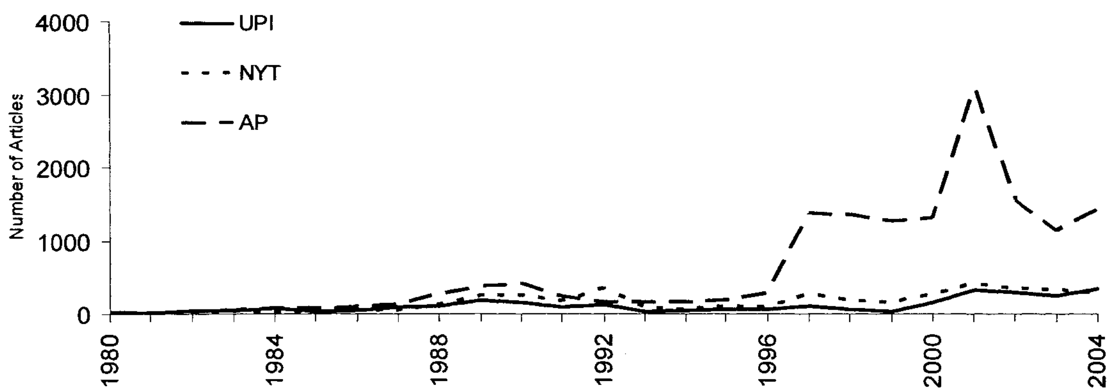
Communication scholars and policy scientists alike acknowledge a debt to Lasswell for pioneering the use of content analysis and the policy sciences analytic framework. But few, if any, have taken him up on his suggestion to build bridges between them. We hope our small contribution can help scholars begin to realize the benefits Lasswell saw in doing just that.

Expanded Methodology for Case Comparison

Sampling Strategy

In both the climate change and ozone case studies, articles by The AP, UPI and New York Times published between October 1, 1980 – the first date all three sources were available online – and Dec 31, 2004 were drawn from the Lexis-Nexis database. The same keywords used in the pilot study were used for the larger ozone case study: "stratospheric ozone," and/or "ozone hole" and/or "Montreal Protocol." The following terms were used for the climate case: "climate change," and/or "global warming" and/or "Kyoto Protocol." In order to return a sample size more easily handled by a single coder, the search was scaled back from full article text to one that included headlines, leads and Lexis-Nexis search terms. An initial search using the ozone terms, turned up more than 500 articles from 1980 to 2004. After removing duplicates, the sample size dropped to a manageable 343 articles. Of those, 35 lacked codeable arguments and so a total of 308 articles were coded. By contrast, the climate search initially turned up more than 21,000 articles. Figure 2 shows the results of the initial search results over the 24-year sample:

Figure 9. Raw Climate Article Sample



Because it was impractical to tackle this entire set climate of articles, it became clear that a random sampling strategy was needed – one that could reduce the climate article sample to a manageable number for coding while preserving annual variation in the intensity of news coverage. It was determined that the best approach was to sample 5 percent of the articles (after correcting the overall sample size for duplicates) in a double stratified sample – by year and news service – with a five-article annual minimum per news service.

Accounting for Duplicates. The raw sample of 21,637 news articles included many duplicates, especially from The AP and UPI which often move identical or near identical stories for AM and PM news cycles. In the sample above, the number of duplicate articles from the AP spiked in 1997, the year The AP introduced its Associated Press Online service. A random sample using a straight percentage of the 21,637 articles would have oversampled the AP articles. Thus, the overall sample size needed to be adjusted to account for duplicates in advance of the final sample selection. Arriving at a manageable final sample with no duplicates that fairly preserved the proportion of unique articles by news service required estimating the proportion of duplicate to non duplicate articles by news service. This task was complicated by the fact that duplicates appear chronologically in pairs and clusters and not randomly throughout the sample. As a result, the proportion of duplicates could not be fairly estimated by adding them up in a randomly selected sample as they would have been greatly underestimated.

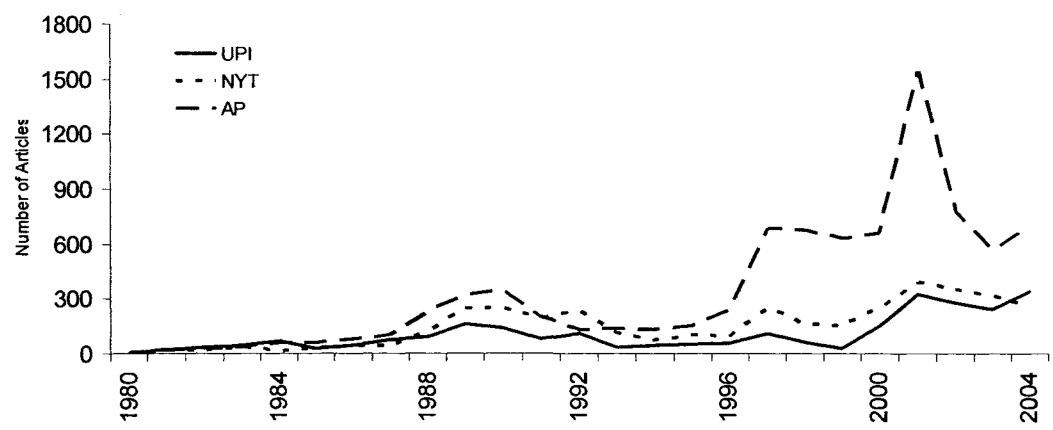
To handle this problem, it was decided that the focus should be on the biggest discrepancy in the data – the spike in AP articles in 1997 – and estimating the percentage of duplicates for each news service before and after this spike. Using random starting dates, groups of 50 articles were selected in chronological order from each news service in two time periods – before and after the spike in AP articles – October 1, 1980 to December 31, 1996 and January 1, 1997 to July 31, 2004. The percentage of duplicates in each group of 50 articles was then calculated. These percentages, shown in the table below, were then subtracted from the raw sample to get a more representative picture of what that sample might look like without duplicates. For example, from 1980-1996, 90 percent of UPI articles were not duplicates. Thus, those years' UPI figures were multiplied by .9 to arrive at a sample size that is 90 percent of the original. This calculation is shown in the table below. Its effect on the overall sample is seen in the following Figure.

Table 7 Climate Duplicates Sampled

	1980-1997			1997-2004		
	UPI	NYT	AP	UPI	NYT	AP
Randomly Selected Starting Month	Jan 1981	Jan 1988	April 1988	June 1997	Feb 2001	Nov 1998
Number of articles	50	50	50	50	50	50

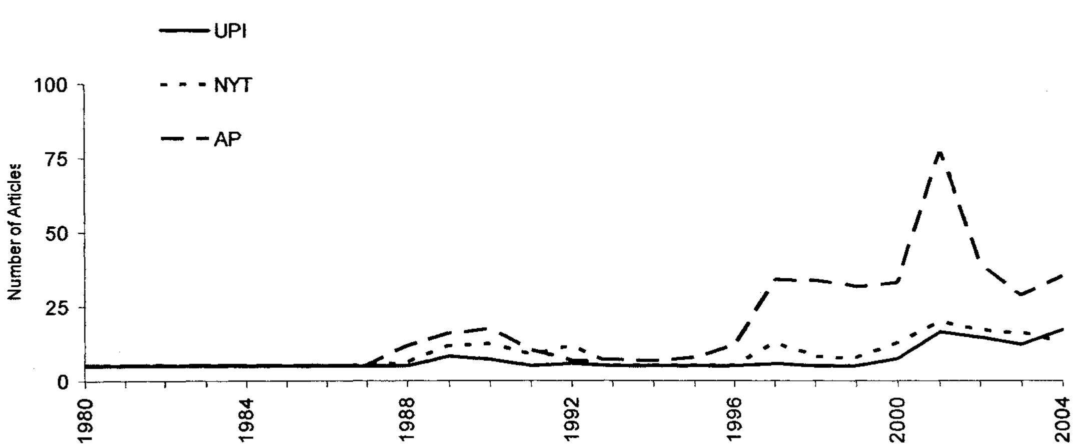
	1980-1997			1997-2004		
	UPI	NYT	AP	UPI	NYT	AP
Number of duplicates	5	0	8	0	2	25
Percent of duplicates	10	0	16	0	4	50

Figure 10. Climate Sample Adjusted for Duplicates



Preserving annual variability. Corrected for duplicates – the overall sample size dropped from 21,637 to 14,787. But it still needed to be reduced to a manageable size for coding. To preserve the annual variability in the sample, it was decided in advance to randomly select articles by year rather than from the entire sample. Stratifying the sample by year gave a better representation of the year-to-year variability that might otherwise be lost by sampling articles over the entire sample. For example, the news coverage was lean in the early 1980s but crucial to setting the tone for events in later years, where the coverage is heavy. Annual sampling helped ensure that articles written in these early years and subsequent lulls in the debate were included in our sample. Further, it was decided to sample by news service, to keep the largest – The AP – from eclipsing the others. To further ensure that informative early articles were not needlessly lost, a five-article minimum was established for each news service for each year of our sample. Finally, a sampling figure of 5 percent was chosen and rule established that any year's article tally that returns less than five be made equal to five. The figures in the Table above were multiplied by .05 to derive our final climate case sample shown in the figure below.

Figure 11. Final Climate Sample



Random Selection. Finally, equipped with the number of articles that needed to be sampled for each year from each of the three news services, a random number generator in Excel was used to determine which articles would be selected. For example, in 1992 the sample required six articles (out of a potential 125) from the UPI, 12 (out of 334) from the New York Times and six (out of 152) from The AP. Duplicates articles were eliminated until the pre-determined number of articles was selected for each year. These were then inputted in text format into the Atlas program for coding. In all, 829 articles were selected for coding. Of those, 61 lacked codeable arguments and so a total of 768 articles were coded.

Timeline and Notetaking

As with the 90-article ozone pilot study, it was helpful to construct a timeline of events in the news coverage, including the release of significant scientific studies, political debates, international meetings and other happenings central to the evolution of ozone or climate policy in the United States. This task was aided by the construction of a monthly timeline in Excel that noted also the current president, Congressional session, the political balance in the House and Senate and its current leaders. Timeline entries included two- to four-sentence summaries of news stories or, in many cases, the verbatim leads of the stories in quotes with the reference number and date of the article summarized. Separately, and in the Atlas coding program, memo categories were created to group article summaries and the researcher/coder's observations about the news coverage. These could be cross referenced to enable later analysis. Among the memo categories that proved useful in both case studies were those that grouped coverage of research studies, international meetings, state and local government initiatives and federal initiatives. In addition, memo categories were created to file examples of arguments that fit clearly into one or more of Dryzek's nine environmental discourses discussed in the Background Chapter. Another memo category provided a space for the researcher/coder to record impressions of the coverage and ideas for future lines of analysis.

Interview Protocol.

To add context and depth to the study's results, a protocol was included for conducting structured interviews with experts in the ozone and climate change issues. This was approved by the University of New Hampshire's Institutional Review Board (IRB# 2866). IRB-related documents – the original research protocol, its amendments and IRB approval letters – can be found in the Appendix. The plan was to interview a number of selected key informants that include government officials, scientists, news reporters, industry representatives and environmentalists who were familiar with or have played a role in the policy process of one or both of the problems. After looking for subjects noted in the literature as participants in the ozone and climate change debate in the areas above, the author drew up a list of potential subjects and, per the IRB approved protocol, arranged to interview them.

In all, seven key informants were interviewed, among them a world-renown atmospheric researcher and leader in both the climate change and ozone regimes, Robert Watson; former U.S. climate negotiator and Natural Resource Defense Council lawyer David Doniger; industry lobbyist and former Global Climate Coalition spokesman Frank Maisano; and veteran Associated Press Congressional and environmental news reporter Josef Hebert. Two other national environmental news reporters and a member of Congress, who chose not to be named, also granted interviews for this study. With the exception of Doniger, who was interviewed by phone, the interviews were conducted in person after each subject signed a consent form. All of the interviews were recorded by an MP3 recorder and back-up audio tape recorder and transcribed by the author. The subjects were given the opportunity to review and make changes to their own transcripts. After signing the consent form (see Appendix), the subjects were read the following preamble:

> I am studying the evolution of the United States' role in international policy efforts to address the global climate change and stratospheric ozone problems. Many groups and individuals have played a role in this process among them, scientists, government officials, industry officials, environmentalists, the news media and the public at large. As a participant in this process, you offer a unique perspective. I will ask you some basic questions relevant to my study and use your answers to inform my understanding of the issues from your perspective. I will use your insights to draw some larger conclusions and recommendations about the

policies themselves. I don't want to keep you any longer than 45 minutes, but would be happy to extend the interview if you would like more time.

The author then asked the six questions listed below. In some cases, impromptu but related follow-up questions were posed.

5. Please briefly describe your experience with climate change and/or ozone issues.
6. What role do you think [again, pick only the interviewee's group – i.e. scientists, government officials, industry officials, environmentalists, the news media] have played and will play in the future with regard to US involvement in the climate change and/or ozone regimes?
7. What role do you think the news media has played and will play in the future with regard to US involvement in the climate change and/or ozone regimes?
8. Please outline what you think are the strengths and weaknesses of each policy effort – climate change and/or ozone. What would you recommend, if anything, be done to improve them?
9. Please describe what globalization means to you and mention a few ways, if any, you think it has affected and/or will affect US involvement in either policy effort.
10. What do you think the future holds for each policy?

Reporting and Integrating Results

Coding Chapter. Coding results for the ozone and climate cases are reported and discussed side by side using 13 tables that report aggregate results in terms of the number of arguments per coding category by totals and percentages. In addition to a master table summarizing sample-wide code totals for each case, tables were compiled for results specific to each of the five policy issue criterion and the seven established participant groups – scientists, US government, industry, the United Nations, the public, environmental organizations and European governments. Each table is accompanied by a brief discussion of its key findings, including trends within that category over the 24-year sample, and, where helpful, examples of arguments from the articles. To aid the comparison of data within and across cases, the degree to which arguments are "For" or "Against" and "Local" or "Transboundary" is described on a scale ranging from "Slight" to "Extremely Strong" outlined below.

Table 8. Scale for Rating Relative Argument Strength

Descriptor of Argument's Relative Strength ("For" vs "Against" or "Local" vs "Transboundary") in a given category	Percent of argument	Approximate range of Corresponding Ratios
Equal	50	1:1
Almost Equal	51-52	~1.04:1 to ~1.1:1
Slight	53-57	~1.1:1 to ~1.3:1
Moderate	58-66	~1.3:1 to ~1.9:1
Strong	67-74	~2:1 to ~2.8:1
Very Strong	75-89	~3:1 to ~8:1
Extremely Strong	90-100	10:1 and higher

For example, if 60 percent of arguments of any given category are coded "For" the Montreal Protocol, then it is reported that arguments in that category ran "moderately" for the policy, or that support for the policy in that category was "moderate." Likewise, if 60 percent of arguments were coded "Against," it would be reported that opposition was "moderate." A result that comes within two percentage points of a category cut-off is described using both terms. For example, if economic arguments "Against" outweigh those "For" 74 to 26 percent, it would be reported that economic arguments were "strongly to very strongly against" the policy. The purpose of this scale is to bring some consistency to the qualitative description of quantitative data. The cut-offs between categories are based on ratios that are intended to make common sense. For example, it is fair to say that when arguments "For" outnumber arguments "Against" by a two-to-one margin, that arguments "For" are "strongly" represented; and when that ratio climbs to three-to-one that they are "very strong." Likewise, an argument's relative strength is considered "weak" until it is at least a third more voluminous that its counterpart at which point it is "moderate." The coding results – reported in charts, graphics and narrative form – are used in the final chapter to inform the description of conditions and trends in social and decision process surrounding the two cases.

Interviews Chapter. The interview chapter summarizes the interview subjects' answers to the questions in a narrative comprising seven sections – one section for each of the six questions posed – and a summarizing conclusion. Like the coding results, the interviews collectively represent a research product that can stand on its own. The two are combined, sorted and supplemented by findings from other studies in the final chapter.

Discussion and Conclusions Chapter. The *Policy Sciences* article outlined a system to integrate coding results with the policy sciences analytic framework, enabling a description of several elements of the social and decision processes, conditions and trends surrounding participant groups. This approach is used in the larger case study comparison. The principal participant groups and their roles in shaping the evolution of the policy processes in each of the two cases are examined side by side. Unlike the smaller pilot study, the case comparison is enriched by interview data. Thus, after an introduction, the Discussion and Conclusions chapter opens with an examination of the social and decision process, conditions and trends surrounding the most prominent participant group in both cases – the scientific community. The analysis moves on to the remaining groups including the U.S. government, industry and the public. The study's most salient findings are summarized in a conclusion. Separately, as in the *Policy Sciences* article, methodological challenges, limitations, and lessons learned in the larger case study comparison are discussed.

CHAPTER III

CODING RESULTS

Introduction

This chapter reports the results of an analysis of arguments in 1,076 news articles about stratospheric ozone depletion and climate change written between 1980 and 2004 by The New York Times, The Associated Press and United Press International. The ozone case sample comprises 308 articles with a total of 774 arguments coded, and the climate case sample comprises 768 articles with 1,962 arguments coded. Recall from Table 4 (Chapter I) that the content analysis is geared to answer five fundamental questions:

1. Are the arguments supportive or opposed to the goals and/or principles of the policy?
2. In what proportion are the arguments international or domestic, and economic, political, social or environmental in nature?
3. What stakeholder groups are main sources/ subjects of the arguments?
4. What are the arguments' relevance to one or more of five policy issue criteria?
5. What are the trends over time in the above categories?

These questions are addressed in three sections in this chapter that report and discuss the results side-by-side – in aggregate and over the 24-year sample. The first section, *Code Totals*, discusses the broadest findings of the analysis reported in Table 9. This table, as with eleven additional results tables to follow, shows how coded arguments in the Montreal and Kyoto cases stack up by total number and percent. This section also includes examples of typical claims in each of the 16 direction and substance categories for both cases. The second section, *Policy Issue Criteria*, breaks down the findings by the five policy issue criteria – problem (Table 10), policy (Table 11), support (Table 12), feasibility (Table 13) and accountability (Table 14). The third section, *Stakeholders*, examines those findings by each of the seven stakeholder group categories – scientists (Table 15), U.S. Government (Table 16), Industry (Table 17), United Nations (Table 18), Public (Table 19), Environment (Table 20) and Europe (Table 21). Where useful, figures illustrate argument totals, totals over time, and differentials over time, between "For" and "Against" arguments. The most salient findings of the three sections are summarized in (

Table 22) in the *Conclusions* section, which serves as a useful reference for the larger analysis in the dissertation's final chapter.

Code Totals

Overview

The first major finding of this study is that on balance arguments in news coverage of both the ozone and climate change problems ran in favor of the goals and principles of both the Montreal Protocol and the Kyoto Protocol. In other words, taken as a whole, the coverage has been more positive than negative in both cases. But Table 9 shows that the reporting on the ozone hole has been a good deal more positive. Ozone case arguments ran "very strongly" in favor of the protocol, by a 3:1 ratio. By contrast, climate change arguments were "moderately" in favor with a ratio of just 2:1. In both cases, arguments are more focused on transboundary than local issues, which is not surprising given that both address global environmental problems. But the ozone case arguments bordered on "extremely" transboundary (7:1) versus "moderately" transboundary in the climate case (about 3:2).

Table 9. All Code Totals

All Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
For	581	75	1225	63
Against	193	25	735	37
Total	774	100	1960	100
Local	95	12	776	40
Trans	679	88	1184	60
Total	774	100	1960	100
Economic	116	15	407	21
Political	213	28	610	31
Social	159	21	326	17
Natural	286	37	617	31
Total	774	100	1960	100

(The 16 three-letter code combinations below are formed by joining one code from each of the three code groupings above. For example, FEL = For + Economic + Local; FPT = For + Political + Transboundary; ANL = Against + Natural + Local.)

	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
FEL	8	1	110	6
FET	47	6	93	5
FPL	25	3	133	7
FPT	127	16	189	10
FSL	13	2	83	4
FST	122	16	157	8
FNL	6	1	67	3
FNT	233	30	393	20
AEL	19	2	140	7
AET	42	5	64	3
APL	14	2	143	7
APT	47	6	145	7
ASL	7	1	53	3
AST	17	2	33	2
ANL	3	0	47	2
ANT	44	6	110	6
Total	774	100	1960	100

Table 9 Cont.

All Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
Problem	409	39	878	26
Policy	271	26	966	29
Support	130	12	732	22
Feasibility	116	11	715	21
Accountability	119	11	82	2
Total	1045	100	3373	100
Scientists	340	45	643	26
US Govt	177	23	761	30
Industry	70	9	337	13
UN	53	7	111	4
Public	52	7	371	15
Environment	42	6	190	8
Europe	28	4	105	4
Total	762	100	2518	100

A look at the four substance categories shows that environmental and scientific arguments topped both cases, followed by political arguments. This, too, is not surprising because environmental concern and scientific research are central to both problems and intertwined with the politics of finding solutions. But in the climate case, economic arguments took third place, while social arguments took a back seat. This reflects a larger preoccupation with the economic costs of the Kyoto treaty. In the ozone case, social arguments predominated, reflecting a concern about the human health effects of increased ultraviolet radiation. A closer look at all 16 possible substance code combinations in each case – shown in Figure 12 and Figure 1 – reveals that the climate chase had a higher proportion of local arguments across the board, and a lower proportion of transboundary environmental and political arguments in favor of its protocol. To provide a sense of the arguments behind the numbers and coding categories, as well as a point of reference for future discussion, this section lists below examples of arguments in each of the 16 three-letter coding categories. The list follows the order in the data tables, with the eight "For" code combinations followed by the eight "Against" combinations. Each includes an ozone case and a climate case example, and a word or two about their significance and/or links to other common codes.

Figure 12. Ozone Case Claims by Direction and Substance

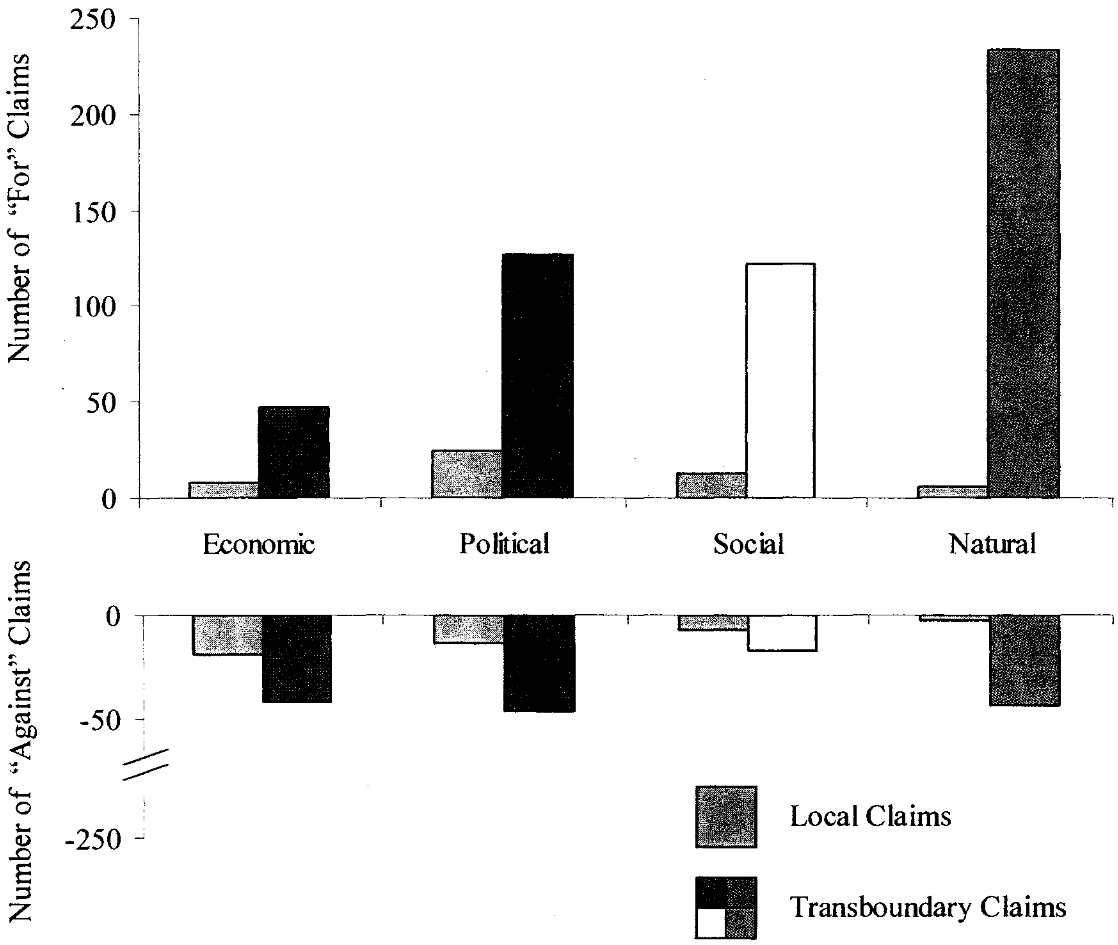
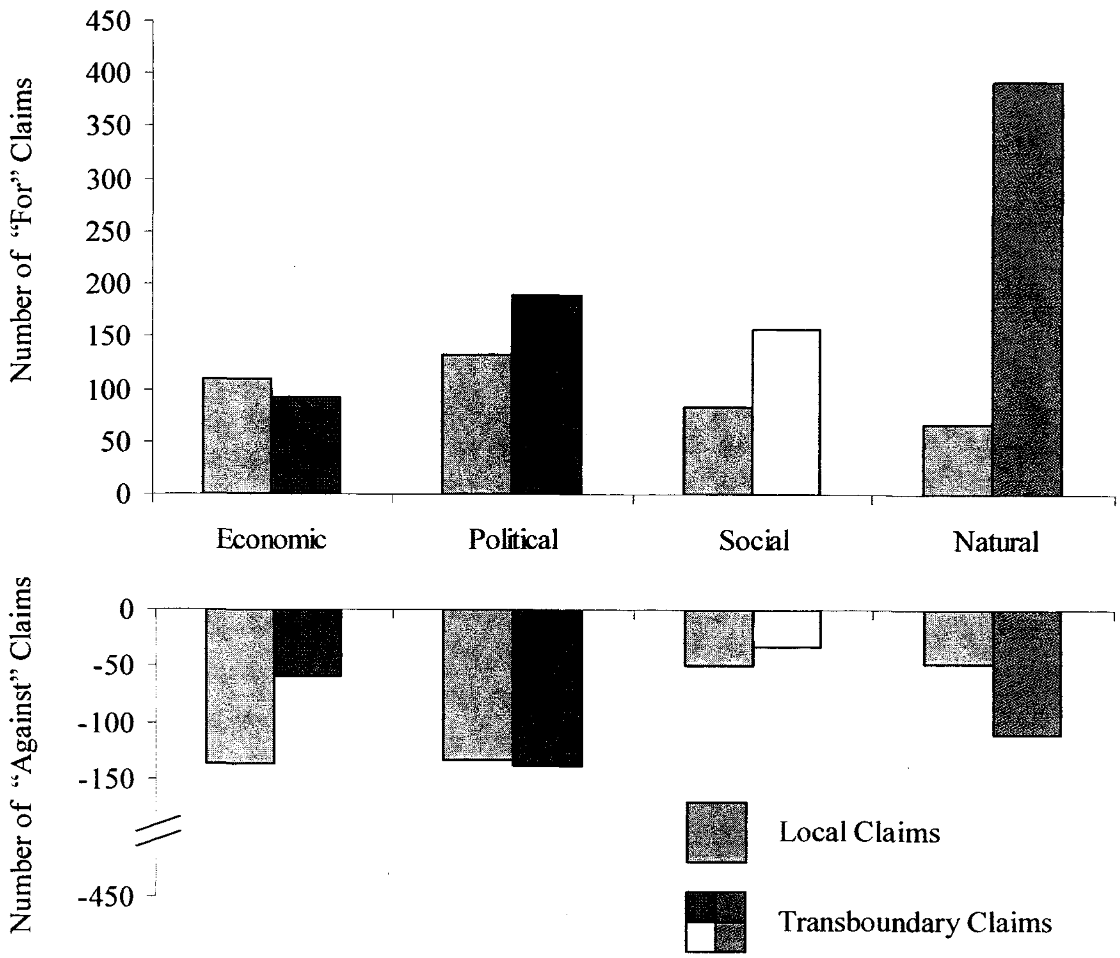


Figure 13. Climate Case Claims by Direction and Substance



FEL – "For/ Economic/ Local"

Ozone example: "The administration announcement, which has been expected since last week, came as the American Institute of Architects Tuesday urged that CFC's be banned from new construction projects" (Heilbronner 1992).

Climate example: "Cleaner energy sources such as the wind, the sun and the ocean tides would go a long way toward cleaning up our air and streams, says Alan Nogee, but he says there's a better reason the state should emphasize renewable energy sources: saving money" (McElhenny 2001).

Comments: The ozone example above is one of only eight domestic economic arguments in favor of the protocol. Here, a major domestic consumer of CFC-containing products has weighed in against the chemicals. Both local and transboundary For/Economic arguments share the themes of shedding of CFC use and developing and adopting substitutes. The climate example above captures an ongoing theme in domestic arguments – the move away from fossil fuel reliance. In this case, a member of the Union of Concerned Scientists in Massachusetts cites economic reasons.

FET – "For/ Economic/ Transboundary"

Ozone example: "'Many farmers worldwide successfully grow crops without methyl bromide,' said Margot Wallstrom, the environment commissioner for the European Union. 'Substitutes are available for the majority of its uses. Methyl bromide exemptions should be agreed only where alternatives are not available and not on any other basis' " (Revkin 2003).

Climate example: "It seems too good to be true: Companies around the world retool their factories, make deep cuts in greenhouse gases and rake in profits at the same time. Many business people say it's just a dream. But environmentalists at the Kyoto climate conference say it's more than just possible - in some places, it's already happening" (Coleman 1997).

Comments: Examples of ozone case FET arguments included warnings that the ozone hole could lead to crop damage and thus economic damage. They also ranged from international pledges of money to help developing nations phase out CFCs, to arguments against weakening restrictions on the soil fumigant methyl bromide, as cited above. FET climate claims included a similar variety, from warnings of economic harm from climate change, support for developing nations, and optimistic arguments – such as the one above from the 1997 Kyoto conference – which echo the FEL example.

FPL – "For/ Political/ Local"

Ozone example: "President Reagan asked the Senate Monday to ratify an international agreement signed in September to control emissions of certain chemicals blamed for depletion of the protective ozone layer around the Earth" (Washington News 1987).

Climate example: "Eleven states asked a federal appeals court Thursday to force the Environmental Protection Agency to regulate greenhouse gas emissions" (Gillespie 2003).

Comments: Ozone case FPL claims focused mostly on U.S. government efforts to negotiate and support the ozone treaty and included arguments against backpedaling within the Regan administration. Reagan's request of the Senate to ratify the treaty, after much infighting, stood out as one of the most important arguments in this category. Climate case FPL claims included arguments within different presidential administrations for U.S. participation and leadership in the climate treaty. A major theme of this coding category, however, is growing support within states for federal action on greenhouse gases – exemplified in the argument above from Northeastern states concerned about air pollution and climate change.

FPT – "For/ Political/ Transboundary"

Ozone example: "An international agreement signed in 1987, known as the Montreal Protocol, calls for an end to CFC production by the year 2000. Scientists and environmentalists have urged governments to move faster and halt CFC production as soon as possible" (Ozone hole closes 1992).

Climate example: "Russian President Vladimir Putin signed the Kyoto international climate treaty last week, which puts it into effect early next year without U.S. participation. The treaty requires industrial nations to reduce emissions of greenhouse gases below 1990 levels" (Heilprin 2004).

Comments: These above examples, acknowledgements of the protocols' successful ratifications, were among a variety of FPT arguments in both cases that document the international political support for each. Most are linked to political leaders in the United States, Europe and the United Nations.

FSL – "For/ Social/ Local"

Ozone example: "The Environmental Protection Agency has been studying the potential health effects of the thinning of the stratospheric ozone layer, which shields the earth from most of the sun's ultraviolet radiation. A draft assessment disclosed by agency officials last week included a stark warning: Over the next 88 years, ozone depletion could result in 40 million cases of skin cancer in the United States, 800,000 of which would end in death" (Mansnerus and Roberts 1986).

Climate example: "Massachusetts Attorney General Thomas Reilly said [greenhouse] gases are causing serious environmental and health problems. 'You're seeing the erosion of our beaches. You're seeing salt water contaminate our drinking water. You see damage to our infrastructure, to our roads and our causeways and our bridges,' he said" (Gillespie 2003).

Comments: In the ozone case, For/Social claims were overwhelmingly concerned with the human health effects of lower stratospheric ozone levels, especially cancer. The argument above is specific to the United States. Likewise, For/Social climate case arguments – both local and transboundary – comprise mostly warnings of negative societal consequences of the environmental problem, as above. Some FSL climate arguments tout the societal virtues of conservation and renewable energy.

FST – "For/ Social/ Transboundary"

Ozone example: "Scientists say the destruction of the ozone layer is causing increased skin cancer and eye damage and poses a danger to the world's food chain" (Huuhtanen 1989).

Climate example: "Rising temperatures could trigger shifts in weather patterns, causing natural disasters such as droughts, more frequent tropical cyclones and rising sea levels; this in turn could cause flooding, loss of land and damage to fish stocks, agriculture and water supplies, the report said" (Mwangi 2001).

Comments: The above examples are typical of this category in both cases. Recall that FST arguments were twice as prominent in the ozone case as in the climate case.

FNL – "For/ Natural/ Local"

Ozone example: "The life-protecting ozone layer may now be thinning above President Bush's summer home in Kennebunkport, Me., as well as other parts of the Northern Hemisphere. That gives Mr. Bush a compelling personal reason to regain the initiative on an issue of global importance" (The Ozone Hole Over Mr. Bush's Head 1992).

Climate example: "A University of Washington scientist says the Pacific Northwest will be 5 degrees warmer by the year 2050, resulting in wetter winters, less spring snowpack, lower summer streamflows, hardship to salmon, and more forest fires" (State and Regional 2000)

Comments: Because both ozone and climate change are global environmental problems, the vast majority of scientific and environmental arguments are not local. Nonetheless, arguments that focus on the domestic concerns of either issue, as those above, fall into this category.

FNT – "For/ Natural/ Transboundary"

Ozone example: "Mounting evidence indicates CFCs are responsible for the worldwide loss of roughly 1 percent of Earth's ozone shield and the formation of a hole that forms in the ozone layer above Antarctica for a few months starting every September" (Siegel 1988).

Climate example: "Carbon dioxide, which is released in the burning fossil fuels, is the most potent greenhouse gas, accounting for more than half of the pollution that many scientists believe is causing a warming of the earth" (Hebert 1994).

Comments: The majority of these arguments in both cases are statements of the environmental problem – the latest scientific findings that underscore the need for the protocols or a rehash of earlier such findings. In both cases, it is by a wide margin the single largest of the 16 categories, and scientists are understandably the largest source of these arguments.

AEL – "Against/ Economic/ Local"

Ozone example: "Small family farms in the United States would be hurt by a complete phase-out of methyl bromide by 2005 because they have not found viable alternatives, said Mark Murai, chairman of the California Strawberry Commission, a growers organization" (Maliti 2003).

Climate example: "'The U.S. economy could lose millions of jobs,' said the industry-backed Global Climate Coalition. "In addition, it means higher costs to Americans for everyday necessities" (Henson 1996).

Comments: In the ozone case, this category includes industry arguments in the 1980s that phasing out CFCs would hurt the U.S. economy, a theme revisited recently by farm operators, in the example above, who sought an exemption to the Montreal Protocol's rules on methyl bromide. Domestic economic arguments play a much larger role in the climate case and center on the costs of cutting fossil fuel use under the Kyoto Protocol.

AET – "Against/ Economic/ Transboundary"

Ozone example: "Japan, Korea, Mexico and others require treatment of California food exports with methyl bromide," (McKinley 1995).

Climate example: "While an ice-free Arctic Ocean would most likely disrupt the global environment, researchers said, it could have positive economic aspects. It could shorten shipping routes, for example, and expand the range of offshore oil drillers. Rich new fishing areas would probably appear, though established fisheries to the south could decline" (Gibbs 2000).

Comments: The ozone argument above shows international economic forces at work against the protocol's methyl bromide provisions. The climate AET argument above is a bit unconventional as it argues, in effect, that global warming could be good for the economy. Nonetheless it qualifies as an economic argument against the goals and principles of the Kyoto treaty. Most other climate AET arguments are an extension of the domestic argument that the Kyoto Protocol is bad for the U.S. economy and argue additionally that developing nations exempt from mandatory greenhouse gas cuts – specifically China and India – would have a competitive advantage over America.

APL – "Against/ Political/ Local"

Ozone example: "Although most scientists now accept the [stratospheric ozone destruction] thesis, it still has influential critics outside the scientific community. Republicans in Congress, for instance, have introduced legislation to overturn the United States' participation in the international ban on the production of chlorofluorocarbons, or CFC's" (Stevens 1995).

Climate example: "The White House's Office of Management and Budget has changed the text of testimony scheduled to be delivered to Congress by a top Government scientist, over his protests, making his conclusions about the effects of global warming seem less serious and certain than he intended" (Shabecoff 1989).

Comments: APL arguments were far scarcer in the ozone case than the climate case. Domestic political arguments against the ozone treaty focused on sporadic attempts to frustrate the negotiation process, including the methyl bromide issue. In the climate case, domestic political arguments against the protocol spanned a wide range of topics. These include Congressional opposition to the treaty, the rejection of the treaty by George W. Bush and the subsequent weakening of air quality regulations and support for the fossil fuel industry under his administration. The argument above alludes to political tinkering with conclusions by renowned NASA climate researcher James Hansen during the administration of George H.W. Bush – a problem Hansen has alleged under the current Bush administration (Revkin 2006a).

APT – "Against/ Political/ Transboundary"

Ozone example: "The world's two most populous nations are slated in coming years to become large CFC producers, but do not want to be subject to a ban on chemicals that helped industrialized nations to develop" (Kelliher 1990).

Climate example: "The U.S. refusal to ratify has loomed large over the 12-day conference. For the treaty to take effect, industrialized countries ratifying it must together account for at least 55 percent of the global greenhouse gas emissions in 1990, the baseline year for the protocol" (Backus 2003).

Comments: The ozone case argument above reflects a fundamental challenge to both the Montreal and Kyoto treaties – winning meaningful participation from large developing nations, particularly China and India. Many APT arguments flow from reports and commentary on international negotiation sessions in both policy regimes.

ASL – "Against/ Social/ Local"

Ozone example: "'We went with the essential amount of this very important substance that the United States needs to ensure safe and affordable agricultural and food products for Americans,' Mr. Connaughton said" (Revkin 2003)

Climate example: "Americans are so discouraged by the difficulty of solving Earth's environmental problems that they have begun losing interest, researchers say. That conclusion came from a review of public opinion surveys. 'If you keep telling people that global warming is dangerous, they're just going to get frustrated,' said John Immerwahr, an administrator at Villanova University who led the review" (Donn 1999).

Comments: The ozone case example above, one of only seven arguments in this category, revisits the methyl bromide issue. Here the need to keep American food products safe is invoked in opposition of the protocol cutbacks of the chemical. Many climate case ASL arguments parallel economic concerns about cutting fossil fuel use – for example, jobs would be lost and rate-payers would be stuck with higher bills. The example argument above is a different kind of social concern.

AST – "Against/ Social/ Transboundary"

Ozone example: "Indeed, for many people it will be hard to imagine that there is a causal relationship between the facts that 80 percent of CFC's are emitted in the Northern Hemisphere and that the ozone hole occurs in the Southern Hemisphere" (Fransen 1993).

Climate example: "Blake said other more insidious pollutants, particularly those caused by auto emissions, also pose a serious threat to earth's atmosphere and contribute to the warming trend that threatens to permanently change earth's climate. 'Unfortunately we can't ask people to give up their cars,' he said" (Ricks 1986).

Comments: The above ozone argument, an excerpt from a New York Times letter to the editor, highlights a stumbling block to public understanding of the ozone hole. Other arguments in this category quote everyday citizens as unconcerned about depleted stratospheric ozone. The most important climate case arguments in this category are those that underscore, as above, the intractability of fossil fuels from every day life.

ANL – "Against/ Natural/ Local"

Ozone example: "NASA is ending a satellite mission that kept tabs on the hole in Earth's ozone layer because the space agency can't afford the $10 million-a-year bill" (Bridges 2001).

Climate example: "But isn't all of this worth it to save the planet from the melting ice caps and rising sea levels supposedly brought on by global warming? The fact is that North Carolina could do all that the Kyoto Protocol requires and more, and it would have no perceptible effect on global climate. Any action that North Carolina could take would involve all costs and no benefits" (Cordato 2003).

Comments: As with FNL arguments, ANL arguments are dwarfed by their transboundary counterparts. The ozone case example above is only one of three arguments in its category. The climate argument echoes the concern noted in the ASL example – that Americans are discouraged about solving the problem of global warming. In this case, the author fosters that pessimism – a strategy used also by opponents of the ozone policy regime.

ANT – "Against/ Natural/ Transboundary"

Ozone example: "All acknowledge that chlorofluorocarbons break down ozone when they rise into the stratosphere, but they have not proved that the chemicals – used as refrigerants, in plastic foams and, in some countries, in aerosol sprays – were the specific cause of the Antarctic problem. Some suggest other pollutants, atmospheric currents or sunspots were the cause" (Hanley 1987).

Climate example: McGowan said there is not enough data to say for sure that the warming of the coastal waters is caused by global warming, a planetwide increase in temperature thought to be caused by increased carbon dioxide in the atmosphere. 'It is consistent with global warming, but we can't attribute it to that,' he said. 'If global warming occurs, it would probably look something like this' " (Recer 1998).

Comments: The overwhelming number of arguments in this category in both the ozone and climate change cases cast doubt on the veracity of science driving the respective treaty processes. The arguments range from direct contradictions of mainstream findings – by scientists, politicians or interest group spokespeople – to more mundane but ubiquitous statements of uncertainty, as in the climate case example above.

Code Total Trends

While the tallies and percentages in this chapter's tables are useful for characterizing the overall body of arguments, they say nothing about the evolution of arguments over the 24-year sample period. Figure 14 and Figure 15 demonstrate one way to do this by displaying the number of arguments present in eight general substance categories each year of the sample. These topographic style maps in two- and three-dimensions (similar to those presented in the pilot study in the previous chapter) reveal the level of attention each category received in a given year. The element of direction is introduced in Figure 16 and Figure 17, which display difference between "For" and "Against" arguments in each category in each year. Here darker blue valleys indicate progressively negative ("Against") territory and darker brown mountains progressively positive ("For") territory. Thus, while the first two grayscale figures show the *intensity* of arguments in the news reports by year, the color maps show their directional *differential*. Together they show, in terms of sheer numbers, whether "For" or "Against" arguments present in a given category in a given year prevailed or fought to a draw.

Taking the four figures in turn, each tells a story about the evolution of arguments in the ozone and climate change news reports. Figure 14 shows that in the ozone case, arguments spiked in years of significant news coverage of big events – mostly the negotiation of amendments named for the cities where they took place – in 1987 (Montreal Protocol), 1990 (London Amendments), 1992 (Copenhagen Amendments), 1995 (Vienna Amendments) and 2003 (when the U.S. sought methyl bromide exemptions). These spikes represent mostly transboundary environmental, social and political arguments. Figure 16 shows that when the difference was taken between "For" and "Against" arguments on that map, the "For" claims consistently prevailed. This includes a steady ridge of transboundary environmental/scientific arguments warning of the threat of CFCs to stratospheric ozone. From this it can be concluded that scientific, political and social arguments in the news media reflected support for the protocol's goals and principles at key times of the protocol's development with one glaring exception: economic arguments in 2003 supporting an exemption to protocol restrictions on methyl bromide.

The landscape of arguments in the climate case shares one striking feature: a prominent ridge of transboundary/scientific and environmental claims (Figure 15) that holds up in the differential (Figure 16). This shows that scientific arguments in news media coverage also ran strongly in favor of the climate change treaty. But the rest is quite different. The climate case landscape is dominated by large, spikes in international political and domestic economic arguments in 2001. This is the year George W. Bush walked away from the Kyoto Protocol and it made big news. In the differential figure, the political spike melts down to just below zero and the domestic economic spike drops to -24 – that's 24 more AEL arguments than FEL arguments in a single year. This shows that a remarkable amount of political argument appeared in the papers in 2001 and – in terms of numbers alone – essentially cancelled themselves out, while two dozen economic arguments opposed to the protocol went unchecked.

Figure 14. Ozone Case Substance Over Time

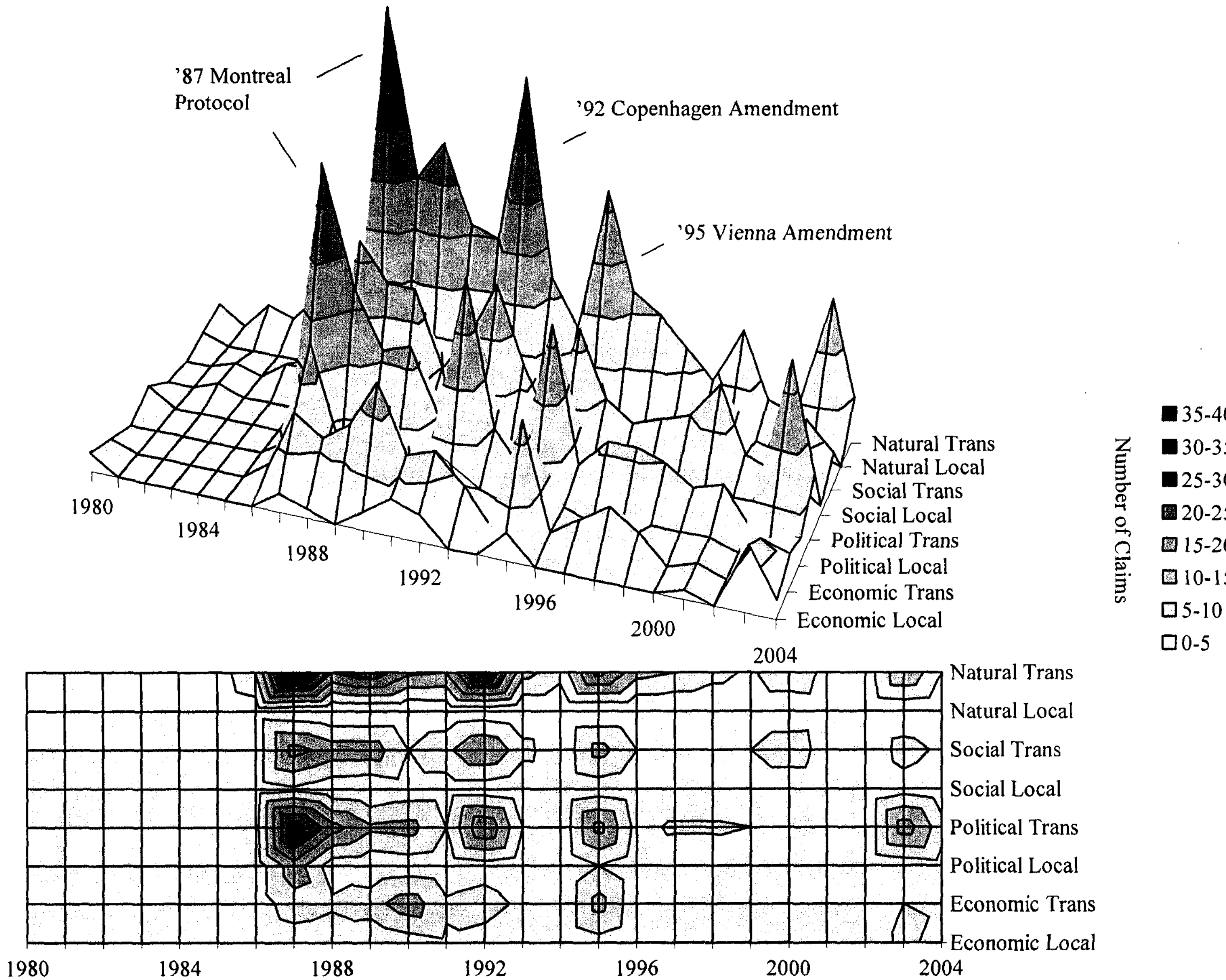


Figure 15. Climate Case Substance Over Time

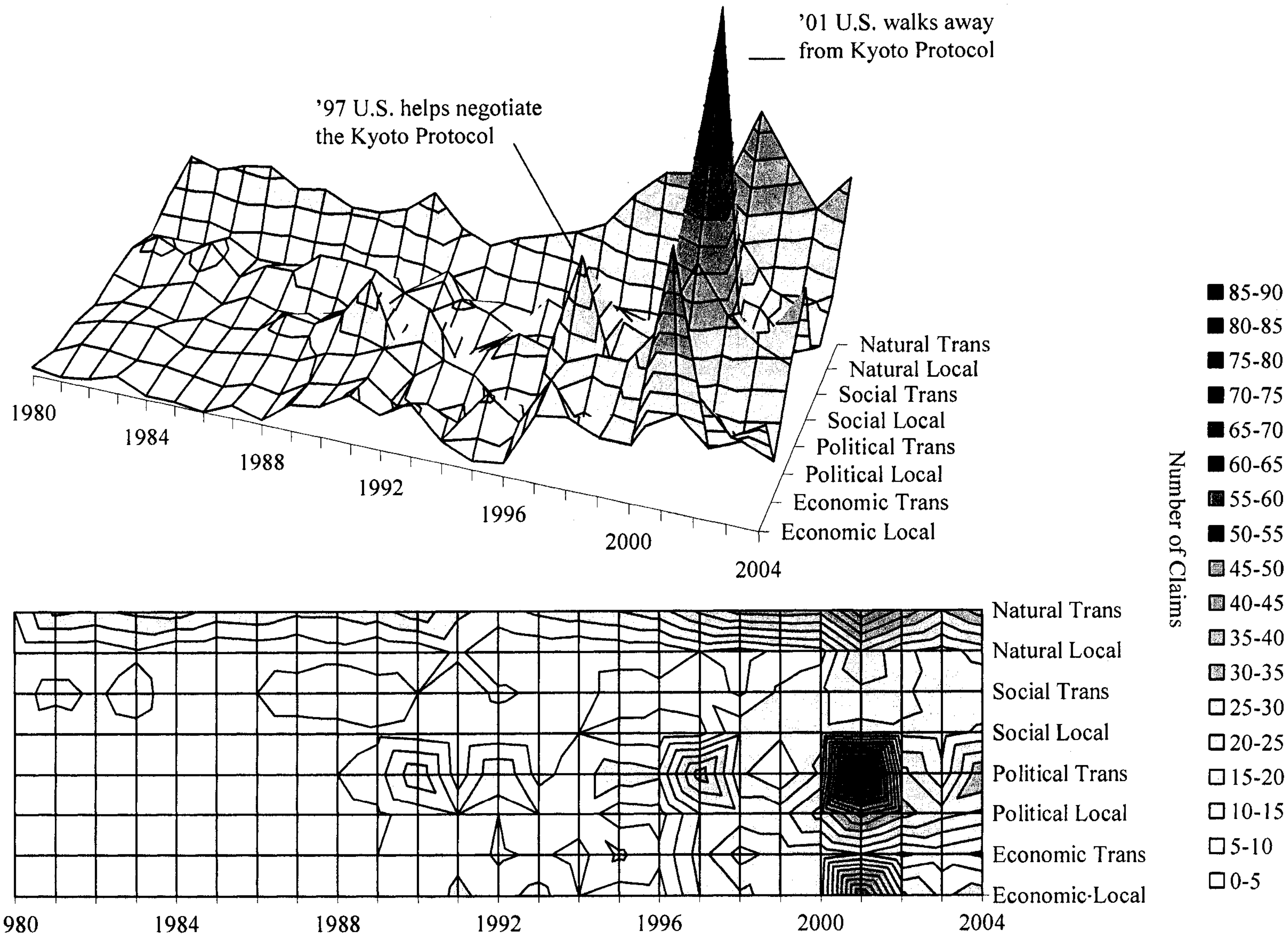


Figure 16. Ozone Case Substance Differential Over Time

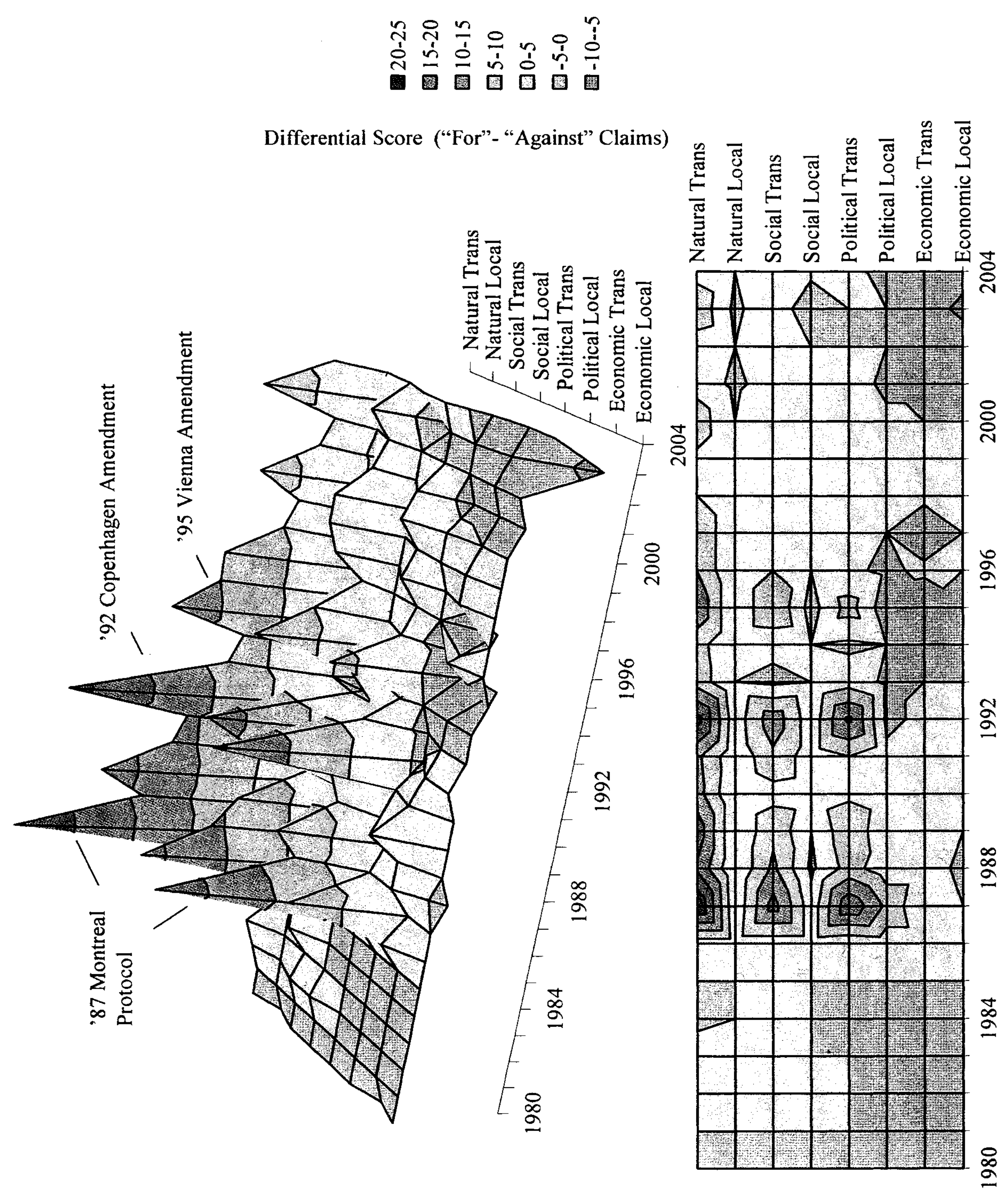
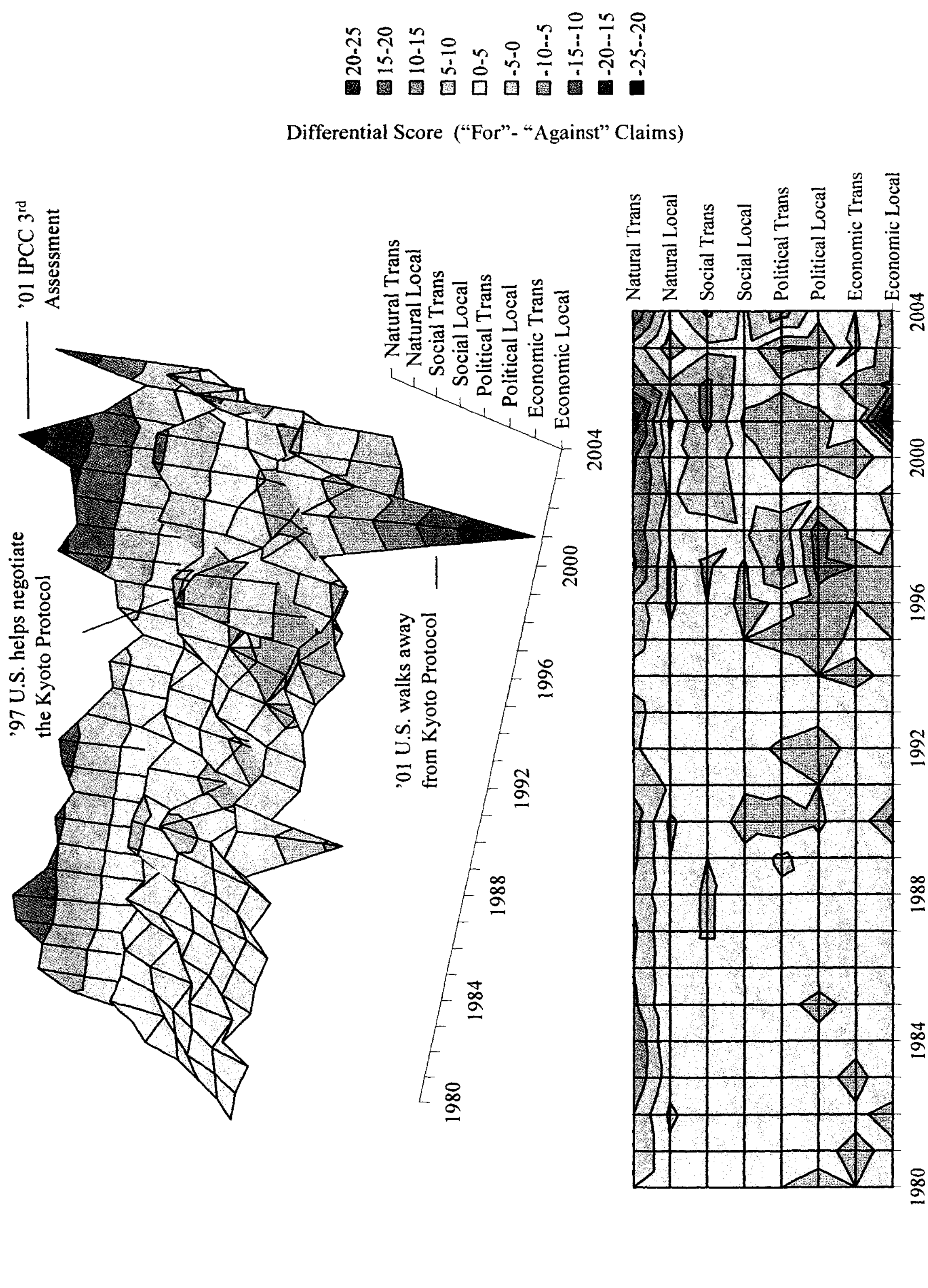


Figure 17. Climate Change Case Substance Differential Over Time



Policy Issue Criteria

Overview

Recall that the policy issue criteria categories were created to aid in describing an argument's relevance to the policy making process. For example, an argument that is relevant to defining the policy problem is coded "problem" and an argument relevant to promoting a particular policy solution is coded "support." Arguments can be relevant to one or several of the five policy issue criteria. This section examines the distribution of arguments that fall into each of the five criteria. Before taking each in turn, it is worth comparing their overall proportions as listed in Table 9. Most noticeable is that by about a 3:2 margin a greater proportion of arguments in the ozone case were focused on debating the "problem" of the ozone hole, than were arguments in the climate case focused on the "problem" of climate change. But in the climate case, nearly twice as many arguments, as a percentage of all five criteria, were linked to the "support" and "feasibility" codes – meaning a greater proportion of arguments in climate change coverage were devoted to lobbying and discussion of the feasibility of solving the problem. By about a 5:1 margin, a greater proportion of ozone arguments were linked to accountability. Figure 18 and Figure 19 show the breakdown of arguments in the policy issue criteria categories by direction and substance.

Figure 18. Ozone Case PIC by Direction and Substance

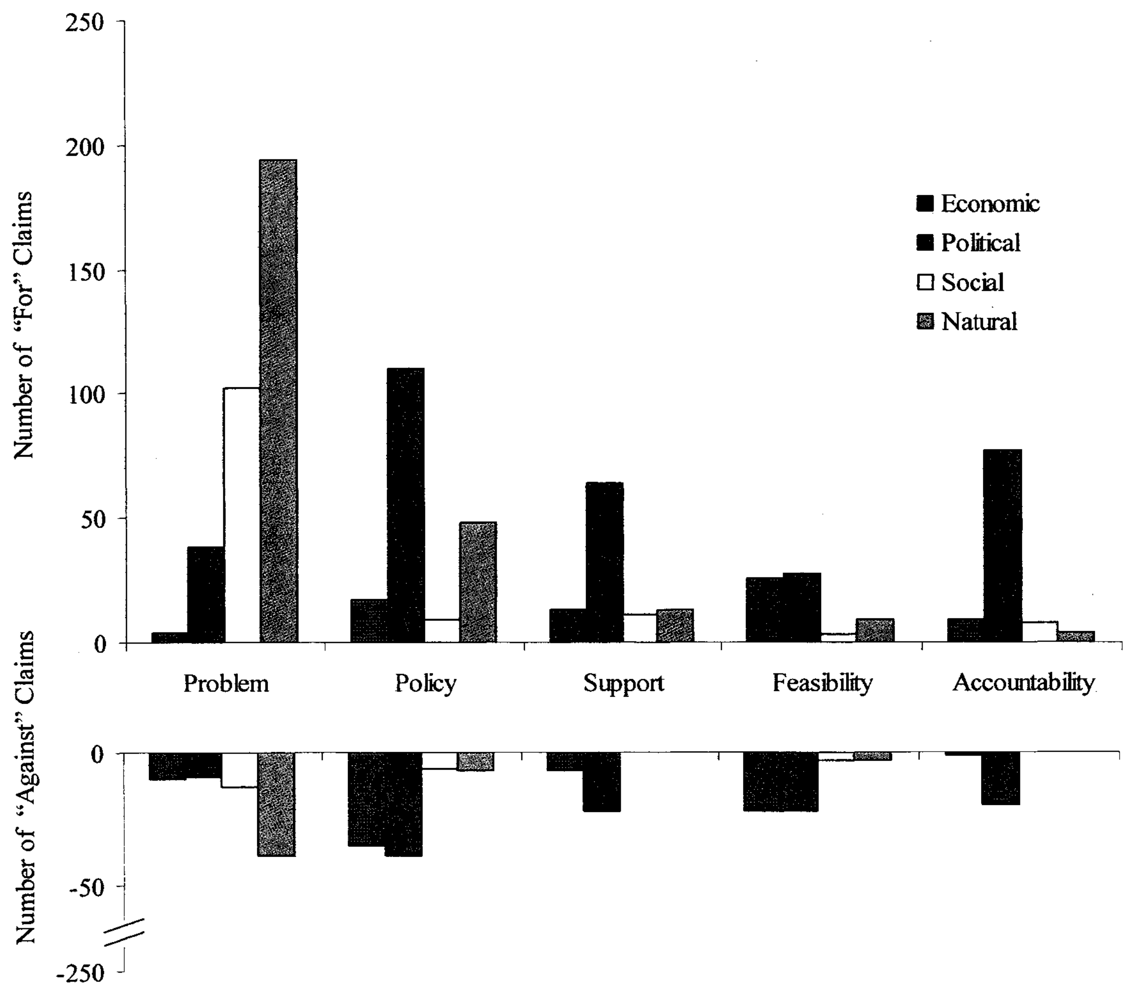
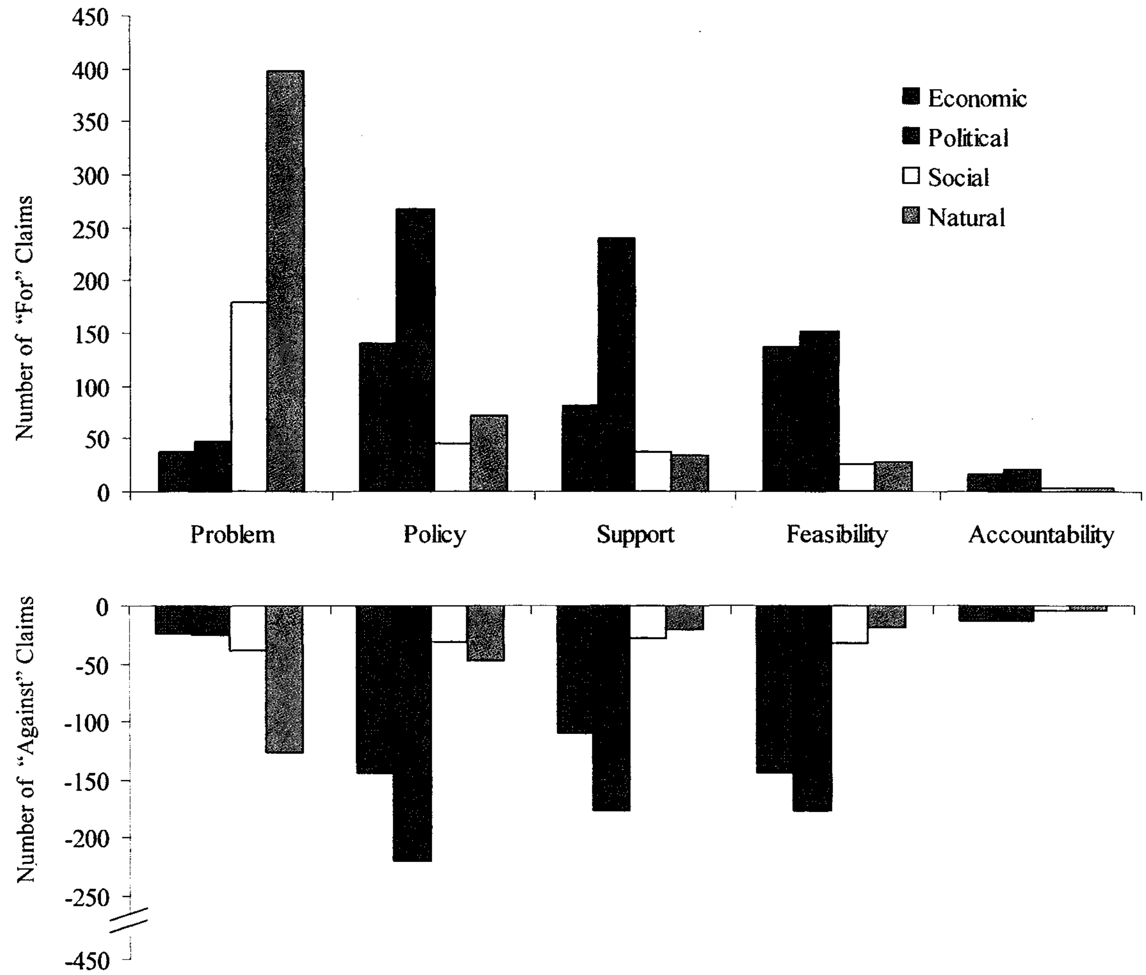


Figure 19. Climate Case PIC by Direction and Substance



The distribution of arguments in the "problem" category was strikingly similar across the two cases, with For/Natural arguments dominating in both. This is so because "Natural" arguments are by definition scientific and environmental arguments. In both cases they were overwhelmingly concerned with the policy "problem," and – as it turned out – they were overwhelmingly favorable to the protocols. The distribution of Social arguments within the problem category is also similar. But a noticeable shift occurred in the distribution of arguments in the next three criteria. The proportion of For/Political arguments in three key categories – policy, support and feasibility –was higher in the ozone case than the climate case. Conversely, the proportion of Against/Political arguments in the climate case was higher across the three criteria than in the ozone case. In other words, political arguments in news reports relevant to selecting, promoting and debating the feasibility of policy solutions were proportionally more favorable in the ozone case than the climate case and more negative in the climate case than the ozone case. Finally, "accountability" arguments are far more prominent in the ozone case due to a proportionally larger number of For/Political arguments in that category. Next, this section lists the more detailed results for each of the five policy issue criteria. The following five tables are each preceded by brief comments describing some of their major features.

Problem

Table 10 reveals that arguments in the problem category in both cases ran "very strongly" in favor of the Montreal Protocol and the Kyoto Protocol. The ozone arguments are "extremely" transboundary and the climate arguments "strongly" so. In both cases, scientists monopolized this category of argument – 64 percent of ozone arguments were linked to scientists versus 46 for climate change.

Table 10. Problem Code Totals

Problem Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
For	338	83	662	75
Against	71	17	216	25
Total	409	100	878	100
Local	21	5	225	26
Trans	388	95	653	74
Total	409	100	878	100
Economic	14	3	62	7
Political	47	11	73	8
Social	115	28	218	25
Natural	233	57	525	60
Total	409	100	878	100
FEL	0	0	15	2
FET	4	1	23	3
FPL	2	0	23	3
FPT	36	9	24	3
FSL	7	2	51	6
FST	95	23	128	15
FNL	3	1	45	5
FNT	191	47	353	40
AEL	2	0	11	1
AET	8	2	13	1
APL	3	1	21	2
APT	6	1	5	1
ASL	2	0	20	2
AST	11	3	19	2
ANL	2	0	39	4
ANT	37	9	88	10
Total	409	100	878	100

Table 10 Cont.

Problem Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
Scientists	246	64	489	46
US Govt	55	14	172	16
Industry	12	3	78	7
UN	26	7	48	5
Public	23	6	174	16
Environment	14	4	73	7
Europe	8	2	27	3
Total	384	100	1061	100

Policy

Table 11 shows that in the policy category, ozone arguments were "strongly" in favor of the Montreal Protocol while climate change arguments were only "slightly" so. Ozone arguments were "very strongly" transboundary and climate arguments were only "slightly" so.

Table 11. Policy Code Totals

Policy Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
For	184	68	523	54
Against	87	32	443	46
Total	271	100	966	100
Local	48	18	508	53
Trans	223	82	458	47
Total	271	100	966	100

Table 11 Cont.

	Montreal Case		Kyoto Case	
Policy Codes	Number	Percent	Number	Percent
Economic	52	19	284	29
Political	149	55	487	50
Social	15	6	76	8
Natural	55	20	119	12
Total	271	100	966	100
FEL	1	0	80	8
FET	16	6	60	6
FPL	15	6	110	11
FPT	95	35	157	16
FSL	3	1	23	2
FST	6	2	22	2
FNL	2	1	27	3
FNT	46	17	44	5
AEL	12	4	103	11
AET	23	8	41	4
APL	10	4	119	12
APT	29	11	101	10
ASL	3	1	22	2
AST	3	1	9	1
ANL	2	1	24	2
ANT	5	2	24	2
Total	271	100	966	100
Scientists	45	19	119	9
US Govt	91	39	533	42
Industry	29	13	224	18
UN	23	10	57	4
Public	9	4	159	13
Environment	19	8	99	8
Europe	16	7	78	6
Total	232	100	1269	100

Support

Table 12 shows a similar pattern exists in the "support" category. Here ozone arguments were "strongly" in favor of the ozone treaty while climate arguments only "slightly" so. Ozone arguments were "very strongly" transboundary and climate arguments "slightly" transboundary.

Table 12. Support Code Totals

	Montreal Case		Kyoto Case	
Support Codes	Number	Percent	Number	Percent
For	101	78	394	54
Against	29	22	338	46
Total	130	100	732	100
Local	28	22	367	50
Trans	102	78	365	50
Total	130	100	732	100
Economic	20	15	193	26
Political	86	66	417	57
Social	11	8	66	9
Natural	13	10	56	8
Total	130	100	732	100
FEL	2	2	45	6
FET	11	8	37	5
FPL	15	12	85	12
FPT	49	38	155	21
FSL	3	2	22	3
FST	8	6	15	2
FNL	2	2	12	2

Table 12 Cont.

Support Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
FNT	11	8	23	3
AEL	2	2	86	12
AET	5	4	25	3
APL	4	3	86	12
APT	18	14	91	12
ASL	0	0	22	3
AST	0	0	7	1
ANL	0	0	9	1
ANT	0	0	12	2
Total	130	100	732	100
Scientists	24	19	55	6
US Govt	49	39	413	43
Industry	18	14	167	17
UN	11	9	41	4
Public	8	6	125	13
Environment	3	2	81	8
Europe	12	10	73	8
Total	125	100	955	100

Feasibility

Table 13 shows that "For" claims in the ozone case dropped in the feasibility category to the "slight" level. Feasibility arguments focused on the possibility of actually carrying out a policy prescription and were heavy on economic and political claims. As a result of this mix, the margin was simply closer. The same was so for the climate case in which these arguments dipped slightly into negative territory in the "almost equal" category. Ozone arguments were "very strongly" transboundary" and climate arguments just "slightly" transboundary.

Table 13. Feasibility Code Totals

Feasibility Codes	Montreal Case		Kyoto Case	
	Number	Percent	Number	Percent
For	66	57	342	48
Against	50	43	373	52
Total	116	100	715	100
Local	20	17	386	54
Trans	96	83	329	46
Total	116	100	715	100
Economic	48	41	281	39
Political	50	43	329	46
Social	6	5	59	8
Natural	12	10	46	6
Total	116	100	715	100
FEL	2	2	80	11
FET	24	21	57	8
FPL	3	3	69	10
FPT	25	22	83	12
FSL	1	1	16	2
FST	2	2	10	1
FNL	1	1	12	2
FNT	8	7	15	2
AEL	7	6	99	14
AET	15	13	45	6
APL	3	3	79	11
APT	19	16	98	14
ASL	2	2	23	3
AST	1	1	10	1
ANL	1	1	8	1
ANT	2	2	11	2
Total	116	100	715	100
Scientists	17	16	68	7

Table 13 Cont.

Feasibility Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
US Govt	30	28	388	40
Industry	25	23	209	22
UN	11	10	43	4
Public	6	6	126	13
Environment	10	9	74	8
Europe	10	9	62	6
Total	109	100	970	100

Accountability

The starkest feature of the accountability category is that ozone arguments here – as nowhere else – outnumber climate arguments. This indicates at a minimum that accountability was a bigger topic within ozone coverage. These arguments ran "very strongly" in favor of the ozone treaty and "slightly" in favor of the climate treaty. Ozone arguments were "very strongly" transboundary and climate arguments "slightly" so.

Table 14. Accountability Code Totals

Accountability Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
For	98	82	46	56
Against	21	18	36	44
Total	119	100	82	100
Local	16	13	35	43
Trans	103	87	47	57
Total	119	100	82	100

Table 14 Cont.

Accountability Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
Economic	10	8	30	37
Political	97	82	36	44
Social	8	7	9	11
Natural	4	3	7	9
Total	119	100	82	100
FEL	0	0	10	12
FET	9	8	7	9
FPL	9	8	5	6
FPT	68	57	17	21
FSL	2	2	1	1
FST	6	5	3	4
FNL	1	1	2	2
FNT	3	3	1	1
AEL	0	0	9	11
AET	1	1	4	5
APL	4	3	5	6
APT	16	13	9	11
ASL	0	0	2	2
AST	0	0	3	4
ANL	0	0	1	1
ANT	0	0	3	4
Total	119	100	82	100
Scientists	17	16	5	5
US Govt	45	43	43	42
Industry	6	6	16	16
UN	15	14	7	7
Public	7	7	10	10
Environment	8	8	11	11
Europe	7	7	10	10
Total	105	100	102	100

Policy Issue Criteria Trends

The policy issue criteria landscape maps in Figure 20 and Figure 21 look similar to the substance landscape maps with spikes in arguments in the same years, only in different categories. Figure 20 shows similar spikes in arguments in the ozone case in 1987, 1992, 1995 and 2003. This map shows that the policy was the dominant topic in the year of the Montreal Protocol (1987) and that discussion of the problem, took precedence during the 1992 Copenhagen Amendments and 1995 Vienna Amendments. Policy was the biggest topic of 2003, when the United States pressed for methyl bromide exemptions. Figure 21 shows again that 2001, when the U.S. left the Kyoto Protocol, was the busiest year for arguments in the climate case. The greatest concentration of arguments that year was in "policy," followed by "support," "feasibility" and then "problem." Smaller spikes are visible in the "policy" category in 1997 (the year the Kyoto Protocol was created), 1993 (when Clinton failed to win an energy tax) and 1990 (when George H.W. Bush backed away from climate efforts). The differential graphs, Figure 22 and Figure 23, show how arguments settled out across the categories in both cases. Figure 22 shows that in the ozone case, the biggest spike in positive territory was in "policy" the year the Montreal Protocol was approved. A steady emphasis on the "problem" persists from 1987 to the end of the sample – reflecting the drumbeat of scientific/environmental arguments captured in the substance landscape map in Figure 16. The biggest valley on the ozone PIC map happens in 2003 in the "policy" category, reflecting the U.S. quest for methyl bromide exemptions – a debate captured as a deep economic valley on the landscape map. Figure 23 shows that arguments in the climate case about the "problem" stayed well in positive territory, reflecting the wall of scientific/environmental arguments seen in the climate *substance* landscape map in Figure 17. A deep valley in the "feasibility" category in 2001 corresponds with the economic arguments lodged against the Kyoto Protocol documented in the substance landscape map.

Figure 20. Ozone Case PIC Over Time

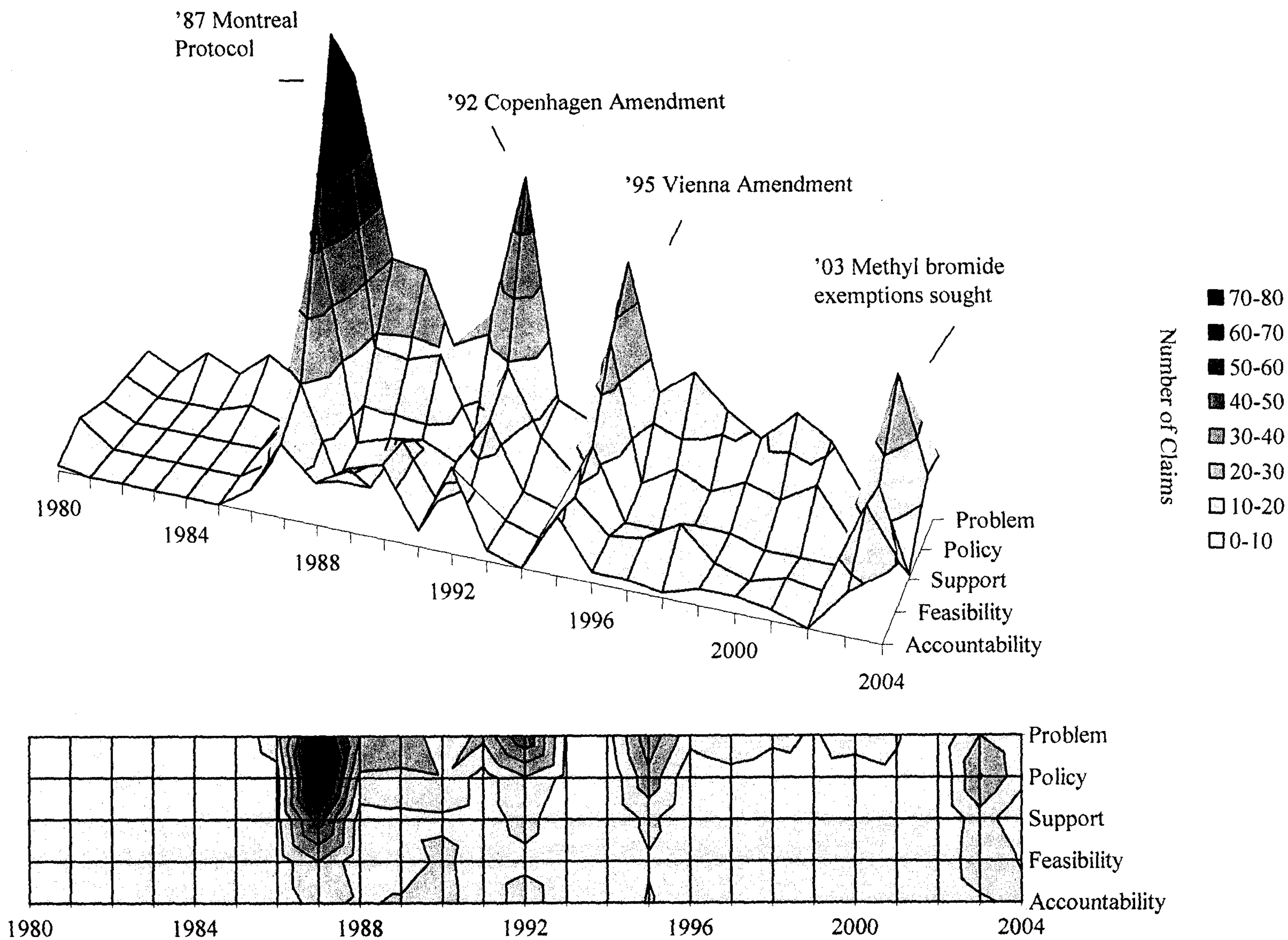
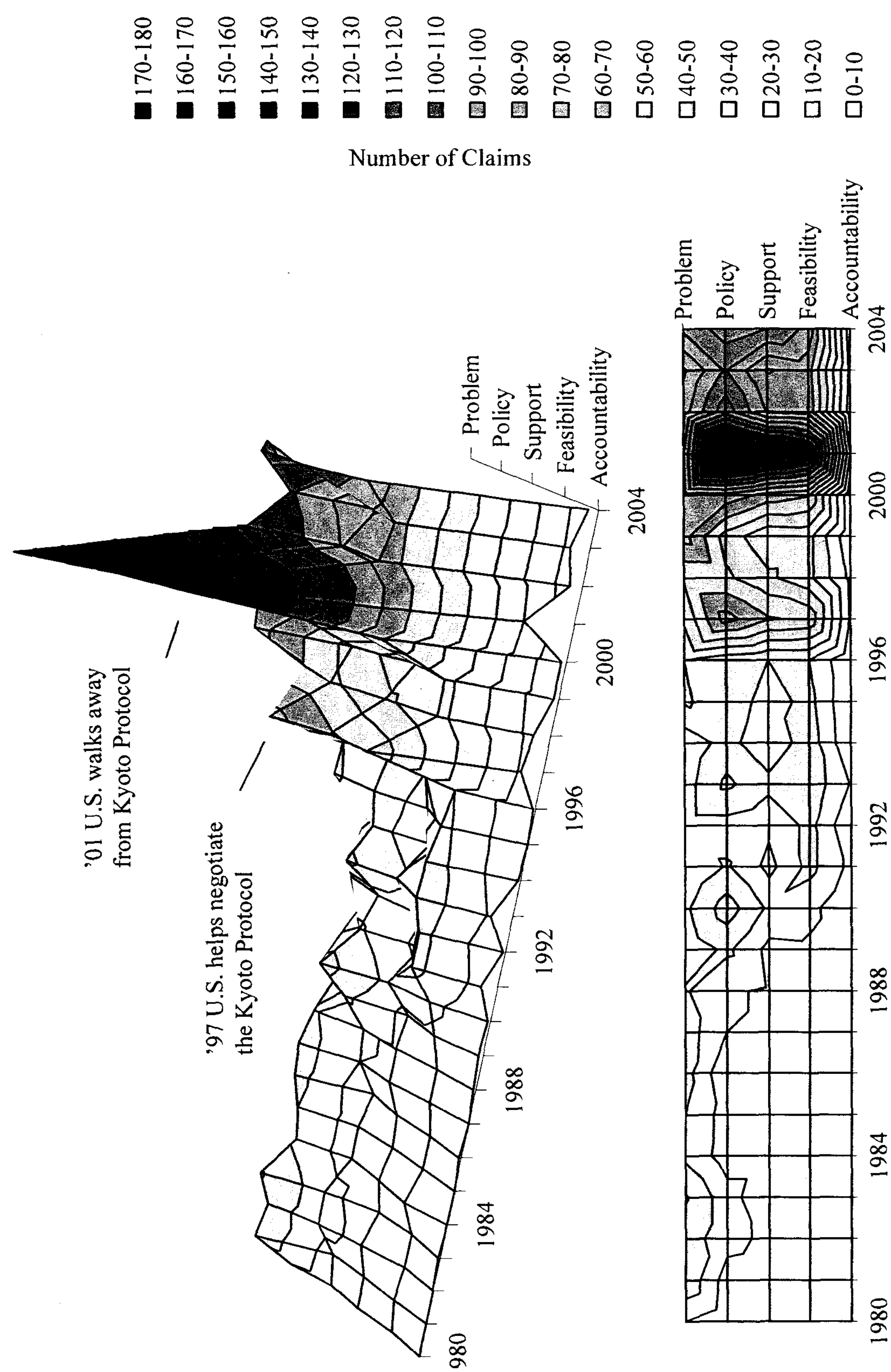


Figure 21. Climate Case PIC Over Time



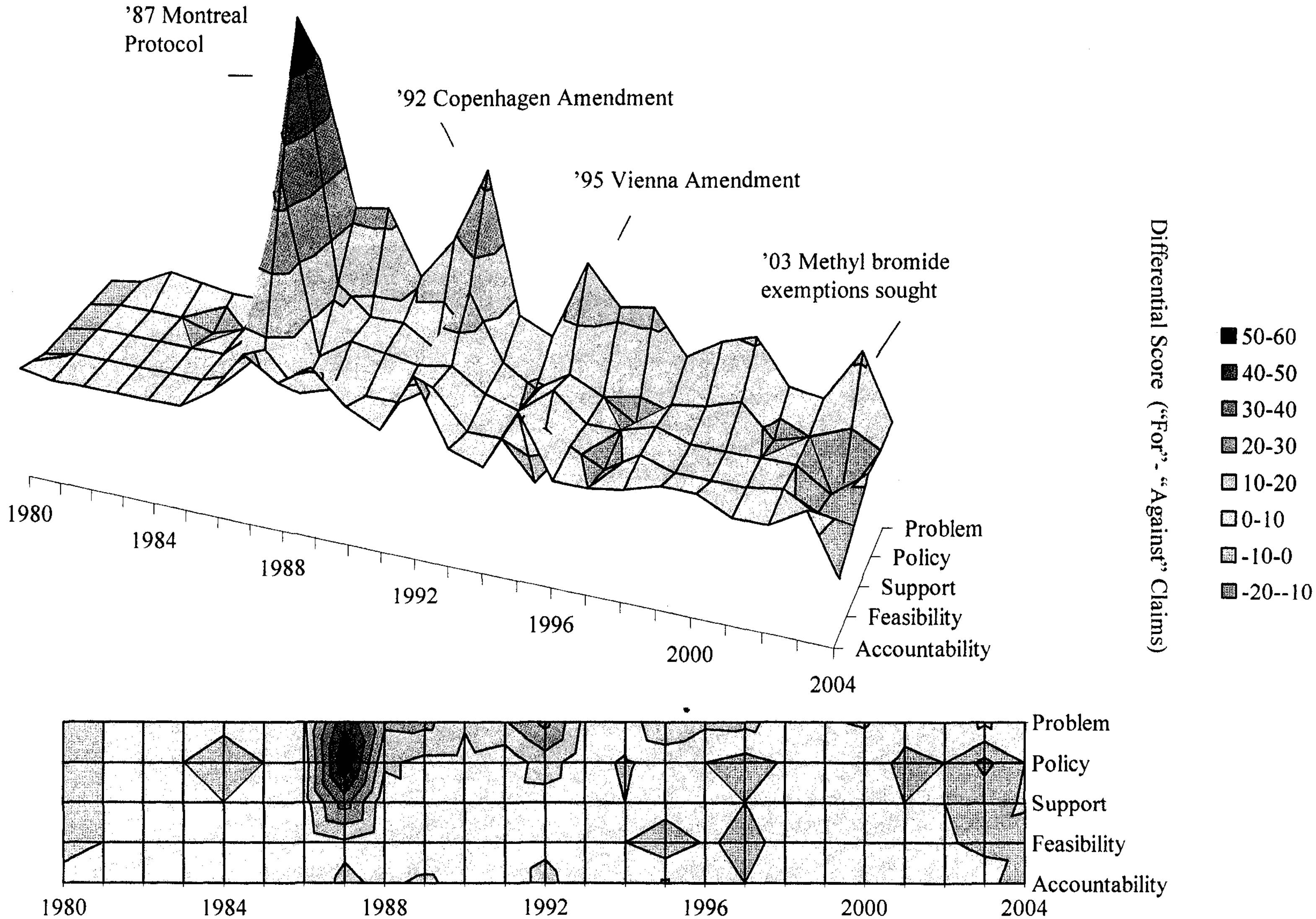
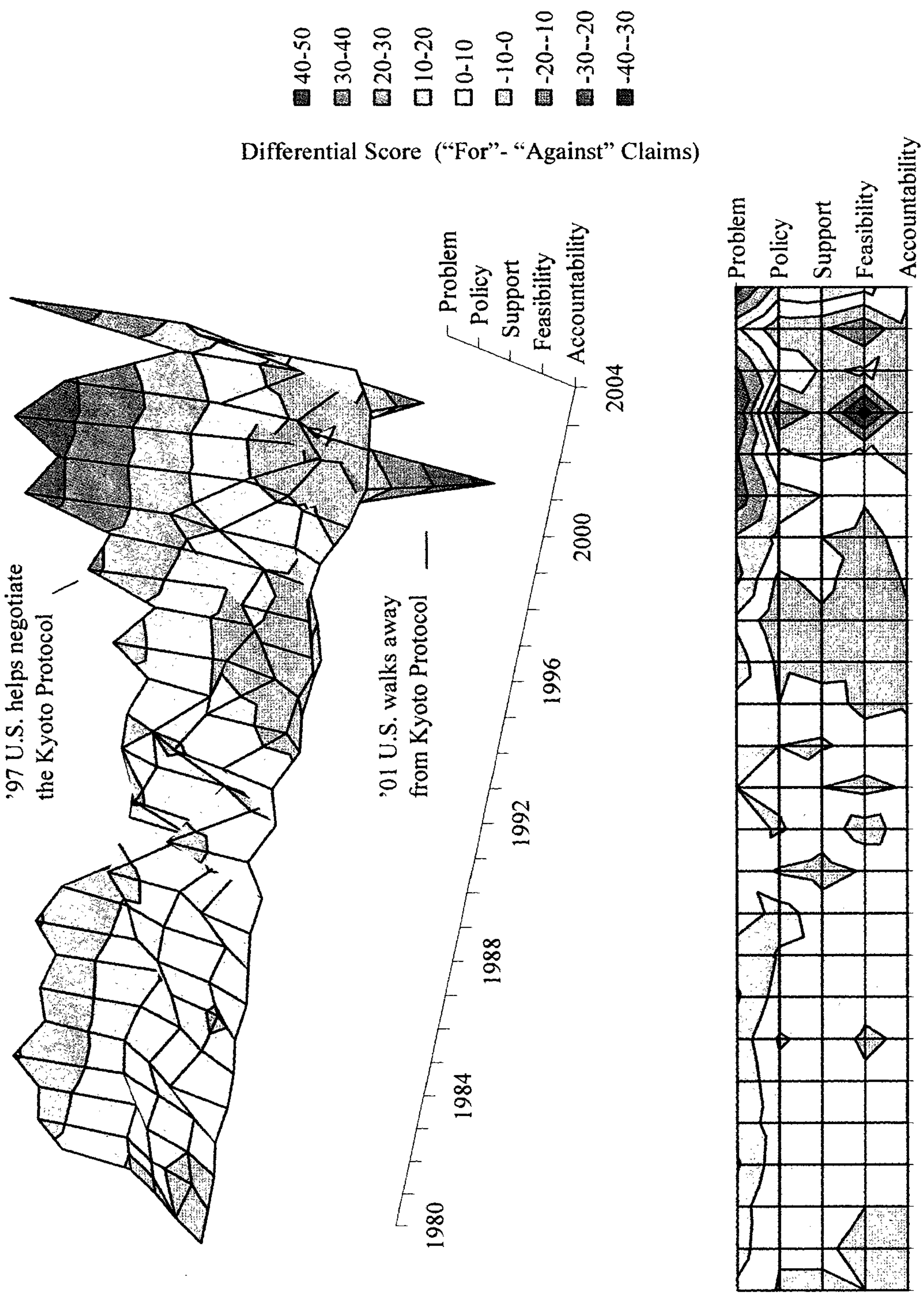


Figure 22. Ozone Case PIC Differential Over Time

Figure 23. Climate Case PIC Differential Over TimeStakeholders



Stakeholders

Having examined aggregate results and annual trends in substance and policy issue criteria, what remains is an accounting of results by stakeholder group. This final step enables an understanding of what groups are behind the results seen thus far. Some have already been alluded to, such as the role of scientists in producing the overwhelming number of scientific/environmental arguments about the "problem" – and most of those favorable to both goals of both case protocols. As with the preceding sections, this one deals primarily with numeric results. Examples of specific arguments linked to stakeholders are drawn upon in the discussion section (Chapter V) where they are placed in context with trends and interview results using the policy analytic framework.

Table 9 shows the percent breakdown by stakeholder group across the cases. Recall that a stakeholder group is assigned to an argument if the argument is made *by* or is substantially *about* a stakeholder group. Recall also that a single argument could be sorted into one or more stakeholder categories, as with DuPont's Dr. Steed in Chapter II, who was a scientist and an industry representative. In both cases, arguments sorted to the "Scientists" stakeholder group included those attributed to an array of research organizations. These include scientists with the World Meteorological Organization (WMO), National Academy of Sciences (NAS), NASA, NOAA, the EPA and a large number of universities around the world. In the ozone case, scientists comprised the biggest stakeholder group – linked to 45 percent of all arguments. They took second place in the climate case at 26 percent. Arguments coded "U.S. Government" included an array of federal, state or local government officials or their organizations. Common were arguments attributed to presidential "administration" officials. In the climate case, American government officials topped the list at 30 percent while they were linked to nearly a quarter of arguments in the ozone case. "Industry" stakeholders were linked to only about 9 percent of ozone case arguments and included chemical companies, their umbrella lobbying organizations or politicians speaking on industry's behalf. The code also extended to farmers in the methyl bromide debate. In climate change, "industry" referred to oil companies, the auto industry, manufacturers and their lobbying outfits, including the Global Climate Change Coalition. Industry's voice was a bit louder in this case at 13 percent. The "United Nations" group, while central to both the ozone and climate cases, weighed in at 7 percent and 4 percent respectively. This included several U.N. organizations active in the cases including the UNEP, the General Assembly and the ozone and climate secretariats. Arguments coded "Public" referred to direct references to the public, public health, Americans or voters and included writers of letters to the editor, which were a small part of the sample of New York Times articles. The "environment" category included references to environmentalists and organizations such as the Natural Resources Defense Council, Greenpeace, the Sierra Club and the Union of Concerned Scientists. Arguments coded "Europe" included any of the European nations, but also the larger European Community.

It should be understood that these groups – and individuals coded as members of them – are not a monolith and that opinions and agendas within them often conflict. Thus, numeric conclusions of stakeholders' arguments have a potential to be misleading. They are intended to point up broader trends and to serve as an entrée to a more detailed qualitative analysis that involves returning to the source articles to see exactly who said what. The choice of the seven principal stakeholder groups in this study emerged from the Montreal Protocol pilot study. These categories by no means encompass the whole of sources and subjects – obviously, there are more than seven players and many more nations that could be individually named – but these are the ones that dominate the American news reports. Two additional and more general stakeholder codes, "developed nations" and "developing nations," were used to capture arguments that might otherwise fall through the cracks. For example. Pacific Island states fearing flooding brought on by global warming have lobbied hard for a climate treaty. To the extent their concerns are not captured by the "U.N." or "environmentalist" codes, they are included in the "developing nations" category. These codes are not reported on here, but they are used to enrich and place in further context the discussion in Chapter V.

Four figures enable a broad visual comparison of the seven stakeholder groups. Figure 24 and Figure 25 show arguments by stakeholders broken down by direction and substance. Figure 26 and Figure 27 show them broken down by direction and policy issue criteria. A few key findings stand out in each. Looking left to right across all four figures, it is plan to see that scientists' arguments are grouped in very similar fashion in both cases – across both direction and substance categories and policy issue criteria. This suggests that scientists were playing a similar role in the debate about both policies. Figure 24 and Figure 25 show that in both cases they were focused on describing scientific and environmental phenomenon and the balance of their arguments were "very strongly" favorable to the protocols. This balance extends to discussion of the "social" consequences of each. A key difference between scientists' arguments in the cases is that the ozone case had a higher proportion of political arguments and lower proportion of economic arguments than the climate case. Figure 26 and Figure 27 show that in both cases scientists' arguments were by a wide margin more relevant to defining the policy "problem" than finding a "policy" solution for the problem. Findings for the U.S. Government and Industry stakeholder groups are a bit more varied. But there is one critical difference between the cases here: they are split by direction. In the ozone case, U.S. government arguments were "strongly" favorable to the Montreal Protocol and industry arguments were "slightly" so. In the climate case, both group's arguments run "slightly" *against* the Kyoto Protocol. Broadly, then, it can be said that while scientists' arguments in the news media were similarly favorable to the Kyoto and Montreal Protocols, American Government and industry were split – in favor of the ozone treaty, but against the climate treaty. Separately, a comparison of "public" stakeholder arguments shows that For/Social arguments were more common in the ozone case than in the climate case (~2:1). This suggests a greater relative preoccupation with public welfare in the ozone case in this category, which was focused on skin cancer. This section now turns to a brief look at the stakeholder data tables, providing additional insights about each group. A short section about trends follows.

Figure 24. Ozone Case Stakeholders by Direction and Substance

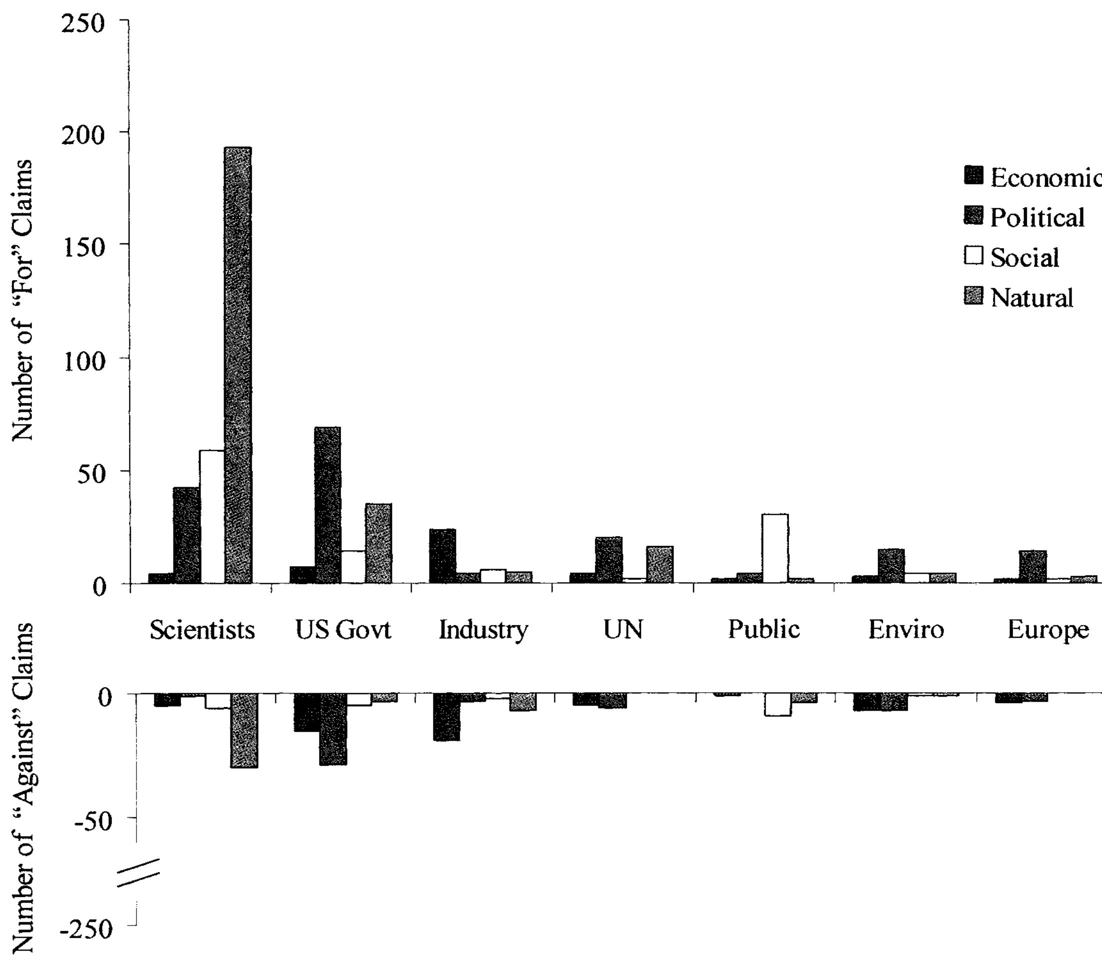


Figure 25. Climate Case Stakeholders by Direction and Substance

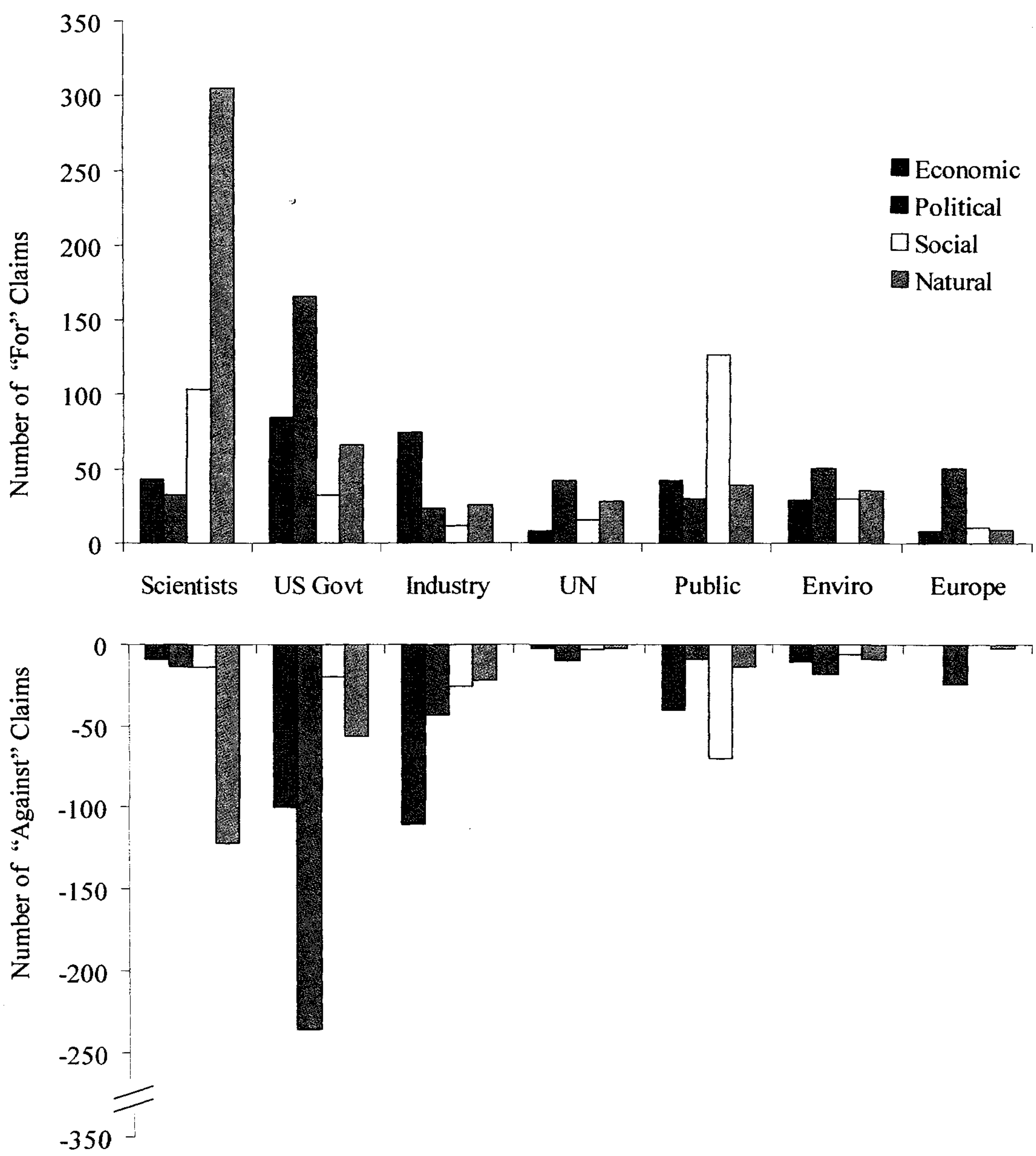


Figure 26. Ozone Case Stakeholders by Direction and PIC

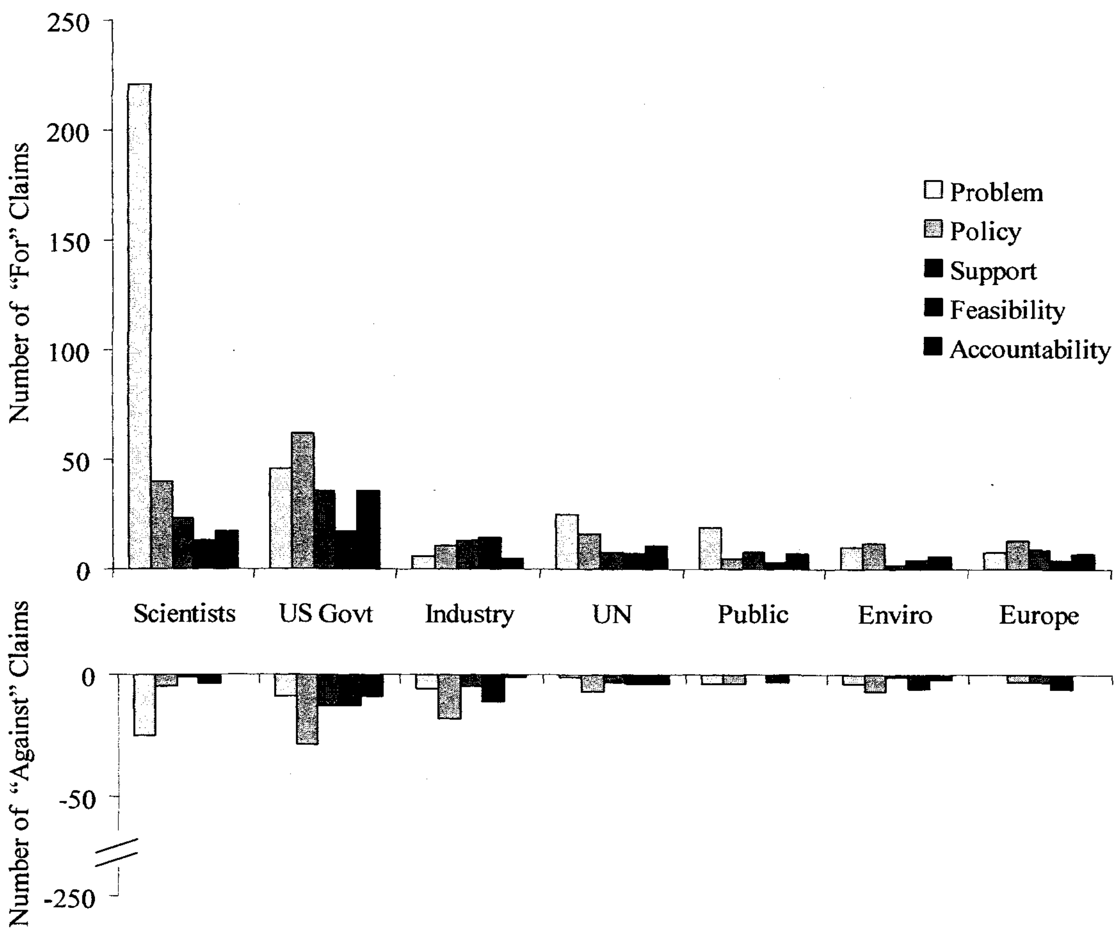
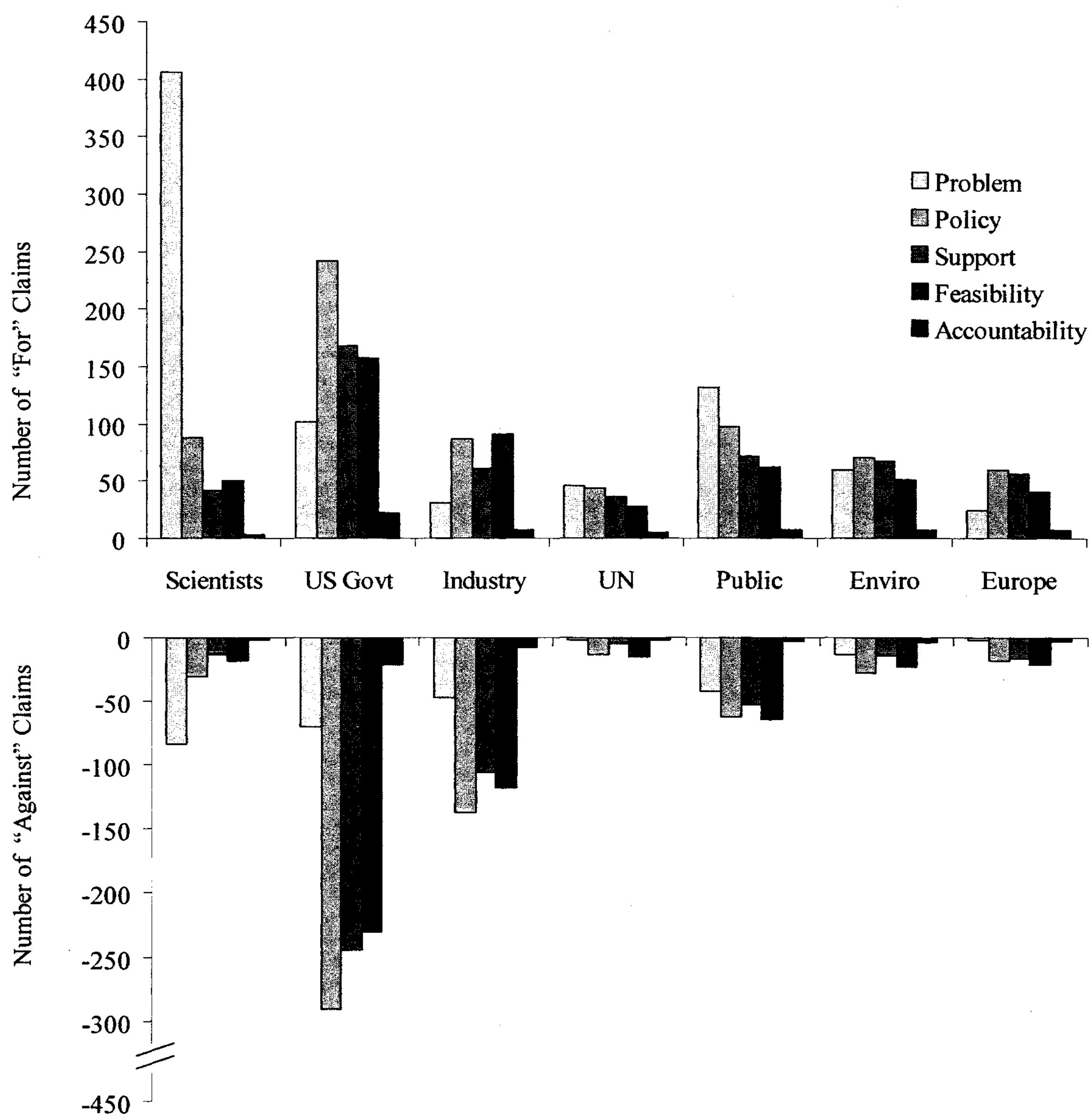


Figure 27. Climate Case Stakeholders by Direction and PIC



Scientists

Table 15 below shows scientists' arguments ran at the high end of "very strong" support for the Montreal Protocol and the low end of "very strong" for the Kyoto Protocol. Respectively, they were "extremely" domestic and "very strongly domestic." Proportionally, both were heavy on FNT arguments but ANT arguments were nearly twice as prominent in the climate case.

Table 15. Scientist Code Totals

Scientist Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
For	298	88	484	75
Against	42	12	159	25
Total	340	100	643	100
Local	14	4	107	17
Trans	326	96	536	83
Total	340	100	643	100
Economic	9	3	52	8
Political	45	13	46	7
Social	65	19	118	18
Natural	223	65	427	66
Total	342	100	643	100
FEL	0	0	21	3
FET	4	1	22	3
FPL	2	1	11	2
FPT	40	12	21	3
FSL	5	1	22	3
FST	54	16	82	13
FNL	4	1	31	5
FNT	189	56	274	43

Table 15 Cont.

Scientist Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
AEL	0	0	1	0
AET	5	1	8	1
APL	0	0	8	1
APT	1	0	6	1
ASL	2	1	2	0
AST	4	1	12	2
ANL	1	0	11	2
ANT	29	9	111	17
Total	340	100	643	100
Problem				
For	221	90	406	83
Against	25	10	83	17
Total	246	100	489	100
Policy				
For	40	89	88	74
Against	5	11	31	26
Total	45	100	119	100
Support				
For	23	96	42	76
Against	1	4	13	24
Total	24	100	55	100
Feasibility				
For	13	76	50	74
Against	4	24	18	26
Total	17	100	68	100
Accountability				
For	17	100	3	60
Against	0	0	2	40
Total	17	100	5	100

U.S. Government

Table 16 shows the directional split between cases in U.S. Government arguments. Ozone arguments ran "strongly" in favor of the ozone treaty while climate arguments ran "slightly" against. Both, however, were in transboundary territory – "strongly" in the ozone case and "moderately" in the climate case. Within the ozone case, political arguments in favor of the protocol were transboundary by a more than 2:1 margin whereas in the climate case they were local by a 3:2 margin. This shows that in terms of arguments, the politics supporting the ozone treaty were largely international (e.g. federal efforts to back the protocol) while on balance domestic political arguments accounted for the most support for the climate treaty (e.g. state and local officials calling for federal action or taking action themselves). In the climate case, again, arguments across the problem, policy, support and feasibility categories ran from "slightly" to "moderately" *against* the Kyoto Protocol. This data, especially, reflects the demise of the Kyoto Protocol in the United States.

Table 16. U.S. Government Totals

U.S. Govt Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
For	125	71	349	46
Against	52	29	412	54
Total	177	100	761	100
Local	58	33	459	60
Trans	119	67	302	40
Total	177	100	761	100
Economic	22	13	185	24
Political	90	53	402	53

U.S. Govt. Cont.

U.S. Govt Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
Social	19	11	52	7
Natural	38	22	122	16
Total	169	100	761	100
FEL	4	2	58	8
FET	3	2	27	4
FPL	21	12	102	13
FPT	48	27	64	8
FSL	3	2	20	3
FST	11	6	12	2
FNL	3	2	25	3
FNT	32	18	41	5
AEL	9	5	86	11
AET	6	3	14	2
APL	12	7	123	16
APT	17	10	113	15
ASL	4	2	14	2
AST	1	1	6	1
ANL	2	1	31	4
ANT	1	1	25	3
Total	177	100	761	100
Problem				
For	46	84	102	59
Against	9	16	70	41
Total	55	100	172	100
Policy				
For	62	68	242	45
Against	29	32	291	55
Total	91	100	533	100
Support				
For	36	73	168	41
Against	13	27	245	59
Total	49	100	413	100
Feasibility				

U.S. Govt. Cont.

U.S. Govt Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
For	17	57	158	41
Against	13	43	230	59
Total	30	100	388	100
Accountability				
For	36	80	22	51
Against	9	20	21	49
Total	45	100	43	100

Industry

Table 17 shows that industry-linked arguments in the ozone case were "slightly" in favor of the ozone treaty and in the climate case "moderately" against the climate treaty. The former is in positive territory because many arguments focused on the invention of substitutes by industry, which supported the treaty's goals. Arguments in the ozone case were "strongly" international while in the climate case they were "strongly" local. This conforms to industry's aggressive opposition to the climate treaty on domestic economic and political grounds. At the same time, economic arguments in favor of the climate treaty (e.g. cost-savings from efficiency and renewable energy investment) were also more local.

Table 17. Industry Code Totals

Industry Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
For	39	56	136	40
Against	31	44	201	60
Total	70	100	337	100

Industry Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
Local	19	27	225	67
Trans	51	73	112	33
Total	70	100	337	100
Economic	43	62	185	55
Political	6	9	66	20
Social	8	12	38	11
Natural	12	17	48	14
Total	69	100	337	100
FEL	4	6	46	14
FET	20	29	29	9
FPL	0	0	17	5
FPT	4	6	6	2
FSL	2	3	7	2
FST	4	6	5	1
FNL	0	0	8	2
FNT	5	7	18	5
AEL	11	16	78	23
AET	8	11	32	9
APL	1	1	39	12
APT	2	3	4	1
ASL	0	0	23	7
AST	2	3	3	1
ANL	1	1	7	2
ANT	6	9	15	4
Total	70	100	337	100
Problem				
For	6	50	31	40
Against	6	50	47	60
Total	12	100	78	100
Policy				
For	11	38	87	39
Against	18	62	137	61

Industry Cont.

Industry Cont.

Industry Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
Total	29	100	224	100
Support				
For	13	72	61	37
Against	5	28	106	63
Total	18	100	167	100
Feasibility				
For	14	56	91	44
Against	11	44	118	56
Total	25	100	209	100
Accountability				
For	5	83	8	50
Against	1	17	8	50
Total	6	100	16	100

United Nations

Table 18 shows that arguments linked to the United Nations in both cases were remarkably similar over most coding categories. Both were "very strongly" in favor of the protocols and both "extremely" international. This is not surprising since the United Nations, an international organization, sponsored the process.

Table 18. UN Code Totals

UN Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
For	42	79	94	85
Against	11	21	17	15
Total	53	100	111	100

UN Cont.

UN Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
Local	1	2	2	2
Trans	52	98	109	98
Total	53	100	111	100
Economic	9	17	10	9
Political	26	49	52	47
Social	2	4	19	17
Natural	16	30	30	27
Total	53	100	111	100
FEL	0	0	1	1
FET	4	8	7	6
FPL	0	0	1	1
FPT	20	38	41	37
FSL	0	0	0	0
FST	2	4	16	14
FNL	0	0	0	0
FNT	16	30	28	25
AEL	1	2	0	0
AET	4	8	2	2
APL	0	0	0	0
APT	6	11	10	9
ASL	0	0	0	0
AST	0	0	3	3
ANL	0	0	0	0
ANT	0	0	2	2
Total	53	100	111	100
Problem				
For	25	96	46	96
Against	1	4	2	4
Total	26	100	48	100
Policy				
For	16	70	44	77
Against	7	30	13	23

UN Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
Total	23	100	57	100
Support				
For	8	73	36	88
Against	3	27	5	12
Total	11	100	41	100
Feasibility				
For	7	64	28	65
Against	4	36	15	35
Total	11	100	43	100
Accountability				
For	11	73	5	71
Against	4	27	2	29
Total	15	100	7	100

Public

Table 19 shows that public-linked arguments ran "strongly" in favor of the ozone protocol and "moderately" so in the climate case. They were "strongly" international in the ozone case and, by contrast, "moderately" local in the climate case. FSL and FST arguments accounted for 58 percent of public arguments in the ozone case, compared with 34 percent for climate, showing again that ozone arguments packed a proportionately more potent social punch in favor of the protocol.

Table 19. Public Code Totals

Public Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
For	38	73	238	64
Against	14	27	133	36
Total	52	100	371	100
Local	14	27	230	62
Trans	38	73	141	38
Total	52	100	371	100
Economic	3	5	82	22
Political	7	13	39	11
Social	39	71	197	53
Natural	6	11	53	14
Total	55	100	371	100
FEL	1	2	31	8
FET	1	2	11	3
FPL	3	6	21	6
FPT	1	2	9	2
FSL	6	12	61	16
FST	24	46	66	18
FNL	0	0	16	4
FNT	2	4	23	6
AEL	0	0	33	9
AET	1	2	7	2
APL	0	0	8	2
APT	0	0	1	0
ASL	3	6	52	14
AST	6	12	18	5
ANL	1	2	8	2
ANT	3	6	6	2
Total	52	100	371	100

Problem

Public Cont.

Public Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
For	19	83	132	76
Against	4	17	42	24
Total	23	100	174	100
Policy				
For	5	56	97	61
Against	4	44	62	39
Total	9	100	159	100
Support				
For	8	100	72	58
Against	0	0	53	42
Total	8	100	125	100
Feasibility				
For	3	50	62	49
Against	3	50	64	51
Total	6	100	126	100
Accountability				
For	7	100	7	70
Against	0	0	3	30
Total	7	100	10	100

Environmentalists

Table 20 shows that arguments linked to environmentalists were "moderately" supportive of the ozone treaty and "strongly" supportive of the climate treaty. Ozone arguments were "extremely" transboundary and climate arguments "slightly" transboundary. Ozone arguments focused more on politics than climate arguments (by nearly 3:2) while the climate case emphasized science and environmental arguments more than ozone (2:1). They were about equally attentive to economics. Other than confirming that environmentalists, like the UN, were in support of the ozone and climate treaties, this shows that environmentalists in the ozone case were reported in the press to focus more energy on politics and the economy while in the climate case they split that between economics, politics and science.

Table 20. Environmentalist Code Totals

Environmental Codes	Montreal Case		Kyoto Case	
	Number	Percent	Number	Percent
For	26	62	146	77
Against	16	38	44	23
Total	42	100	190	100
Local	4	10	84	44
Trans	38	90	106	56
Total	42	100	190	100
Economic	10	24	40	21
Political	21	51	69	36
Social	5	12	36	19
Natural	5	12	45	24
Total	41	100	190	100
FEL	0	0	16	8
FET	3	7	13	7
FPL	2	5	25	13
FPT	13	31	26	14
FSL	1	2	14	7
FST	3	7	16	8
FNL	0	0	6	3
FNT	4	10	30	16
AEL	0	0	5	3
AET	7	17	6	3
APL	1	2	9	5
APT	6	14	9	5
ASL	0	0	4	2

Environmental Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
AST	1	2	2	1
ANL	0	0	5	3
ANT	1	2	4	2
Total	42	100	190	100
Problem				
For	10	71	60	82
Against	4	29	13	18
Total	14	100	73	100
Policy				
For	12	63	71	72
Against	7	37	28	28
Total	19	100	99	100
Support				
For	2	67	67	83
Against	1	33	14	17
Total	3	100	81	100
Feasibility				
For	4	40	51	69
Against	6	60	23	31
Total	10	100	74	100
Accountability				
For	6	75	7	64
Against	2	25	4	36
Total	8	100	11	100

<u>Europe</u>

Table 21 shows that the European stakeholder group had a remarkably similar structure across the cases. Both cases were "very strongly" in favor of the protocols and "extremely" transboundary. The level of support in the ozone case is notable, because several European nations at first opposed an ozone treaty with binding limits. These "Against" arguments were overwhelmed over the life the sample.

Table 21. Europe Code Totals

	Montreal Case		Kyoto Case	
Europe Codes	Number	Percent	Number	Percent
For	21	75	79	75
Against	7	25	26	25
Total	28	100	105	100
Local	1	4	0	0
Trans	27	96	105	100
Total	28	100	105	100
Economic	6	21	8	8
Political	17	61	75	71
Social	2	7	11	10
Natural	3	11	11	10
Total	28	100	105	100
FEL	0	0	0	0
FET	2	7	8	8
FPL	0	0	0	0
FPT	14	50	51	49
FSL	0	0	0	0
FST	2	7	11	10
FNL	0	0	0	0
FNT	3	11	9	9
AEL	1	4	0	0
AET	3	11	0	0
APL	0	0	0	0
APT	3	11	24	23
ASL	0	0	0	0
AST	0	0	0	0
ANL	0	0	0	0

Europe Codes	Montreal Case Number	Montreal Case Percent	Kyoto Case Number	Kyoto Case Percent
ANT	0	0	2	2
Total	28	100	105	100
Problem				
For	8	100	25	93
Against	0	0	2	7
Total	8	100	27	100
Policy				
For	13	81	60	77
Against	3	19	18	23
Total	16	100	78	100
Support				
For	9	75	57	78
Against	3	25	16	22
Total	12	100	73	100
Feasibility				
For	4	40	41	66
Against	6	60	21	34
Total	10	100	62	100
Accountability				
For	7	100	7	70
Against	0	0	3	30
Total	7	100	10	100

Stakeholder Trends

This section examines the evolution of arguments from the two biggest stakeholder groups – scientists and the U.S. government – as they relate to the policy process of both cases. Recall from the preceding trend sections, that "Natural" and "problem" claims persisted in positive territory in both cases – showing that scientific and environmental arguments largely supported both protocols. Recall also that "Political" arguments, and "policy," "support" and "feasibility" arguments split between cases at key times in their evolution – with ozone claims rising into positive "For" territory during the Montreal Protocol's approval and subsequent amendments, and climate claims dropping into negative, "Against" territory, especially in 2001, when the United States walked away from it. These features come into sharper relief when sorted into the scientists and U.S. Government stakeholder groups. Figure 28 shows the PIC differential for ozone case scientists and the U.S. government groups in three dimensions with spikes and valleys labeled by key events on the timeline. Figure 29 does the same for the climate case. Together these figures show that arguments of scientists in both ozone and climate change news coverage were focused on defining the "problem" and were solidly and consistently supportive of the Montreal and Kyoto Protocol's goals and principles. By contrast, U.S. government arguments were spit between the two cases. Figure 28b shows that in the ozone case government arguments were supportive when it arguably counted most – in the year of the Montreal Protocol's approval. After that, they dropped off the map and formed a valley of opposition in 2003 in the "policy" and "support" categories over the methyl bromide issue. Figure 29b shows the fate of the Kyoto Protocol in terms of government arguments. There were small flashes of support in the early going, including the 1983 EPA and NSA climate change reports, which led to a positive spike in "problem" arguments, and the 1997 U.S.-aided negotiation of the protocol, which left a small ridge of "policy" and "support" arguments. But then a chasm opened up in 2001, when the Bush administration abruptly pulled away from the Kyoto Protocol process. A surge of arguments hostile to the protocol on "policy," "support" and "feasibility" grounds filled the news.

Figure 28. Ozone Case PIC Differentials a) Scientists b) U.S. Govt.

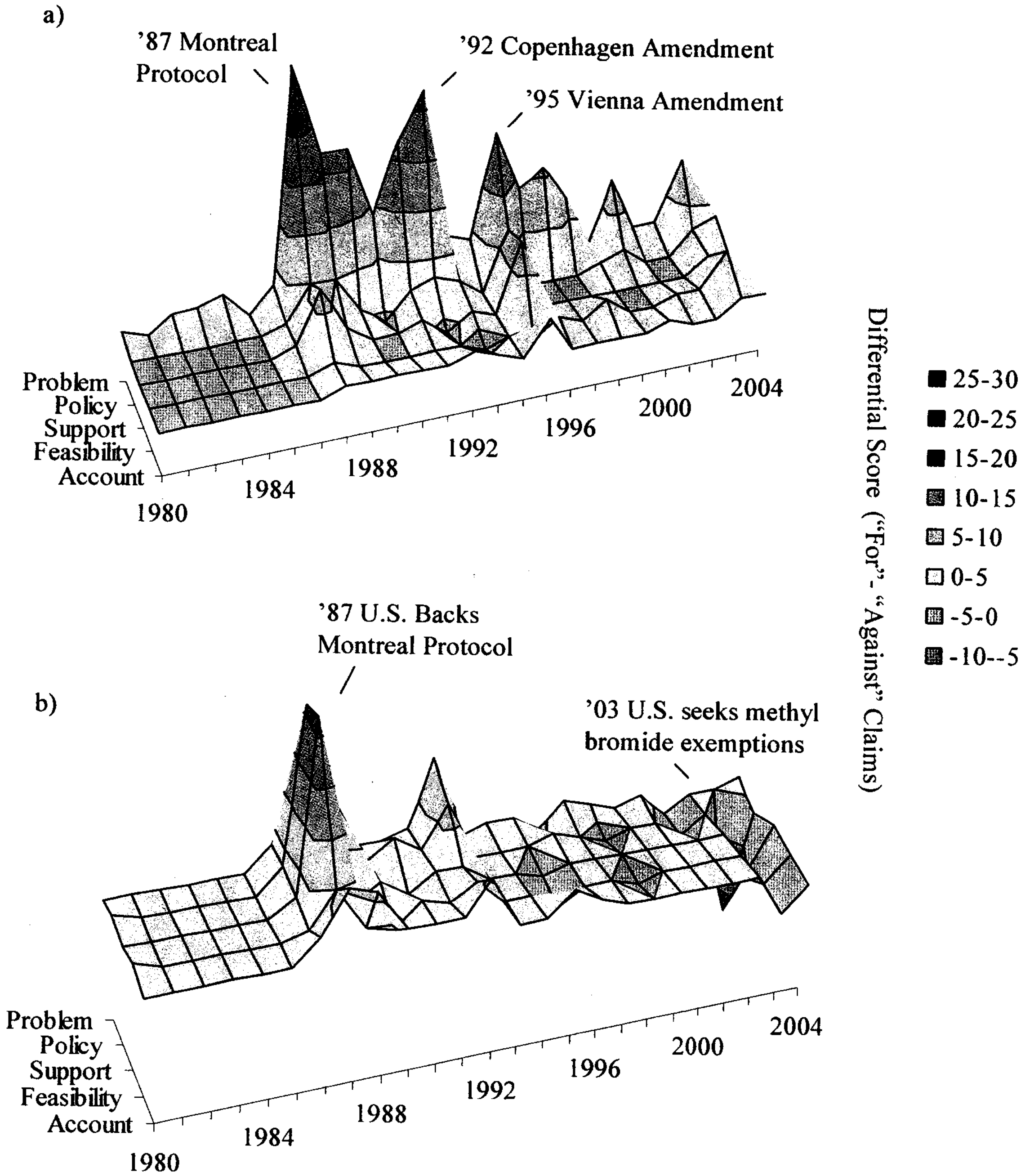
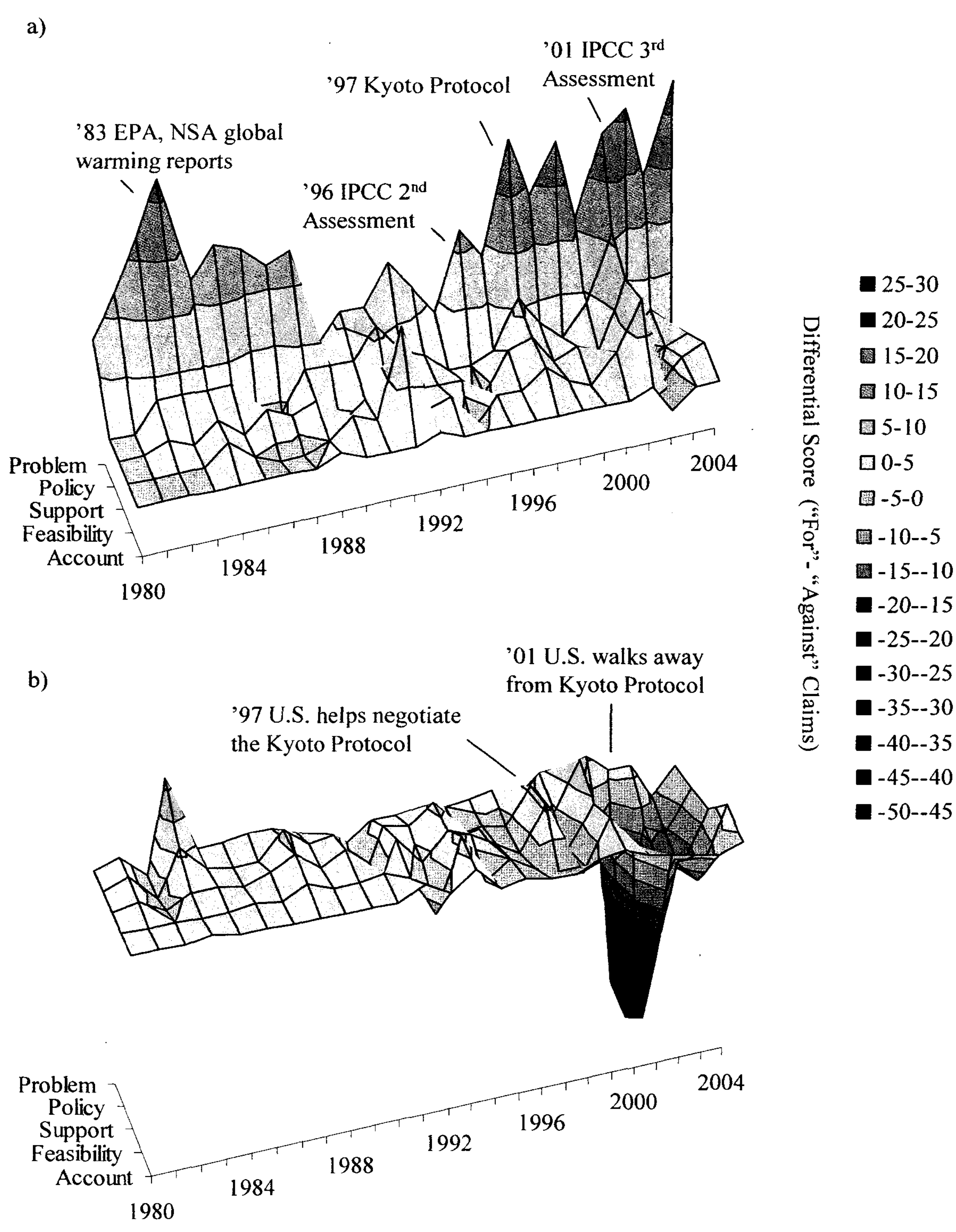


Figure 29. Climate Case PIC Differentials a) Scientists b) U.S. Govt.



Summary

The Excel program used to generate the above maps enabled the examination of scores of data combinations – of totals and differentials in aggregate and time series among the categories of direction, substance, PIC and stakeholders. The data presented and analyzed in this chapter answers the research questions outlined for it at the beginning of the chapter and in Section B of Table 4. The data set is large, however, and holds the promise for additional lines of inquiry for separate studies.

Table 22 summarizes below the main conclusions from this chapter's three previous sections – code totals, policy issue criteria and stakeholders – and can serve as a useful reference throughout the study. These results are combined with historical information from the first chapter (Background) and insights from the next chapter (Interviews) to paint a more comprehensive picture of trends, conditions and the interaction of key players in the policy process of both cases.

Table 22. Summary of Key Findings of Case Comparison

A. Code Totals	Related Tables & Figures
1. Arguments in both cases ran in favor of their protocols. But ozone "very strongly" and climate only "moderately."	Table 9, Figure 12 and Figure 1
2. Ozone arguments were "extremely" international while climate arguments only "moderately" so.	Table 9, Figure 12 and Figure 1

A. Code Totals	Related Tables & Figures
3. Environmental and scientific arguments dominated the coverage of both cases followed by political arguments. Economic arguments were more prominent in climate coverage (e.g. costs of Kyoto) than social arguments (e.g. disruption from sea levels rise). In the ozone case, social arguments (skin cancer scare) got more play.	Table 9, Figure 12 and Figure 1
4. In terms of trends over the 24-year sample, arguments spiked in both cases in years of intense media attention.	Figure 14
5. In the ozone case, spikes in For/Natural, For/Political and For/Social categories rose in years of the protocol's approval and subsequent revisions.	Figure 16
6. Climate economic and political arguments dropped precipitously in 2001 when the U.S. walked away from the Kyoto protocol. Political arguments mostly cancelled out but negative economic arguments prevailed.	Figure 17

B. Policy Issue Criteria	Related Tables & Figures
1. By about a 3:2 margin, a greater proportion of arguments in the ozone case were focused on the "problem" of the ozone hole, than were arguments in the climate case focused on the "problem" of climate change.	Table 9, Figure 18 and Figure 19
2. The distribution of arguments in the "problem" category was strikingly similar across the two cases. For/Natural arguments predominated, followed by For/Social arguments.	Table 9, Table 10, Figure 18, Figure 19
3. Political arguments in news reports relevant to selecting, promoting, and debating the feasibility of policy solutions ("policy," "support," and "feasibility" codes respectively) were proportionally more favorable in the ozone case than the climate case and more negative in the climate case than the ozone case.	Table 9, Table 11, Table 12, Table 13, Figure 18 and Figure 19
4. "Accountability" arguments were more prominent in the ozone case are mostly political and favorable to the Montreal Protocol	Table 9, Table 14 and Figure 18 and Figure 19

B. Policy Issue Criteria	Related Tables & Figures
5. In the ozone case, the dominant feature of the PIC landscape differential map was a positive spike in "policy" arguments the year the Montreal Protocol was approved. A steady positive emphasis on the "problem" persists from 1987 to the end of the sample, corresponding to positive scientific/environmental arguments.	Figure 22
6. In the climate case, a similar wall of positive "problem" arguments was also seen. A deep valley in the "feasibility" category in 2001 corresponds with the economic arguments lodged against the Kyoto Protocol.	Figure 23

C. Stakeholders	Related Tables & Figures
1. In the ozone case, scientists were linked to 45 percent of ozone case arguments, the U.S. government to nearly a quarter of all arguments, and industry 9 percent. In the climate case, American government officials topped the list at 30 percent followed by scientists at 26 percent and industry at 13 percent.	Table 9, Figure 24 and Figure 25
2. Scientists' arguments in both cases were focused on describing scientific and environmental phenomenon. Remarkably similar in direction, substance and PIC, their arguments were "very strongly" favorable to the protocols and were by far most relevant to defining the policy "problem" followed by debating the proper "policy" solution for the problem.	Table 15, Figure 24, Figure 25, Figure 26 and Figure 27
3. In the ozone case, U.S. government arguments were "strongly" favorable to the Montreal Protocol and industry arguments were "slightly" so. But in the climate case both group's arguments run "slightly" *against* the Kyoto Protocol. Broadly, then, it can be said that American government and industry was split between the cases – in favor of the ozone treaty, but against the climate treaty.	Table 16, Table 17, Figure 24, Figure 25, Figure 26 and Figure 27
4. United Nations and European arguments were remarkably similar across both cases. Not surprisingly, they were both "very strongly" in favor of the protocols and "extremely" transboundary.	Table 18, Table 21, Figure 24, Figure 25, Figure 26 and Figure 27

C. Stakeholders	Related Tables & Figures
5. In the "public" stakeholder category, there were more "social" arguments in favor of the treaty in the ozone case than the climate case by about 2:1.The ozone For/Social arguments were mostly about skin cancer.	Table 19, Figure 24, Figure 25, Figure 26 and Figure 27
6. Environmentalists, like the UN and Europe, were in support of the ozone and climate treaties. In the ozone case, environmental arguments focused mostly on politics and the economy while in the climate case they split between economics, politics and science.	Table 20, Figure 24, Figure 25, Figure 26 and Figure 27
7. Over the 24-year sample, arguments of scientists in both ozone and climate change news coverage were focused on defining the "problem" and were solidly and consistently supportive of the Montreal and Kyoto Protocol's goals and principles. Peaks in these arguments corresponded with protocol conferences and the release of major scientific reports.	Figure 28 and Figure 29
8. In the ozone case, U.S. government arguments were strongest in favor of the protocol when it arguably counted most – in the year of the Montreal Protocol's approval. In 2003, they dropped into negative territory in the "policy" and "support" categories over the methyl bromide issue.	Figure 28
9. In the climate case, the lack of U.S. government support was clear. With the exception of small upticks in "For" territory in 1983 and 1997, the U.S. government PIC landscape differential hovers close to zero until it drops into a deep, broad hole in 2001 across the "policy," "support" and "feasibility" categories when the Bush administration abruptly pulled away from the Kyoto Protocol process.	Figure 29

CHAPTER IV

INTERVIEWS

Introduction

This chapter summarizes the content of interviews with seven key informants who are highly familiar with at least one of this study's two cases – the ozone hole or climate change. The interview subjects were chosen to represent a cross section of the major stakeholder groups examined in this study – scientists, U.S. government officials, industry, environmentalists and the news media itself – and to offer perspectives that can add valuable context to understanding the social and decision processes at work in the evolution of the two cases. Their observations serve as additional data and also an informal check against the primary source of information for this study – the mainstream news media. Recall from Neuendorf's typology that the news media analysis in the preceding chapter is a study of *message* alone. The following accounts comprise data from both the *senders* of the message (news reporters and their sources) and *receivers* of the message (policy makers and interest group members). By themselves the interviews are rich in description and analysis and are all the more powerful when combined in the final chapter in an analysis with the coding results and additional studies from scholars in the field. That said, the use of this limited subject pool should not be mistaken for an attempt to formally test the media coding results for any causal relationships, as in agenda setting research. Rather, the reader is asked to consider how *what* the subjects have to say begins to fill out the picture painted by the preceding content analysis and, additionally, what it says about the creation of the news itself and the evolution of the U.S. role in the ozone and climate cases.

The interviewees are: Robert Watson, a world-renown atmospheric researcher and leader in both the climate change and ozone regimes; a member of the U.S. Congress who asked not to be named; David Doniger, a longtime lawyer with Natural Resources Defense Council; Frank Maisano, an industry lobbyist and former spokesman for the Global Climate Coalition; Josef Hebert, a veteran Associated Press environmental news reporter; and two national environmental news reporters who asked not to be named. Taking each subject in turn by the participant group they best represent – scientists, U.S. government, industry, environmentalists, and the media – this chapter provides a straight-forward account of each interview with an emphasis on the subjects' own words. Each subject was asked the following six questions (also listed in Table 4):

1. Please briefly describe your experience with climate change and/or ozone issues.
2. What role do you think your group has played and will play in the future with regard to U.S. involvement in the climate change and/or ozone regimes?
3. What role do you think the news media has played and will play in the future with regard to U.S. involvement in the climate change and/or ozone regimes?
4. Please outline what you think are the strengths and weaknesses of each policy effort – climate change and/or ozone. What would you recommend, if anything, be done to improve them?
5. Please describe what globalization means to you and mention a few ways, if any, you think it has affected and/or will affect U.S. involvement in either policy effort.
6. What do you think the future holds for each policy?

The answers and the amount of time devoted to each question varied greatly among those interviewed. Six of the seven interviews ranged from 20 minutes to just over an hour; the shortest interview was about 12 minutes. Despite identical core questions, discrete themes emerged within each response. Thus the varied subheadings under each of the five respondent sections reflect both the length of the interviews and the diversity of the subjects' responses. As with the previous chapter, an effort has been made to gather the key results into a useful reference table. This chapter concludes with a summary section that comprises the six-part Table 23 – one part for each of the interview questions asked – which distills major points made by each interviewee. It is intended as an aide to accessing the comprehensive observations that unfold below.

Robert Watson, Atmospheric Scientist

Robert Watson, currently the chief scientist at the World Bank, has had a long and high-level involvement in the development of science and policy in the ozone and climate change problems. As an atmospheric scientist and NASA's upper atmosphere research program manager, he led efforts in the 1980s in the United States and at the United Nations to investigate the ozone hole. He later worked as a White House science aide in the first Clinton administration, and served a term as chairman of the IPCC until 2002. Watson was frequently quoted in news coverage of the ozone hole and climate change issues and his views appeared in many articles in this study's sample. He described his role in both cases as being primarily "a cheerleader to the scientific community," encouraging international scientific assessments followed up by efforts to translate the results "into sort of what I call an understandable language for policymakers or decision makers in general." Watson said the work of scientists in this regard was "absolutely critical."

Separate Problems

Watson stressed early in the interview that he considered the ozone and climate change cases fundamentally different in terms of their scientific and policy evolution. He said that in the ozone case scientists conducted solid research and spoke with one voice that was heard clearly by policy makers who moved swiftly to enact progressively tougher measures to respond to the problem. "Now, to be honest, I call it yesterday's issue because not only have developed, but developing countries have already agreed to phase out literally all long-lived chlorine and bromine containing compounds," he said. "There's still a little bit of work to be done to finalize that phaseout, but fundamentally we're well on track." Watson called the evolution of ozone science and policy – from the development of the initial theory ozone destruction by CFCs to the latest protocol amendments – "an incredible story of good science interpreted through an international assessment" that drew a positive response from world governments and the private sector. Watson described the process:

> The original international convention on ozone was done, I would call it, on model calculations. Then the Montreal Protocol was also largely based on what the theoretical projections were. We showed there was chlorine in the atmosphere, we showed it was long lived from the fluorocarbons and, again, the Montreal Protocol was largely in response to the observation of chlorine in the atmosphere and the fact that all the models projected a significant loss of ozone. Then of course we found the Antarctic ozone hole and we demonstrated – in my opinion, beyond a doubt – that effectively the ozone hole was due to human activities. That led even to a revision of the Montreal Protocol, and I believe that was in London, if I remember the sequence correctly. Then we discovered that there was a loss of ozone globally or at least primarily in the mid and high latitudes and primarily in winter. There wasn't any in the tropics and subtropics. So it was a global scale. That then also stimulated further regulations. Then we found – and we found that for both satellite and ground based data – then we found, obviously, that we were seeing large depletions of ozone occasionally in the winter hemisphere of the Arctic. So the evidence just built up and every time there's more evidence the policy makers responded.

Aiding the solution was an ability and willingness on the part of the chemical industry to develop and introduce substitute chemicals on the market. By contrast, said Watson, the climate change problem has been more complicated for many reasons:

> The climate situation is much, much tougher. First, the climate change is predominantly caused by two big issues: one is land use change and the other dominant one is energy use. This is not simply an issue for the northern hemisphere or industrialized countries. It's an issue and it affects both developed and developing countries. Also it's got a much larger economic impact when you change energy and land use policies [rather] than just changing gases for refrigeration, air conditioning, solvents etcetera. And therefore the dynamics around the climate issue are much more complex.

<u>The Media's Role</u>

Watson's views on the role and importance of the news media echoed those of scholars quoted in this study's first two chapters – that the news media both reflects influences public opinion and policy making. He said, "If we live in a democracy, which I would argue we do in the U.S., then public opinion is absolutely critical for policy formation by government. It's also critical as a message to the private sector as to what is acceptable and what is not acceptable in the products they produce." In the ozone case, he said the news media "told middle America there's a threat to your human health or your child's human health." The media also showed visual imagery of the ozone hole itself, making the threat seems more concrete. Said Watson:

> If there's one word in the English dictionary or the American dictionary that scares the hell out of people it is probably the word "cancer." So as soon as you linked an environmental issue to cancer, people – and especially cancer in white Caucasians, light skinned people,

that's middle class America – people suddenly said, "Wait a second, what's happening?" And when they realized there were cost-effective solutions to the ozone-depleting gases we were putting in – again knowledge through the media – they called for action.

On the climate change issue, Watson said the news media has come up short. "In general," he said. "I do not believe that the media is doing a particularly good job of explaining environmental issues to the American public. There's some superb media, but there's a lot that's just sensationalism. It either overplays the issue or significantly underplays the issue." Specifically, Watson criticized the attention paid by the news media to climate change skeptics, who he has perceived as receiving an unfairly equal proportion of attention in light of overwhelming scientific consensus that human-induced climate change is real. "And the minority view," Watson said, "which might be one percent or five percent, is given equal weighting to the majority view and the public is as confused as hell. Quite often it's the same in a Congressional hearing or on a television interview." Watson said part of the problem is that climate change is a complicated subject and few reporters – with the exception of some who specialize in the topic for large newspapers – are familiar with the science or the policy. "I've certainly been called to say, 'Bob, I'm doing a story on ozone could you sort of give me some information on it? Give me the story of the Kyoto Protocol.' And the first question is, 'By the way, what is climate change? What is ozone depletion?' or 'This Kyoto Protocol, what is it?' And you really are trying to educate from zero. And to write a good story you really have to have some basic knowledge." Watson said he wished the American news media paid more attention to environmental issues to help inform citizens and empower them to demand change from political leaders. He added that American news outlets have been "almost silent" on the issue compared to their European counterparts.

And the question is why? Is it the people that own the newspapers and the television don't think the environment is an important issue? Is it they don't think it's politically correct at the moment? But for whatever reason, the media is not playing a very proactive role at this moment in time in the U.S. As I say, given that we live in a democracy I believe the media should step up to the plate and really try to report these issues in a fair and balanced way – admitting we don't know everything, admitting there are some uncertainties but trying to explain to the public what are the issues and what are the options for change.

Globalization and Social Equity

Asked for his definition of globalization, Waston replied: "To me globalization simply means that the world is becoming smaller and smaller." Specifically, he said, the growth of markets across international boundaries has had an enormous impact on people and the environment with consequences that bring into sharp relief both social inequities (he noted that1.3 billion people living on less than a dollar are seeing next to none of globalization's economic benefits) and the need for cooperative international solutions led by the developed world. Said Watson:

A good example is that we in America are rich – not everyone in America is rich or middle class – we demand fruits year round. We demand shrimp year round. We demand vegetables year round, and where do we get them if they're not in the growing season? America, we get them from all over the world. So we have a footprint on the rest of the world. In general issues such as ozone depletion and issues such as global warming, climate change – whether we're in a globalized economy or not – the only way to deal with these issues is collectively. They are global commons issues. That means to say given that all countries do emit at all

> levels greenhouse gases, if we need a 60 to 80 percent reduction in emissions relative to today, then you have to have all large emitters on board. Europe can't solve it alone. The U.S. can't solve it alone. China or India can't solve it alone. It forces us to work together. Because you need an international regime to address ozone depletion – which we've got and works very well – or to address climate change.

Watson noted that "the industrialized world became rich through economic development that used cheap energy" and thus it bears a responsibility for helping the developing world. "So if we indeed need China and India to also reduce their emissions over time, then what's our responsibility in OECD countries to help them get the energy they need to fight poverty but to also be climate friendly at the same time?" Watson answered that a "globalized way" is needed to help developing nations acquire the technologies they need to help in the fight against climate change.

A strong theme of social and environmental justice ran through his remarks as he noted that from the local to the global level, poor and disadvantaged people are most vulnerable to environmental damage, which is often caused by the consumptive patterns of the affluent. For example, asked why the ozone policy process has enjoyed greater success than the climate change process, Watson shared what he called "truly simplistic analysis of it" grounded in social equity concerns:

> First, both climate change and ozone depletion were predominantly caused by industrialized activities of the OECD countries. It was the OECD countries that were predominantly emitting chlorine and bromine containing compounds. Now I'm not blaming industry, I don't mean that, I mean we, we society, wanted these products. So it's not an anti-industry comment but we use chlorine and bromine containing compounds. We're also the biggest producer of carbon dioxide. So in both cases the major driving force was our choice of

activities in the North. In both cases they're long-term issues, but there's a huge, huge difference. And that is on ozone depletion the major threat was to human health in North America and Europe. It was skin cancer and that really worries Americans and Europeans. They don't want cancer. Therefore they demanded change. Climate change predominantly affects poor people in developing countries – not middle class rich people in OECD countries. And therefore, so, it's very straight foreword. The American public demanded action on stratospheric ozone depletion 'cause the threat was to them. On climate change the threat isn't – the predominant threat – isn't to them. The predominant threat is to poor people in developing countries. And therefore if climate change, hypothetically, had been effective, the results or the implication that climate change had been cancer of one form or another in America – I'm absolutely convinced we would have seen action way before now. I think it's almost as simple as that.

The Future

Looking to the future, Watson praised the course of both the international stratospheric ozone and the climate policy regimes. Existing measures to address the ozone hole, he said, were correct and "we just have to finalize implementation of the phaseout." He called the Kyoto Protocol "a very important first step toward what will eventually need to be a very significant reduction in greenhouse gas emissions." Watson said to stabilize the earth's climate at an acceptable level would require moving from on-average 5-percent reductions in developed nations to worldwide 60 to 80 percent reductions – a move that would necessitate cleaner power generation and higher energy efficiency. He described a systematic approach that would give policymakers options to choose from depending on their desired outcomes.

So I believe the governments around the world should have a serious conversation about setting a long term target: What is an acceptable change in the earth's climate, which would lead to what is an acceptable change in the atmospheric concentration of CO_2. So if we could set ourselves a target of the global mean surface temperature – [i.e. it] should be changed no more than X, the rate of change should be no more than Y degrees Celsius per decade – this would mean, based on the best knowledge today … this is what we have to do for emissions. And then you would have to have an equitable allocation of emission rights between developed and developing countries and that would mean you would have to develop technologies and policies to meet those goals.

Despite the major social and political barriers he outlined in the climate case, Watson said the growing strength of scientific evidence of the problem, coupled with signs of interest from the private sector in addressing the issue give him reason for optimism.

I have to remain optimistic that we will indeed address the climate change issue in a sensible way. The question is, "How long will it take us?" The longer we take the more we're committed more and more to climate change. Once you put carbon dioxide into the atmosphere it has a residence time of one or two hundred years. So for every decade we wait to seriously address climate change means we're committing ourselves to a warmer, and warmer and warmer world. The solution therefore is government must get together with the private sector, must get together with civil society and developed nations must work with developing nations. We need people to understand that the cost of inaction is actually greater than the cost of action and that revolutionizing our energy system is not a threat to the economic structure. It's actually an opportunity.

A Member of the U.S. Congress

The member of Congress interviewed for this study has been involved with climate change issues for three years. Like many other lawmakers on Capitol Hill, this member has followed discussions about the Clean Air Act amendments and a number of proposals to address greenhouse gas emissions – from voluntary measures to the McCain/Liebermann bill – which reflect ambivalence about the issue across Washington. "There's been no consensus around what the United States should do in response to President Clinton and Vice President Gore's signing the Kyoto Protocol," the lawmaker said. "In fact, the Senate, by a unanimous vote as I recall – after the President Clinton and Gore signed the Protocol – voted against it. There have been two votes on McCain/Lieberman in the Senate. They've lost votes in the '05 vote – I think it was '05, right? – so, that's sort of where the process is right now."

The Media and the Protocol

On the question of the quality of the news media's reporting on climate change, the lawmaker gave it a grade of "Incomplete," and said that it lacks a "comprehensive look at the claims by both sides on the debate" – specifically, how enacting the Kyoto Protocol in the United States would effect the economy, energy production, energy use and the lifestyles of Americans. The Congress member said the Kyoto Protocol was not viable and suggested a climate strategy in the United States that begins with "doing the easy things first." The lawmaker said:

> Well, I think that, in terms of public policy, the United States should be focused on trying to pick the low-hanging fruits and doing things that make sense, that are cost effective, that drive technology in a way that we can reduce levels of CO_2 without harming the economy. And that we can also push the envelope in terms of technology. And so initiatives are already

underway in this country in terms of – you know – voluntary trading arrangements I think make some sense. I see that as a good first step. Possibly expand that somewhat with tax incentives for voluntary measures. That would be something that is probably worthy of debate. And then, going beyond that, looking possibly toward initiatives that perhaps focus on levels of compliance that can be done without having a negative impact on the economy and on energy production.

The Congressperson faulted Kyoto for failing to include the developing nations of India and China. "First and foremost it doesn't include two of the world's largest countries that are going to be increasing all the time their consumption of fossil fuels and that needs to be rectified," said the lawmaker. "I think we have to include countries like China and India, probably Brazil. For it to apply to so-called industrial countries only is a major flaw in Kyoto."

Globalization

Asked about the role of globalization, the lawmaker offered a perspective that took into account both economic and environmental issues.

Well, most people refer to globalization as an integration of the world's economies, and free trade, the free exchange of goods and services – products. And certainly, when I think of globalization, I think of that. Obviously, when you talk about the big four pollutants – so-called pollutants – sulfur, nitrogen, mercury, CO_2 – the first three are much more regional in their effect. CO_2 isn't really a pollutant, it's a greenhouse gas, which is why a worldwide bank and trade system that the United States would and has started to enter voluntarily, makes quite a bit of sense.

The Future

Asked about the future course of the climate change issue, the Congressperson noted that the problem was likely to get more attention in the future. Underlying this, as with previous remarks, was an emphasis on balancing concern for the environment with protecting the nation's market economy.

> I think that even though the United States has not indicated a willingness to sign on to the Kyoto Protocol, and the treaty that's involved, that more and more American businesses are expecting at some point in time, in the future, CO_2 regulations. And so that's why I think it is important that we encourage technology that would limit CO_2, that we have a bank and trade program, that we start to talk about tax incentives for voluntary compliance because there is a growing body of scientific evidence that points to the need to reduce CO_2. Yet there are those who would dispute that and so we have to also better understand the actual science of, you know, greenhouse gases, and how that may or may not impact climate change. But those are I think some of the things where we ought to focus, and that's a positive agenda that protects our environment and takes some initial steps toward mitigating the possible impact of global warming without doing harm to the American economy.

Frank Maisano, Industry Spokesman, Strategist

As head of the media relations program for the Global Climate Coalition, Frank Maisano oversaw the campaign of the coal, oil and automobile industries to keep the United States from ratifying the Kyoto Protocol. He took the job in 1997, the year the protocol was created. Maisano is currently the Director of Strategic Communications at the Washington office of the Bracewell

& Giuliani lawfirm. As a key spokesman for the industry position on the climate change issue, Maisano was frequently quoted by the news media and his remarks appear in many articles in this study's sample. In the interview for this study, Maisano touched on wide range of issues – from the necessity of fossil fuels to the economy and the industry perspective on the Kyoto process, to the public relations strategy against the treaty and the dynamic of intra-industry competition that has emerged since its defeat in the United States. Like Watson, Maisano opened the interview by underscoring the differences between the ozone and climate change problems. Maisano noted that in the case of CFCs, industry was able to change its practices – albeit at some expense – to address the problem of the ozone hole. Climate change, he said, is far more intractable. Said Maisano:

> You could virtually remove CFCs by taking them out of the product stream, by changing the way that it operated. You can't do that with carbon. And that inherently is one of the problems we face with this much larger global warming protocol. You can't do some of the things that you can do with, you know, things like CFCs, or – in the current examples of where we are with scrubbing NO_x and SO_x, you know, pollutants that cause acid rain, things like that. You can scrub those from the emissions stream. You cannot scrub carbon. Carbon happens when you combust fossil fuels. Now you can combust fossil fuels more efficiently so that you produce more energy out of the same amount of fossil fuels ... But currently, we don't have any real method of eliminating fossil fuels from the stream and that's just a stationary source. When we get to mobile sources and natural CO_2 emissions it even becomes more complex.

Targeting the Protocol

In discussing the role of the Global Climate Coalition (GCC), Maisano stressed that its post-Kyoto mission was built not around arguing against the science of climate change, but against the treaty itself. "Previously to my entrance onto the scene, the GCC was always seen as a black hat, you know, the industry guys who denied that global warming was happening," he said. "And I think as of about the Kyoto treaty, industry started to make a shift away from that denying global warming was happening to saying, 'We need to do something about this.'" The coalition disbanded in 2002 after the Bush administration walked away from the protocol. But before that, the protocol had provided a common threat for a diverse group of industries – many in competition with each other – to rally together against. Said Maisano:

> I think our goal was to stop the Kyoto Protocol because it was bad for consumers; it was bad for our economy; it was bad for the environment in terms of overall accomplishing a goal of reducing emissions, and it was bad for technology, because, you know, when you have to reduce emissions you switch fuels. You don't try and develop the new technology when you have to do it in a time frame that's too short.

Maisano was critical of the process that took the climate change issue from the realm of a scientific debate to policymaking, creating a treaty that he argued is primarily an economic pact that gave other nations an unfair advantage over the United States – a theme he elaborated on later in the interview. Specifically, Maisano found fault with the distillation of reams of scientific research reviewed by the IPCC into highly-consequential, pithy statements in summaries for policymakers [i.e. "the balance of evidence suggests a discernable human influence on global climate" (IPCC cited in Raustiala 2001)] which he said were negotiated word-for-word by politicians and scientists "who act as politicians in a sense."

Well look, here's the problem: The IPCC is inherently a scientific body. If you read the three phone-book-sized volumes of scientific evidence, you get a very complex, confusing picture of the science behind climate change, which is very uncertain, no matter what anybody thinks. There are things we know; there are things that we don't know; and there are the things that we don't know that we don't know – to borrow phrases from our defense secretary. And the things that we don't know that we don't know are the most scary in this debate. Because every time that we've opened a door into something that we think we know, now, we've opened a whole panoply of new things that we didn't know that we don't know. And that type of complexity in science has really made the issue of science one that is hard to grapple with, which is why environmentalists to this day are still trying to prove that global warming science is certain – in that, you know – they've been trying to prove that for 15 years in the debate and, frankly, the debate has moved well beyond that with the emergence in 1997 of the Kyoto Protocol ... What is the fascinating thing that the Kyoto Protocol brought about was that there is something that we think that we ought to do now.

Economics and Fairness

Critical to Maisano's perspective is the assumption that carbon emissions are themselves an indicator of economic health and that cutting back emissions is tantamount to cutting back the economy. Emissions, he said "go up or down depending on the state of the economy."

In the case of carbon, you don't really have a vehicle to reduce emissions other than constraining the carbon, constraining supply of energy ... So, we've actually reduced emissions in the United States between 2000 and 2003. Well, we've done that because our economy was not good. And clearly, that's not the situation that we want to be in. The

> Europeans have struggled to make emissions reductions and part of that is because their economy is in the tank. And what would happen with their emissions reductions that they can't meet currently if their economy started to grow some?

This fundamental threat seen by Maisano to the economy is compounded, he said, by an unfair advantage the Kyoto Protocol's year 1990 emissions baseline provides Europe and Russia in carrying out emission reductions.

> Why is that significant? It's significant because, that allows Germany and Eastern Europe and Russia and Britain to take advantage of things that were outside of normal pollution control that caused them to change their emissions mix in a way that gave a false reduction. OK? The eastern European countries fell apart in the late 1980s –1989 is when Europe fell. Well the collapse of all those polluting economies meant all those emissions were gone. So now Germany has reduced emissions by 20 percent, or whatever the number is – it was some high number like that – by just picking the 1990 baseline as the thing from which you judge. I'm going to reduce my emissions by seven percent or ten percent beyond the 1990 emissions. Well their 1990 emissions are already lower because of the collapse of those economies. At the same time, the same thing applied to Russia, although the Germans didn't want to let the Russians take advantage of all those hot air emissions in trading. Inherently, it's why we've always argued the U.S. is at a disadvantage and the Australians are at a disadvantage because they don't have, you know – the baseline didn't work for them, they didn't have any – we would actually have to reduce those emissions to meet the target.

Moreover, as Watson and the member of Congress noted, developing nations would also have to be part of the solution. From the industry perspective, the absence of binding emissions reduction commitments from these nations was a fatal flaw. "Everybody knows that developed countries are needed to reduce emissions," Maisano said. "But also everybody also knows that the developing countries, who have very competitive economies now – China, India, Mexico, South Korea, people like that – those competitive, developing economies, who are much less efficient than us, are going to be the future growth problem. OK? Maybe not today, but in 20 – by the next period, the 2012 period – they will begin to surpass us."

PR Strategy Explained

The Global Climate Coalition's strategy to defeat the Kyoto Protocol in the United States was grounded in the economics and fairness issues described above. It was executed, Maisano explained, through a comprehensive campaign of public advertising and lobbying that focused on the potential costs of the Kyoto Protocol to Americans and the American economy. Central to this effort was an industry-funded study by the Boston-based Whatron Econometric Forecasting Associates firm (WEFA), which provided state-by-state cost estimates of the treaty along with its potential cost to major cities. Said Maisano:

> And that had a real definite impact because we were able to take those documents to the media. We were able to take those documents to the Hill and say, "Look, this global warming is a very abstract issue. It's very complex and hard to understand and it's very complex to see. Environmentalists will tell you that a hurricane is because of global warming. Well, that's not necessarily true." And what we – that's the way they try and impact it. What we would say is, "Here's what the price of global warming is to your state, to your city."

The second part of the strategy was emphasizing "the fairness argument." In the following explanation, Maisano pulled together the threads of this approach, noting how it countered environmentalists' arguments in favor of the protocol with an image of a growing expense bill that could never be paid – a bill for what industry framed as a self-destructive errand:

> Developing counties never wanted a part of this. They wanted the developed world to act first because they were the ones who caused the problem … But what we [the GCC] did, what we kind of did is set up this dichotomy which put the environmentalists in a spot of saying, "Oh yeah, this is just a first step, we need to do more [emissions cutting]," then put a price tag on it – what the first step is. And then put, not only a price tag with it, but build back into that argument of this-is-only-a-first-step-we-have-to-do-more, this is what the cost is of the first part of this. And guess what? We're only going to do a sliver. This is only the tip of the iceberg, and it costs *this* much to do the tip of the iceberg. How much is it going to cost to do the whole iceberg? You know? And that will never fly in a representative government.

The Media's Role

Maisano is an experienced source for news reporters working to cover the climate change problem. Like Watson, he said some news reporters who specialize in the issue have done excellent work. Maisano said the media's greatest weakness in covering climate change is its "inability to explain the complexity of the issue" and its "ability to be played by sensationalism." He provided an example:

> This whole argument about this link between hurricanes and global warming which has pervaded because we've had a number of hurricanes – that's just a microcosm of what has been a problem all along. You know, an island saying that they're about to go under water because of rising sea levels, when, I mean, that's really kind of hyperbole. They're not really going under water because of rising sea levels. There are many things that are issues that

affect us, you know, dying coral, you know there are many things that affect these things and it's just easy to say, "Oh, it must be global warming," because they can erect some study by running numbers through a computer that says, "Oh yeah, well it does seems like it's happening that way."

Maisano added that the media has come in for criticism from both sides of the debate and described himself as "an apologist for the media more often than not." He said he thinks the news media has been misunderstood to a degree by both the industry and environmentalist camps. "I would tell you one hundred percent that the guys that I work for feel the media has been unfair," he said, adding that so too do environmentalists "who say when they [the media] include an industry position that they're kowtowing to the skeptics of climate change when [the science of climate change is] all so obvious." Maisano praised news reporters covering climate change for trying to find new story angles and said: "And sometimes that works and sometimes it doesn't." He made two other important points regarding the news media. First, Maisano noted and rejected a critique that the news media has given "too much credence to the fairness and the economic issues in lieu of the science issues" saying that science probably figures less in the calculus of policymaking judgments than do economic and political "realities." Second, he said: "I discount media coverage – some – of this issue [climate change] because it's only one small factor in many other factors that we need to understand."

Kyoto's Rejection and Industry Competition

The Global Climate Coalition folded up shop in 2002, a year after the Bush administration walked away from the Kyoto treaty. Referring to the political criticism it provoked, Maisano described Bush's move as "walking into a hornet's nest." But, he said, it also "made great policy sense because for four years, the Clinton administration basically kowtowed to the world community about how we would get involved in Kyoto, knowing full well that it was never going to pass in the Senate. It was never going to be ratified. There was no circumstance that would ever allow the Kyoto Protocol to be passed in the Senate." About this time, however, Maisano said the energy industry's unified front – formed to fight the protocol – began to crack and pre-Kyoto divisions along competitive lines reemerged.

> You have so many industries that have competitive advantages that they have, you know, the oil industry versus – I mean you just have to look at the utility industry itself. It's got so much competition within it. Nuclear utilities, they're all for carbon reduction in carbon emissions. Natural gas utilities were always, you know Enron, the Enron's of the world – they were the lead utilities in the Clinton administration saying, "Oh yeah, let's get some carbon restraints." Of course, because they have a lower carbon portfolio than someone like Southern Company, who has a lot of coal plants and uses a lot of coal ... You have a dramatic inter industry, intra-industry competition that is always going on. Ford, GM and Chrysler – before it was Daimler-Chrysler – is a big example of this. These guys would sit in a room and argue and hate each other and fight each other to the death. Then Andy Card [Clinton's former chief of staff] would walk out of the room and hold a press conference and give the industry position.

Maisano was quick to note that to the degree environmentalists see industry embracing eco-friendly measures on the fossil fuel front, it is because they are seeking a competitive advantage.

An Alternative Approach

Asked about the strengths and weaknesses of the Kyoto Protocol and its likely future, Maisano referred to efforts to pursue the treaty as "like trying to fix a broken toy or a broken car that is never going to be fixed. It's not worth the price of investing to try and fix it." Said

Maisano: "In other words, you can talk about reducing your emissions all you want. Unless you figure out how to do that in a way that isn't economically divisive, and one that can include developing countries, you will never be able to achieve step one of this multi-process step. That inherently is its problem." He hinted at an alternative in remarks about the treaty's strengths.

> Its strength is that it's driven the world in a direction on an issue that it sees as an important issue – to varying degrees. Even the United States has demanded and admitted that this is a very important issue, a significant challenge. And I know as back as far as 1998, as an industry spokesman, I have been saying that climate change is a very serious issue and we take it very seriously. We think that there's a better solution than constraining our emissions, constraining our economy. We think a better solution is one that allows technology to continue to grow and develop so that we change the way we use energy in the future. OK? And environmentalists will say, "Oh, well that's not going to work. That's not fast enough." That's because that's not in their mindset to do that. It never has been. It never will be.

Maisano said he sees opportunity in the margins of the Kyoto process, for example, "ingenuity – that environmentalists and industry working together can develop mechanisms to try and find new ways to reduce costs and things like that." But a wholesale alternative is needed, he said, such as the establishment of an Asian Pacific Partnership which could enable India, China and other nations to receive energy-efficient technologies from the United States – an arrangement that would "focus more on results and solutions versus emissions reductions." Maisano said globalization – "the fact that we no longer really have borders in terms of our business, in terms of our technology, in terms of our ability to be affected by what other countries are doing" – can aid in moving that technology around the world.

That's the low-hanging fruit. That's the future of how this goes. How do we engage the developing world and get them to buy in? And I argue vociferously that technology development is that vehicle. Technology transfer is that vehicle. Putting these technologies that we're using here, that we will develop in the next ten years here, and getting them to be used in [other] places. And I would argue that that is what the U.N. process should be about, versus trying to force people to reduce emissions.

<u>David Doniger, Environmental Lawyer</u>

David Doniger is a veteran attorney with the Natural Resources Defense Council (NRDC), a Washington-based international environmental advocacy group with feet both firmly in the ozone and climate change issues. The NRDC has been active in lobbying, treaty negotiations and legal advocacy in both cases. Among other activities, it brought suit against the EPA to force it to regulate CFCs and halons and lobbied for a policy of phasing out the chemicals in international negotiations that led to the Montreal Protocol. "On global warming, we're playing something of the same role now, though it's part of a much larger effort," said Doniger. "NRDC was one of only a couple groups working on ozone depletion in the 80s and now we're essentially the only one – the only national group on ozone depletion. On global warming there's a much larger array of environmental organizations that are working on this and we work with them in coalition." Like Watson and Maisano, Doniger has a lot of experience with the news media. While Watson was sought by reporters as a representative of the mainstream scientific community, and Maisano of industry, Doniger was a prime source of information from the environmentalist community.

<u>Strengths and Weaknesses</u>

Doniger shared the prevailing view among those interviewed that the policy process to address the stratospheric ozone problem was well established and on its way to achieving its goals. Of the Montreal Protocol, he said:

> It's very comprehensive. It's comprehensive in its coverage. It's comprehensive in the countries that are included. Compliance is quite high. There are a number of reasons for this: The alternatives are there, the risk is clear. Although it was not undisputed at the beginning, now it's broadly accepted. There's a high degree of consensus that we need to carry out this treaty. So much so that when the United States has attempted to balk, under this administration, regarding the last important chemical – which is called methyl bromide – they found themselves constrained by how widely accepted the Montreal Protocol is and how bad it would look for them to walk away from it.

By contrast, Doniger called the Kyoto Protocol a "qualified success." He said Kyoto has stalled in the United States because of what he termed "ferocious industrial resistance" principally from the coal, oil, auto and electric industries. But he said there is reason for optimism:

> We're pretty far along but not yet as far along as with ozone. We're getting very broad, approaching universal, agreement on the scientific risks at least for action. There's a market-based structure, built up from the acid rain program … and even though the Kyoto Protocol – the United States at this point in time is not likely to join the Kyoto Protocol – that same market based cap-and-trade structure lies at the heart of all domestic proposals and may be at the heart of any future international agreements as well. So those are some of the strengths. Obviously one of the strengths of Kyoto is that everybody *but* the United States is going ahead with it.

The Media's Role

Doniger spoke at length about the role of the news media in the climate change case. He gave the press high marks for drawing the public's attention to the problem but faulted journalists for their pursuit of balance.

> More often than not the role of the media has been to tell the story of the scientific results … communicating that there's a big problem out there and new findings have been made about it. The drawback is that the media often are constrained by the "he-said she-said" or the need to tell so-called "two sides" of the story – to put up somebody who's not sure [about climate change] or somebody who denies. There have been periods of time – the period of 1992 to 1995, for example – where the dominant [news] coverage was [saying] we didn't know anything, everything was confusing. And it was a very big failure, an institutional failure, I think, on the part of the media to not be able to distinguish between when there is a dominant consensus view and then there are a few outliers, many of them who are funded by fossil fuel industries. The job of these outliers is simply to get into the papers and be quoted fuzzing things up. And the news media has fallen prey to that and they do from time to time. You end up with a confused public who thinks there is a legitimate scientific dispute out there, when in fact it's all one way.

Asked if the news media had given environmentalists a fair amount of play relative to other interests, Doniger described the challenges of making his group's message heard to the public.

> You have to work at it – work hard at it. Nobody gets news [coverage] without having a good idea. And so you need in this modern age to spend a lot of time focusing on messages and strategies … and how you're going to get them picked up. Sometimes we hit, sometimes we

miss. As I said, it's frustrating when the media go into its "he-said she-said" motif, so that just because we're from an environmental group, many reporters feel that they can't talk to us without, quote, balancing, unquote, their story by talking to somebody with a contrary view. Just a little anecdote: This year, there were a reasonable number of interviews that I was given on TV. They were from the McNeal/Leherer News Hour and C-Span and a couple of other outlets. But everywhere I went, like a shadow, one or two people from the Competitive Enterprise Institute, a couple of other organizations, would also be invited to quote, balance, what it was I had to say. And that is frustrating because it uses up half the air time on [those people] whose objective in life is to confuse what I have to say. That is their objective. They wouldn't get on TV on their own. They only get on TV in sort of balancing reflection of the viewpoints of people like me and their goal is to just make things confusing. And I have to end up using some sort of, I have to figure out – whether it's print or radio or TV – how to get the message through and, and how to jujitsu what they think to make the message come through.

Globalization

Doniger called the ozone and climate change problems "the greatest examples" of globalized environmental problems and said they need global solutions. Echoing Watson's view he said that process requires leadership and investment from the nation's most responsible for the problem. Said Doniger, "And then, having taken a confidence building first step, those nations can turn to less capable and smaller contributors – including the ones that are coming on big and fast, like China and India." Doniger explained how globalization, while part of the problem, is also critical to the solution.

> The Kyoto Protocol illustrates how you can set up environmental protection … that harnesses globalized market forces – the big, global investment flow in energy development. And a lot of that energy development in rapidly developing countries is to provide the power to run the factories to produce the trade goods that flow in the opposite direction. In other words, you wouldn't be seeing rapid electrification in China and India if you weren't seeing the underlying globalization that's bringing up their economies. But those same economic forces can be harnessed in an institution like the Kyoto Protocol or some market-based, cap-and-trade based structure. So that it makes sense for … national trade in carbon credits and payments that go back and forth for them. And, for example, if emission reductions are made in China, it may be cheaper to make than the same quantity in the United States and it may be worth an American company's paying to produce a cleaner power generating facility in China in order to achieve a given reduction.

The Future

Doniger termed the Montreal protocol "basically a success story all around the world." He noted that the agreement held despite the challenges it faced on methyl bromide from the United States and predicted it would "march forward towards the completion of the objective of phasing out the ozone depleting chemicals." He predicted the younger Kyoto Protocol would eventually succeed.

> The science is just getting more and more compelling. And the impacts are becoming so obvious that even USA Today in a cover story this summer proclaimed that the debate on global warming is over. It is warming. And given those circumstances and given the fact that businesses need to understand what the rules of the road are going to be when they make 20- and 50-year investments in plant equipment, I'd see it as inevitable that we're going to have

an agreement or a set of agreements that constrain carbon monoxide and the other global warming pollutants and eventually work up to a very low-emitting energy economy. The question is whether it will take 20 years longer than it should and whether the cost of waiting the extra 20 years, 25 years to get this regime in place – because of the resistance that has been felt mainly in the United States – what will the cost be in terms of the damage you can't undo in the later part of the century? I would predict that our children and our grandchildren are going to look back at this generation and say – the political leaders and business leaders – and say: "What were they thinking? How could they have missed this? How could they have left us with this burden?"

Three National Environmental News Reporters

This section reports on the results of interviews with three news media sources – Josef Hebert of The Associated Press and two unnamed writers – a Washington-based national environmental news reporter and a former national environmental reporter. For clarity, Hebert is referred to by name and the others are referred to, respectively, as "Reporter 2" and "Reporter 3." Hebert has written extensively on both the ozone and climate change issues for The AP. He followed the emergence of the Montreal Protocol throughout the 1990s and covered the negotiation of the Kyoto Protocol in Japan in 1997. As of 2001, Hebert has focused more on energy issues and the nuclear industry. Reporter 2 has covered several aspects of the climate change story over the past several years including international negotiations, scientific research and the approach of the current Bush administration to the issue. Reporter 2 has also covered the ozone issue, including the methyl bromide debate. Reporter 3 wrote extensively about the evolution of environmental policy, including climate change, at the outset of Bush's first term in office. Collectively, the responses from the three reporters to the research questions cover a lot of ground but dwell especially on the challenges of gathering accurate information and reporting fairly and effectively on climate change – challenges central to the critiques of the previous interviewees. The reporters' remarks, sorted into several themes below, figure heavily in the critique in Chapter V of the news media's reporting on the issues and recommendations for reporters and readers.

Conforming with the view of the four previous interview subjects, the three reporters noted that the ozone hole problem has been largely solved and has thus received less attention than climate change in the news media – a point solidly backed by the proportion of climate to ozone hole articles found in the initial Lexis-Nexis search for this study. That said, the primary focus of the reporters' remarks was on the climate change issue. Like Watson, Maisano and Doniger, Hebert noted that substitute chemicals provided an attractive solution to the ozone hole problem whereas there have been no such off-the-shelf substitutes for fossil fuels. "Climate change asks you to totally rethink your entire, almost your entire energy structure, which has much broader implications, much broader costs, much broader upheaval of what's going on," Hebert said. "So I think that when you say that 'Why was one [policy regime] successful and one's still struggling?' to a certain extent that's because climate is a much more difficult issue to tackle than dealing with the ozone."

The Media's Role

Reporters 2 and 3 defined the news media's role as providing information on a topic of vital concern to the public – conveying facts to educate and empower citizens. Said Reporter 3:

> I think the media's primary role has been to characterize the conflicting political, policy, economic views in this country on the question of global warming, air pollution control and ways to reduce air pollution by industry and the utilities in this country. I think the newspapers and magazines and TV stations, networks and all have done generally a pretty

good job of spelling out the major issues and trying to outline what the stakes are for the nation – and for the world. This is really one of the most serious, important issues facing the world today, the whole issue of climate change and the effects on weather and on the lives of, you know, hundreds of millions of people around the world. And I think people, more and more, are becoming very concerned about the effects of climate change as they see, you know, destructive changes in the weather …

On that topic, Reporter 2 said:

I think really that one of the issues is that climate change is to many people a very abstract issue which they've failed to kind of visualize in terms of how it affects their own lives. And so I think the media's most instrumental role is frankly keeping it as part of the national policy debate. And if you didn't have reporters writing as extensively as they have on both weather effects and the latest scientific developments I don't think policy makers would feel as compelled to debate these issues and take action.

Hebert credited the news media with bringing about a shift in public and political perception of the issue:

I think the only thing that you can say is there has been over the years coverage of the issue enough where today people are aware of it, and politicians are aware of it. And even President Bush and the Bush administration, which is criticized for basically scuttling Kyoto, as far as the United States is concerned. He, you know, he has not come out and said there is no such thing as climate change. With some very rare exceptions, today you have a general consensus that this is something that we have to deal with and the only thing I can say is I think the news media has probably been responsible for raising that, for that happening.

Challenges of Climate Reporting

All three reporters characterized the task of reporting and writing on climate change as challenging – at times frustrating – for several reasons, among them, the complexity of science driving the debate, conflicting scientific reports, and heavy "spinning" of the issue by interest groups. The task is compounded, they said, by the need to meet journalistic standards of fairness and balance. All three said they were well aware of criticisms of the news media's handling of climate change reporting, including charges that news reports are oversimplified, give too much attention to climate change "skeptics," or that they under or overplay the potential dangers of climate change. Reporter 3 summed up the challenges many reporters face and how they cope with them:

> The material, the data, is so incredibly complicated and I think it's difficult for a lot of reporters to sort of grapple with it and evaluate it. And so in the end you have to – most reporters have to find sort of reliable sources, scientists, analysts, public officials, bureaucrats who have sort of dealt with this issue over the years. You know, and some members of advocacy groups – some of the environmental groups who cover this stuff, follow this stuff intensely, you know, year round – and try to find some people you are comfortable with whose opinion and evaluation you sort of trust. Because otherwise, you're really up against a mountain of data and studies, you know, the UN-sponsored reports and the government-generated reports and then dozens and dozens of scientific journal articles and papers generated by the industry – utility industry in particular – all, you know, taking a different slant or take on this issue. And, as a reporter, you feel obliged to give a balanced view of things.

Said Reporter 2:

> I think that where the media tends to get attacked is for failing to strike the right balance. A lot of times I think that criticism is unjustified, but it certainly is something that people struggle with: To what extent do you reveal where the people you're quoting get their funding from? You know, how high up do you put global warming skeptics when clearly, within the scientific community, they're a tiny, tiny fraction of where most people come down. Those are the issues that the media have grappled with.

Hebtert and Reporter 3 acknowledged that these pressures have made for some inconsistent reporting, and even some mistakes. Hebert said climate change reporting at times has been "uneven" and "sensational." Some concepts introduced to the public are confusing, he said, like the Bush administration's plan to reduce so-called carbon intensity – "that it's simply a reduction in the rate of growth [of carbon emissions] but it's still growing." Specifically, Hebert faulted the press for failing to explain the concept that carbon emissions accumulate in the atmosphere and that "all the stuff that's going into the air now is still going to be in there for a long time." He echoed the frustrations of the other reporters on the task of striking the proper balance in climate change stories:

> How much weight do you give a report by this UN committee, which represents a whole bunch of people, versus maybe a couple of scientists who very legitimately are pursuing certain things and you report their skepticism. But when you report their skepticism, are you then maybe skewing the whole thing just by giving their skepticism the same weight as what is being said by a large body of scientists? And I think that in terms of the climate debate, that's been very difficult.

By contrast, Hebert said ozone was "a simpler story" with a greater amount scientific consensus, and far less industry opposition.

Kyoto Obstacles

Given his long experience with the climate change and the ozone hole problems, Hebert offered an analysis of the strengths and weaknesses of their respective policy regimes. The other writers declined to answer the question. Hebert said from his perspective as a reporter covering the 1997 Kyoto Protocol negotiations, it appeared that "everybody was looking out for themselves." Like Maisano, Hebert noted the advantage that the 1990 emissions baseline provided key supporters of that date. Since then, for example, Russia's economy had collapsed and thus its fossil fuel use dropped steeply; West Germany unified with the East, whose coal-fired industry sector shut down; and England had swapped its heavy use of coal for natural gas.

> So there you've got three major countries that are players in this who all are saying "Yeah, we picked 1990, we don't have a problem with that. You nasty Americans, what problem do you have?" Well we didn't have the same sort of fudging mechanisms. But we also had the ability to find a whole bunch of sinks out there – because we're a big country – like trees, plant trees, do all those kind of things. ... But the overall view was that if we don't do something, the Third World countries, particularly China, India – in terms of industrial development – they weren't going to commit to anything. And they're the ones that are expanding the fastest. So the idea was let's put something on the table so that the next go around we can get the Third World countries in. But Kyoto basically, I think – unlike Montreal – I think Kyoto has been sort of a flop. You know ... it is in large part because the United States didn't – hasn't participated. But I think it's also because everybody has seemed to have found ways – a lot of smoke and mirrors going on there.

Hebert said environmentalists wondered aloud what good it would do the atmosphere to have the United States buy pollution credits from Russia in pursuit of a goal to reduce emissions at a level that would be "just a drop in the bucket in terms of what really needs to take place." Hebert noted, as did Watson, that Kyoto's original targets were designed mainly "to get the ball rolling" on bigger cuts. He said he did not know what could be done to improve upon the protocol but said any solution would have to avoid serious economic pain. "I just think that you have to find a way to address the issue without causing such economic harm that politically it's not palatable," he said. "And if politically something isn't palatable then it just isn't going to be done."

Globalization

On the question of globalization and the environment, Reporters 2 and 3 noted two potential outcomes of the phenomenon. Reporter 2 said that a growing international awareness of nations' environmental interconnectedness can to spur global policy action to protect the environment:

> The fact is we're becoming more aware of how intertwined different countries are and how their environmental policies affect the public health and well-being of everyone across the globe. And so that speaks sense which I think a number of environmental issues – you see this with PCBs, you see this with a number of issues, ozone is another example – where the impact of someone's actions very far away can actually be affecting your life and your health. And so I think that's why leaders are coming to the conclusion that they need to work cooperatively to adopt policies that will level the playing field and will protect public health and the environment.

Reporter 3 was less optimistic and pictured the momentum of globalizing markets as a trump to environmental efforts, including calls to have the United States join the Kyoto Protocol:

> As Third World countries grow geometrically in their economic development – as countries like China and India come into their own and move to center stage as great economic powers, there will be more and more resistance to the kinds of solutions that a lot of world leaders, especially the Europeans, say are necessary. And – you know, for every effort at controlling greenhouse gas emissions – adding, you know, new scrubbers to utility plants, changing CAFTA standards, you know, in the auto industry – there's a counterweight of economic forces to prevent it and they're very powerful, wealthy and well-connected. And it's this tension that we're seeing playing out on the world stage now. And while the Kyoto Protocol and these agreements essentially between European countries to try to slow the rate of growth of emissions may have some, you know, minor effect in the coming years, that could really be offset by an economic power like China that has very few environmental regulations and is not sympathetic at all to that and does not want to be part of any kind of international agreement. And I think that's one area where I sort of have sympathy with the Bush administration. They're arguing that they should not – the United States should not – be saddled with any international agreement until some of these Third World nations are brought into the agreement as well. And you're not going to see that happen in our lifetime, I don't think.

Hebert noted the potential of globalization to be both a hindrance and a help to the cause of global environmental protection. He said the more that nations realize they are interconnected, "I think maybe they will realize that they're all in the same ballpark and they have to deal with that."

The Future

None of the reporters were as certain of the outcome of the Kyoto policy process as Maisano or Doniger. But they agreed, again, that the terms of the public discussion have shifted from whether climate change is real to what should be done about it. Among other trends, they noted that state and local efforts to address the issue are growing in lieu of an aggressive federal policy and that industry is getting in on the act – if only to stay competitive. Said Hebert:

> There's no way that you can return to the old attitudes about climate. It's just, there are just too many people now that believe that this is an issue. Even though there's a shortage of data to some extent – the data is becoming more and more pronounced. The political, the politics of it is becoming much more, "Yes, we've got to address the issue." The economic are such that, for whatever reason, it's understood that even though fossil fuels are going to stay around for a long time, we have to find a way to make them less environmentally harmful.

Reporter 3 noted a groundswell of state and regional concern on climate issues:

> Well the trends that I see in the United States that I think are very interesting are initiatives by individual states to address global warming absent any kind of federal policy. And I think we've done stories showing that, you know, in a majority of the states, state legislatures and governors have launched efforts to reduce emissions – to address global warming because it has a terrific impact on agriculture, it has terrific impact long-term over shorelines in the effort to salvage beachfront and coastlines around the country because a lot of that land is disappearing as the sea level rises and there are a lot of scientists who think that that's related to global warming. So, while there seems to be an absence of real leadership in Washington, I find it heartening that there are a lot of initiatives by state and local government and industry,

utility industries around the country who see it in their own self interest to take a more environmentally friendly approach.

Reporter 2 predicted in both government regulations and the business practices of multi-national corporations "a progression toward more stringent approaches to dealing with greenhouse gases." Then the reporter hedged just a bit: "But you know, again, there still is resistance and a lot of this will be determined by who ends up being in office after 2008."

Summary

Recall that the preceding reports of each interview were grouped by themes in order to most accurately reflect the emphasis placed by the interviewees on varied subjects as they answered identical questions. These differences are telling and figure significantly in the analysis in the final chapter. However, so not to lose sight of the original questions, and to provide a more apples-to-apples comparison between the interview subjects, Table 23 summarizes the gist of their responses to each question in thumbnail statements. As noted earlier, it is intended as a quick reference and best used as a supplement, rather than a substitute, for examining the interviewees' longer responses above.

Table 23. Thumbnail Summaries of Interview Answers Questions 1-6

Question 1. What is your experience with climate change and/or ozone issues?

Stakeholder	Thumbnail Summary
Watson (Scientist)	Led U.S. research program on ozone hole at NASA; active in U.N. ozone regime; former White House adviser; former head of the IPCC. Frequent media source on ozone and climate science.

Question 1. What is your experience with climate change and/or ozone issues? Cont.

Stakeholder	Thumbnail Summary
Congress Member (U.S. Govt)	Has had three years of experience following proposals to address climate change at the federal level.
Maisano (Industry)	Led media relations program of industry's Global Climate Coalition – an alliance of the coal, oil and automobile industries against the Kyoto Protocol. Frequent media source on industry stance on climate change.
Doniger (Environmentalist)	An attorney with National Resources Defense Council. Helped negotiate the ozone treaty; has been active in climate negotiations. Frequent media source for environmentalist viewpoint.
Hebert and Reporters 2 and 3 (Media)	Hebert covered ozone issues in the 1980s and climate change until 2001 for The Associated Press. Reporter 2, a national environmental news reporter, has covered climate change and the U.S. handling of it; Reporter 3, a former national environmental reporter, also covered climate change.

Question 2. What role do you think your group has played/ will play regarding U.S. involvement in the climate change and/or ozone regimes?

Stakeholder	Thumbnail Summary
Watson (Scientist)	Scientists play an "absolutely critical role" in developing knowledge about the environmental problems and translating that knowledge to policy makers.
Congress Member (U.S. Govt)	Congress has proposed a range of measures to deal with climate change – from voluntary to mandatory – and is continuing to debate the issue.

Question 2. What role do you think your group has played/ will play regarding U.S. involvement in the climate change and/or ozone regimes?

Cont.

Stakeholder	Thumbnail Summary
Maisano (Industry)	The Global Climate Coalition worked to stop U.S. involvement in the Kyoto Protocol through lobbying and public advertising. Different sectors of the energy industry are not always on the same page, but some are interested in promoting and shaping an alternative climate policy regime to Kyoto based on technology transfer and trade.
Doniger (Environmentalist)	The Natural Resources Defense Council has played multiple roles in both the ozone and climate change cases, including lobbying, international negotiation, legal advocacy, and public advertising aimed at producing strong agreements to cut emissions in chemicals that harm the ozone layer and contribute to climate change.
Hebert and Reporters (Media)	All three reporters viewed the media's role in covering the ozone hole and climate change as alerting the public to important environmental problems and empowering readers with knowledge about them. Hebert credited the media with convincing the public that climate change "is something that we have to deal with."

Question 3. What role do you think the news media has played/will play regarding U.S. involvement in the climate change and/or ozone regimes?

Stakeholder	Thumbnail Summary
Watson (Scientist)	The media effectively alerted the public to the dangers of the ozone hole but has confused the public on climate change by underplaying and overplaying the issue and giving undue attention to climate skeptics.
Congress Member (U.S. Govt)	Media coverage of climate change has been "incomplete" and more reporting needed on the potential effect of the Kyoto Protocol on the economy, energy production, energy use, and the lifestyles of Americans.

Question 3. What role do you think the news media has played/will play regarding U.S. involvement in the climate change and/or ozone regimes?

Cont.

Stakeholder	Thumbnail Summary
Maisano (Industry)	The media has often failed to grasp the complexity of the climate change issue and has been "played by sensationalism" (i.e. climate change causes hurricanes). Maisano says his employers feel the news media is unfair but adds that he thinks the media has been "misunderstood" by both environmental and industry critics. Reporters are often good at finding new story angles.
Doniger (Environmentalist)	The media has done well to publicize the fact that ozone and climate change are problems worth attention. But it has been bogged down by its convention of balancing all sides equally, which has downplayed mainstream science and confused the public.
Hebert and Reporters (Media)	*The following addresses the reporters' critique of the news media*: All three reporters characterized their task as challenging, at times frustrating, because of the complexity of science driving the debate, conflicting scientific reports, and heavy "spinning" of the issue by interest groups. Hebert said reporting has at times been "uneven" and "sensational." Despite this, Reporter 3 said: "I think the newspapers and magazines and TV stations, networks and all have done generally a pretty good job of spelling out the major issues and trying to outline what the stakes are for the nation – and for the world."

Question 4. What are the strengths and weaknesses of each policy effort and what would you recommend, if anything, be done to improve them?

Stakeholder	Thumbnail Summary
Watson (Scientist)	The ozone policy has largely been a success and is working; The Kyoto Protocol is "a very important first step," but will need to grow from 5-percent reductions in developed nations to 60 to 80 percent reductions worldwide.

Question 4. What are the strengths and weaknesses of each policy effort and what would you recommend, if anything, be done to improve them?

Cont.

Stakeholder	Thumbnail Summary
Congress Member (U.S. Govt)	Kyoto's biggest fault is failing to include the rapidly growing nations of China and India in mandatory emissions cuts. A "low hanging fruit" (i.e. do the easy things first) approach should be pursued.
Maisano (Industry)	The Kyoto Protocol, a dead letter in the U.S., would irreparably harm America's economy and fail to solve the climate change problem. Cutting carbon emissions effectively cuts economic growth. Kyoto's baseline reduction date is unfair to the United States and, worse yet, large developing nations (China and India) are not on the hook for reductions. An alternative "low hanging fruit" strategy grounded in trade and transfer of efficient energy technologies is needed.
Doniger (Environmentalist)	The ozone treaty is comprehensive and enjoys strong international support. The Kyoto Protocol has stalled in the U.S. under "ferocious industrial resistance," but existing markets (such as the air pollution cap-and-trade system in the U.S.) and political support (in the rest of the world) bode well for its future.
Hebert and Reporters 2 and 3 (Media)	While Reporters 2 and 3 declined to answer this question, Hebert noted that Kyoto's greatest challenge is that its goals are a preliminary "drop in the bucket" and said, "I just think that you have to find a way to address the issue without causing such economic harm that politically it's not palatable."

Question 5. Please describe what globalization means to you and mention a few ways, if any, you think it has affected and/or will affect US involvement in either policy effort.

Stakeholder	Thumbnail Summary
Watson (Scientist)	Globalization means "the world is becoming smaller and smaller." Developed nations need to lead the way in solving environmental problems in a "globalized way" by making the first sacrifices and sharing technology with developing nations.

Question 5. Please describe what globalization means to you and mention a few ways, if any, you think it has affected and/or will affect US involvement in either policy effort.

Stakeholder	Thumbnail Summary Cont.
Congress Member (U.S. Govt)	Globalization is "an integration of the world's economies." An international bank and trade system for carbon makes sense.
Maisano (Industry)	Globalization represents "the fact that we no longer really have borders in terms of our business, in terms of our technology, in terms of our ability to be affected by what other countries are doing." This phenomenon can aid in technology transfer to address climate change.
Doniger (Environmentalist)	Climate change and the ozone hole are the "greatest examples" of globalized environmental problems. Climate change will need to be solved with the help of the global market system, specifically, markets for carbon emission credits.
Hebert and Reporters (Media)	Hebert and Reporter 2 noted that a growing awareness of international environmental interconnectedness might further spur global policy action to protect the environment; Reporter 3 saw the momentum of globalizing markets and economic forces controlled by the "very powerful, wealthy and well-connected" as a likely trump to such efforts.

Question 6. What do you think the future holds for each policy?

Stakeholder	Thumbnail Summary
Watson (Scientist)	The ozone policy is on track for success; "I have to remain optimistic that we will indeed address the climate change issue in a sensible way. The question is "How long will it take us?""
Congress Member (U.S. Govt)	Growing scientific evidence of climate change is prompting action in industry and government on measures including voluntary compliance, technology transfer, tax incentives and carbon trading.

Question 6. What do you think the future holds for each policy?

Cont.

Stakeholder	Thumbnail Summary
Maisano (Industry)	Pursing Kyoto is like trying to fix a badly broken toy. Instead nations "should allow technology to continue to grow and develop so that we change the way we use energy in the future."
Doniger (Environmentalist)	Doniger said he believes the Kyoto Protocol will succeed and said it's "inevitable that we're going to have an agreement or a set of agreements that constrain carbon monoxide and the other global warming pollutants and eventually work up to a very low-emitting energy economy."
Hebert and Reporters (Media)	The reporters see growing support at the state and local level in the United States for action on climate change. Reporter 2 predicted in international business and government "a progression toward more stringent approaches to dealing with greenhouse gases." Said Hebert: "There's no way that you can return to the old attitudes about climate. It's just, there are just too many people now that believe that this is an issue."

CHAPTER V

DISCUSSION AND CONCLUSIONS

Introduction

The full range of data – news article excerpts, coding totals, descriptions by interviewees and observations from scholars – are all brought together in this chapter.

Table 24 below revisits the study's research questions and notes where summaries of answers to each can be quickly found.

Table 24. Research Question Answer Guide

A. Overall Guiding Questions	Summary Location
1. How have the sources, structure and content of arguments carried by mainstream American print media about the ozone hole and climate change evolved from 1980 to 2004?	Chapter III Table 9, page 136, through Table 22A-D, page 198 Additional context in Chap IV Table 23 Questions 1-5, page 239. See also Conclusions Section below, page 268
2. What do the trends in social and decision process emerging from this analysis reveal about the relative success of the Montreal Protocol in the United States versus the failure of the Kyoto Protocol?	Chapter V Stakeholder Analyses and Conclusions Section, page 251

B. Coding Questions – from analysis of 1,076 news articles	Summary Location
1. Are the arguments supportive or opposed to the goals and/or principles of the policy?	Chapter III Table 22A, page 198

B. Coding Questions – from analysis of 1,076 news articles	Summary Location
2. In what proportion are the arguments international or domestic, and economic, political, social or environmental in nature?	Chapter III Table 22A, page 198
3. What stakeholder groups are main sources/ subjects of the arguments?	Chapter III Table 22C, page 200
4. What are the arguments' relevance to one or more of five policy issue criteria?	Chapter III Table 22B, page 199
5. What are the trends over time in the above categories?	Chapter III Table 22A-D, page 199

C. Interview Questions – posed to stakeholders	Summary Location
1. What is your experience with climate change and/or ozone issues?	Chapter IV Table 23 Question 1, page 239
2. What role do you think your group has played and will play in the future with regard to US involvement in the climate change and/or ozone regimes?	Chapter IV Table 23 Question 2, page 240
3. What role do you think the news media has played and will play in the future with regard to US involvement in the climate change and/or ozone regimes? [Everyone gets this question but news reporters who've already answered it]	Chapter IV Table 23 Question 3, page 241
4. What do you think are the strengths and weaknesses of each policy effort – climate change and/or ozone. What would you recommend, if anything, be done to improve them?	Chapter IV Table 23 Question 4, page 242
5. Please describe what globalization means to you and mention a few ways, if any, you think it has affected and/or will affect US involvement in either policy effort.	Chapter IV Table 23 Question 5, page 243
6. What do you think the future holds for each policy?	Chapter IV Table 23 Question 6, page 244

D. Policy Sciences Analytic Framework Synthesis	Summary Location
1. What conditions and trends, both overall and within each cases' main participant/stakeholder groups, have led to the current outcomes? What direction are these trends pointing in the future?	Stakeholder Analysis section below, page 251
2. What discourses are most prominent within and among the participant/stakeholder groups and in the news media coverage as a whole and how might that relate to outcomes?	Stakeholder Analysis section below, page 251
3. What lessons do these findings hold for news reporters and editors and consumers of news?	On the Press Section below, page 283
4. What are the greatest strengths and weaknesses of this dissertation's methodology? How might it be improved and used in the future?	Chapter II Methodological Issues section, page 120 & Closing remarks section below, page 290

Thus far, Chapters III and IV have gone most of the way to addressing the first of this study's two overall guiding questions: "How have the sources, structure and content of arguments carried by mainstream American print media about the ozone hole and climate change evolved from 1980 to 2004?" Chapter III reported and summarized the coding data that described this structure and content. Chapter IV added context with interviews from stakeholders immersed in the issues. This chapter (Chapter V) tackles the second overall guiding question: "What do the trends in social and decision process emerging from this analysis reveal about the relative success of the Montreal Protocol in the United States versus the failure of the Kyoto Protocol?" It also answers several sub-questions listed in

Table 24D.

The first of this chapter's four sections, *Stakeholder Analyses,* revisits each stakeholder groups in turn and describes their role in the larger ozone and climate change news media narratives using elements of the social and decision process categories of the policy sciences analytic framework. The balance of attention is paid to the two largest stakeholder groups – scientists and U.S. government. The seven social process categories, first introduced in Chapter II, enable an analysis that – as described best by Lasswell – helps reveal "who, with what intentions, in what situations, with what assets, using what strategies, reaches what audiences, with what result?" (1968, 62). The social process categories, again, are:

1. Participants – People and organizations with a stake in the policy.
2. Perspectives – Varied viewpoints of these stakeholders.
3. Situations – Situations in which the stakeholders interact.
4. Base Values – Assets used by stakeholders to pursue their goals (power, wealth, enlightenment, skill, well-being, affection, respect and rectitude).
5. Strategies – Approaches stakeholders use to achieve their goals.
6. Outcomes – Changes in values among the stakeholders.
7. Effects – Institutional effects of stakeholders' actions (Clark 2002, 33-34).

Simultaneously, this section notes the categories of the decision process in which the stakeholders were most involved. The seven decision process categories, introduced in Chapter II, are:

1. Intelligence gathering – Essentially planning, the collection and processing of information for policymaking),
2. Promotion – The promoting of, lobbying for policies,
3. Prescription – The establishment of the rules
4. Invocation – The enforcement of the rules

5. Application – The process of shaping and keeping the prescription and invocation in check, e.g. through appeals or lawsuits.
6. Appraisal – The "assessment of a decision process as a whole and of the success of particular prescriptions in achieving their goals" (Clark 2002, 68))
7. Termination – The "repeal or large-scale adjustment of a prescription" (Clark 2002, 69).

For example, scientists in the ozone and climate cases concerned themselves mostly with intelligence gathering and politicians with prescription and promotion. Because of stakeholders' widely varied roles, the amount of attention paid to each of the analytic categories above varies from group to group. Each stakeholder discussion is capped with a brief analysis of the environmental discourses most prominent in their arguments. Table 3 is reprinted below to provide a refresher of the eight environmental discourses defined by John Dryzek in his book, *The Politics of the Earth* (1997).

(Table assembled from Dryzek 1997)

Category	Discourse	Catchphrase
Limits	Survivalism	"Looming Tragedy" (1997, 21)
	Promethean	"Growth Forever" (1997, 45)
Problem Solving	Administrative Rationalism	"Leave it to the Experts" (1997, 63)
	Democratic Pragmatism	"Leave it to the People" (1997, 84)
	Economic Rationalism	"Leave it to the Market" (1997, 102)
Sustainability	Sustainable Development	"Environmentally Benign Growth" (1997, 123)
	Ecological Modernization	"Industrial Society and Beyond" (1997, 136)
Green Radicalism	Green Romanticism	"Save the World through new Consciousness" (1997, 155)
	Green Rationalism	"Save the World through New Politics" (1997, 172)

This chapter's second section, *Conclusions*, follows from the comprehensive mapping of the players. It comes in three parts: 1) a presentation of four central findings that address the study's two overall guiding research questions; 2) an exploration of the challenges in the argument landscape to limits on fossil fuel emissions and a set of policy recommendations to counter those challenges; and 3) a critique of the news media followed by some recommendations, also based on the data, for reporters, their sources and readers of climate news coverage. The final section of the chapter, *Closing Remarks*, provides a brief description of this study's evolution – from its back-of-the-napkin beginnings to its current form – and offers a few parting thoughts on how its findings and methodology might be put to use in the future.

The discussion and conclusions in this chapter are necessarily general – given the sheer size and detail of the data sets involved – but they are sufficient to answer the research questions. Hopefully, they will provoke debate and further exploration of the issues they raise. The conclusions' value rests in the fact that they were distilled from a comprehensive and diverse pool of information using a reliable, systematic and, above all, transparent research methodology. Specific examples of arguments are culled from the coded articles and research interviews to back up the findings presented here.

Stakeholder Analyses

Scientists

Scientists were major *participants* in the news coverage of the ozone hole and climate change cases – with links to nearly half the arguments in the ozone case and more than a quarter of arguments in the climate case. As noted earlier, scientists often spoke in their capacity as researchers at universities and major national and international organizations such as the EPA, NASA, NOAA, the UNEP or WMO. Serving mostly in an intelligence gathering capacity, they focused on a range of issues including the causes of ozone depletion and climate change and their likely effects on the environment, society and the economy. In some instances they spoke on behalf of industry or environmental groups who had contracted them to conduct specific studies.

In the both the ozone and climate cases, the principle *perspective* of scientists is one of concern about the environmental problem and desire to figure them out. Scientists are cast in many *situations*, from working with computers and satellites to drilling ice cores and testifying at Congressional hearings. Every October, scientists announced the appearance of the ozone hole and documented its growth from the previous year – keeping it alive in the public conscience. As "experts" whose work was subject to the rigorous peer review, scientists were given a high degree of attention and credibility in the stories by reporters and other stakeholder groups. Said The AP's Josef Hebert in his interview:

> And in any of these scientific issues, the word "peer review" seems to put things on a different, on a new scale. I mean, I'm not a scientist, but I do know that there's a process involved and you have journals such as Science magazine or Nature and people like that who take peer review very seriously. So once you have something that is somewhat, that is peer reviewed by other scientists, you're always going to have this back and forth but as a journalist, you know, you give that much more credibility.

In news articles, scientists were often pitted against competing researchers and skeptics within industry and government. In the ozone case, challenges to the fundamental science that led to the 1987 Montreal Protocol rekindled in 1995, prior to the Vienna Amendments, and again in 2003 during the methyl bromide debate. One of the most acutely political statements from the scientific community in either case was the awarding of the Nobel Prize in chemistry to Sherwood

Rowland of the University of California-Irvine, Mario Molina of the Massachusetts Institute of Technology, and Paul Crutzen, a Dutch citizen working at the Max Planck Institute for Chemistry in Germany. The Royal Swedish Academy of Sciences in Stockholm declared: "The three researchers have contributed to our salvation from a global environmental problem that could have catastrophic consequences" (Allen 1995). While the reports of the IPCC represent a remarkable scientific consensus about climate change, scientists have come across far less unified and clear-minded about global warming in press reports. As recently as May, 2004, UPI captured an ugly dispute between scientists over interpreting satellite measurements of temperature critical to demonstrating human-induced climate change reporting and concluded: "There even remains – in the United States, at least – controversy over whether global temperatures are rising and, if so, how much" (Whipple 2004). Scientists have also fought with the White House over its alleged suppression of climate change research for political reasons, including the work of NASA climate researcher James Hansen who accused the administration of pursuing an increasingly aggressive policy of censorship against him. Reported the New York Times (Revkin, 2006a):

> The fight between Dr. Hansen and administration officials echoes other recent disputes. At climate laboratories of the National Oceanic and Atmospheric Administration, for example, many scientists who routinely took calls from reporters five years ago can now do so only if the interview is approved by administration officials in Washington, and then only if a public affairs officer is present or on the phone. Where scientists' points of view on climate policy align with those of the administration, however, there are few signs of restrictions on extracurricular lectures or writing.

Two years earlier, the Times declared in an editorial: "Although the Bush administration is hardly the first to politicize science, no administration in recent memory has so shamelessly distorted scientific findings for policy reasons or suppressed them when they conflict with political goals" (2004).

To the extent their research and opinions informed policymaking decisions, scientists performed a prescription and promotion function. For example, as ozone research progressed, scientists repeatedly called on Capitol Hill for cuts in CFCs. Warned Rowland at one hearing: "We need to act now and impose severe restrictions on CFC emissions immediately if we want to bring the chlorine concentrations in the atmosphere under control by early in the next century ... I don't think the global community can afford to wait for another dozen years before applying stringent controls on CFC emissions" (Goeller 1987). In both cases, scientists joined with environmentalists and politicians to publicize the dangers of ozone destruction and climate change and champion laws to address them (Layzer 2002, Benedick 1998).

In her book on science reporting in the news media, Nelkin points to a more narrow and subtle form of promotion and *strategy* on the part of scientists in the making of the news. Writes Nelkin: "Industries, political institutions, professional associations, special interest groups, and aspiring individuals all want to manage the messages that enter the cultural arena through education, entertainment and above all the media. Scientists are no exception" (Nelkin 1995, 13). Scientists, she said, are in a "quest for improved public understanding of science and greater public support" (13) and often "ventriloquate through the media to those who control their funds" (124).

The observations above shed some light on the *base values* at work among scientists in the news coverage. As noted in Chapter II, enlightenment ranks highly along with rectitude for the part that scientists play helping policymakers understand the problems of ozone depletion and climate change. This is evident in Watson's remarks about the "absolutely critical role" scientists play in this regard. Apart from a desire for the figurative "wealth of knowledge," monetary wealth comes to scientists in the form of grants for research. Big media coverage helps researchers win grants. Respect is a theme to the extent that scientist want their ideas taken seriously and fight for them in the press. Well-being is also a theme in the way that human and environmental well-being is an end that scientists say they are fighting for. Watson and Doniger summed up the *outcomes* and *effects* of the scientific community in the cases well. In the ozone case, scientists succeeded in getting across the message that CFCs needed to be banned. Increasingly dire reports on the ozone hole were followed by stricter policy measures which are on track to fix the problem. While scientific consensus on climate change has grown steadily, scientists have not yet convinced the American public and politicians in sufficient numbers to confront the problem through a binding global treaty.

A look at the discourses most prevalent in scientists' arguments shows a good dose of Survivalism ("Looming Tragedy") in both the ozone hole and climate changes cases. This is understandable, because the problems have made news for their potential to do worldwide damage. For example, UNEP meteorologist Peter Usher said of the Montreal Protocol: "Without this treaty, we were on a crash course for disaster. Life on Earth was at risk within a century" (Bradley 1987). John T. Lynch of National Science Foundation told The New York Times: "It's terrifying. If these ozone holes keep growing like this, they'll eventually eat the world" (Browne 1998). Reflecting a tinge of green romanticism, some scientist used metaphors that portrayed earth systems as living entities. James G. Anderson, a Harvard University professor of chemistry and a NASA project scientist declared that "the atmosphere's immune system is less sturdy" than previously believed" (Recer 1992). In a story about a spat among climate change scientists and environmentalists, Marine biologist Sylvia A. Earle argued that underwater speakers to gauge ocean temperature would hurt whales and other marine life and used the following analogy: "If you further damage the patient, the earth, while you try to take its temperature, then maybe the method is flawed" (Broad 1994). But scientists also expressed views in Promethean terms, often when proposing technological fixes to sweeping problems. Qualifying for this realm were fantastic proposals to patch the ozone hole with a fleet of 100 airplanes releasing hydrocarbons (Recer 1991) and solving climate change by seeding carbon-eating ocean algae with container shiploads of iron dust (Fordahl, 2000). The National Academy of Sciences came in for criticism in a piece by Peter Passel for the New York Times for dwelling on the language of economic rationalism: "If you sense something is missing here, you are not alone," wrote Passel. "The perspective of the study is that of economists and engineers: Nature is an economic tool and a playground for humans. Therefore, rapid, irrevocable changes in the global ecology are a liability only to the degree that they reduce productivity or upset the users of the playground" (Passel 1991).

Finally, scholars report that an additional ingredient flavors the tone of scientists in the news media: an abiding predisposition toward maintaining scientific "objectivity." This is a notion that itself arguably constitutes a discourse. In an analysis of climate change news coverage from 1987 to 1990, Wilkins reported that scientists and, in turn, journalists generally presented an Enlightenment perspective on the climate change problem grounded in a shared notion that science and journalism "needed to be seen as rising above political, social and economic concerns." The *Enlightenment* notion of objective truth stands in contrast to the *Pragmatist* viewpoint, which proposes that "knowledge and reality are not *fixed by* but instead are the *result of* an evolving stream of consciousness and learning" (Wilkins 1993). Writes Wilkins:

> Scientific explanations of the problem tend to frame the issue in "science-driven" terms, rather than suggesting that political policy and human choices are the base of the physical phenomenon. With this rather central omission, it becomes possible to seek solutions to the greenhouse effect in the "neutral" realm of science and to make public policy choices subservient to "scientific findings." However, social scientists and philosophers have argued that the reverse approach, making value choices in the form of political and social policy as a mitigation strategy and building scientific models on those choices, makes equally as much sense.

Wilkins' study finds that the scientists and news reporters emphasized three additional themes: progress (the advancement of understanding), the institutionalization of knowledge (knowledge as the domain of science and government) and innocence (curious humans as removed from responsibility for the phenomenon). These themes, in the larger Enlightenment perspective, run throughout this study's samples in both cases.

U.S. Government

The U.S. Government category includes federal, state and local government officials, including elected leaders, agency staff and their spokespeople. These participants' perspectives and situations were as varied as their roles in the debates. In the ozone case, the government stakeholders were almost exclusively federal officials, for example, administrators and scientists of the EPA, NASA and NOAA, members of Congress, the president and his inner circle. The climate case, which featured a larger proportion of local arguments, included the voices of state officials including governors and lawmakers. While there is some overlap between government and scientists' arguments, government arguments were divided more evenly between the pro-protocol and anti-protocol categories. An analysis of officials' perspectives, situations and strategies can be divided along these lines. First, however, it is important to recall that on balance government officials supported the Montreal Protocol and opposed the Kyoto Protocol. In the ozone case, the federal government pushed the international community to adopt the Montreal Protocol and stayed with the treaty through its several amendments. Not until 2003, did the government attempt to reverse protocol aims on the methyl bromide issue. By contrast, with the exception of the Clinton administration's adoption of the Kyoto Protocol and a continued support for climate change research, the federal government has been dead set against the climate treaty. Recall that this contrast is shown dramatically in Figure 28 and Figure 29.

With the exception of government scientists, government officials were most engaged with prescription, and promotion, and – further along – invocation, application, appraisal and termination. Herein lies an important limitation of mainstream press coverage as a data source for the activities of government. For many reasons, coverage of the often tedious process of drafting policy – the prescription function – was sporadic and tended to focus on political controversy – be it the haggling among treaty negotiators at international meetings or domestic squabbles.

Against a larger backdrop of policy success in the ozone case, a few bold stands by opponents made headlines, including that of Interior Secretary Donald P. Hodel who environmentalists and some lawmakers accused of trying to scuttle U.S. involvement in an ozone hole treaty. The UPI reported that Hodel "insists he was misunderstood in published reports saying he suggested wearing hats, suntan lotion and sunglasses could substitute for international controls on production of chemicals that attack the ozone layer" (Darst 1987). The report noted that Hodel thought President Regan was getting "boxed in" by the pro-treaty positions of the EPA and State Department. New York Representative James H. Scheuer, quipped that that Hodel's policy "could spawn an industry of entrepreneurs who would 'apply sunscreen to animals'" (Darst 1987). In addition to showcasing the news media's appetite for a good political row – one with some humor to boot – the Hodel story spotlighted political infighting that could have undermined the ozone regime, and it demonstrated the depth of political will in Washington to follow through on the process. Opponents to regulation persisted, and in a September 1995 hearing on Capitol Hill, lawmakers showcased skeptics to cast doubt on ozone science and lend support a bill to delay phaseouts of CFC and halons. Despite the evolved political and scientific consensus on ozone, the hearing was described by the UPI as an exercise in "whose credentials were more reputable, whose consensus was bigger, whose charts were skewed and who cared more about taxpayer burdens" (Milius 1995).

In the younger, less-evolved climate change regime, political challenges were more the rule than the exception. While Vice President Gore helped negotiate the Kyoto treaty, he and

President Clinton were faced with overwhelming opposition in the Senate on the grounds that the treaty was unfair and would harm the American economy. In 1998 Gore cited a NOAA report on record temperatures as a "a reminder once again that global warming is real, and that unless we act, we can expect more extreme weather in the years ahead." UPI reported his comments were to pressure Congress on $63 billion budget request for tax and research incentives to promote energy efficient products and technology (Record warm intensified in early 1998) . After the Clinton administration's failure to move the nation toward carbon cuts, the big story was the Bush administration's outright rejection of the protocol in 2001 which has been followed by a growing chorus within Congress and from individual states to do something about the climate change problem. The big stories that have followed – on SUV mileage, the McCain Lieberman proposal, the fights between California and Detroit, and the Northeastern states and Midwest power plants lawsuit – reveal a similar zen for controversy on the media's part. The base values are clear to see. Politicians love the power and rectitude that comes with rulemaking. Wealth, in the form of large campaign contributions for elected leaders, is also a factor along with respect.

The discourses in the arguments of U.S. government stakeholders tended to fall into two camps. Proponents of ozone regulation stressed the nature of global limits and potential for catastrophe found respectively in the Sustainability and Survivalism discourses while opponents of ozone and climate change treaties emphasized Promethean and Economic Rationalist themes. True to their promotion role, politicians demonstrated a flair for the dramatic. For example, at a hearing held to consider further regulation of CFCs, Senator Dale Bumpers, a Democrats from Arkasas, said of the ozone hole: "There is a time bomb ticking up there – and we can't afford to wait" (Lammi 1988). On Climate change, the UPI quoted from Gore's book, *Earth in the Balance*, where the vice president warned that "evidence of an ecological 'Kristallnacht' is as clear as the sound of glass shattering in Berlin" (Anderson 2000). For their part, opponents of ozone and climate regulations evoked images of economic threat and even ruin. California Governor Pete Wilson warned that enforcing the Montreal Protocol ban on methyl bromide pesticides – which he called "vital products with no practical alternative" – would "devastate California's agriculture industry and threaten thousands of California jobs" (McKinley 1995). On climate change, presidents George H. W. Bush, Bill Clinton and George W. Bush often stressed Promethean economic values alongside their environmental proposals. The following three excerpts from AP news reports provide typical examples:

> President Bush called Monday for balancing economic and environmental concerns when dealing with global warming, prompting environmentalists to accuse him of siding with industry and avoiding a pressing world problem. Bush, speaking to an international conference on the threat of a world "greenhouse" effect, said "our policies must be consistent with economic growth." And he suggested that in some areas of the debate "politics and opinion have outpaced the science" (Hebert, 1990).

> Clinton linked environmental regulations reducing hydrocarbon emissions by raising fuel efficiency standards for cars and other tactics to fight pollution with the creation of new, high-paying jobs. "I believe if you have uniform national environmental standards it's good for the economy ... you can generate tens of thousands of high technology jobs," he said (Ghioto 1992).

> The [G.W.] Bush administration, counting on more reliance on cleaner energy and new technology, is aiming to cut greenhouse gas intensity by 18 percent over the next 10 years. But an expanding economy can mean overall emissions increase, even though intensity might decrease (Backus 2003).

Economic themes also took precedence in news stories about the efforts of Northeastern states and California to reduce carbon dioxide emissions. While opponents in the power and automobile industry claimed the measures would hurt consumers, supporters countered that industry was only out for itself. A story by the New York Times documents these issues and the shift of the climate policy debate from the federal to state capitols.

> Repeated defeats on Capitol Hill have made California an appealing alternative battleground for frustrated environmental groups and politicians. Senators John McCain and John F. Kerry, who led a failed Senate effort to raise fuel standards, sent a joint letter to California legislators encouraging them to consider the bill. "Big money and the special interests went to the mat to stop us," Mr. Kerry said earlier this month. "I'm just glad to see they weren't able to smother a real dialogue in California" (Hakim 2002).

Industry

The industry group encompassed the commercial interests represented in news reports with a stake in the ozone and climate change issues. In the ozone case, this was primarily the chemical industry and its customers, including agribusiness. In the climate case it was the energy, manufacturing and automobile industries. Perspective and situations among these diverse subgroups broke down along the lines of those flat out opposed to the treaties and those willing to work with or even profit from new regulations. Their perspectives often changed over time with the advancement of both ozone and climate change science. For example, in the ozone case, the American chemical industry, led by DuPont, dropped its opposition to cuts in CFCs and embarked on developing substitutes. These stories, including McDonald's switch to CFC-free hamburger containers, drew much attention. In the climate case, as Maisano noted, industry's approach shifted from challenging the science to fighting the Kyoto Protocol. In news articles, industry arguments are most often juxtaposed with those of environmentalists or politicians supporting regulation. The following AP lead is typical: "Ford Motor Co., defending itself from attacks by environmental groups, says its hulking, nine-passenger Excursion sport utility vehicle will be among the safest and cleanest-running SUVs on the market" (Akre 1999). In another story Exxon Mobil spokesman Tom Cirigliano claimed Greenpeace protestors unfairly criticized the company's opposition to emission limits. "There is no company in the industry putting more time, effort or money into new technologies that will provide real answers to greenhouse emissions" (State and Regional 2003).

Industry officials were busiest performing a promotion function, be it lobbying against regulation or in favor of their products. Wealth is the central base value expressed in industry arguments. Power to control resources and influence policy is also highlighted. To the degree officials like Cirigliano seek to be understood, respect also plays a role. In terms of strategies, industry has adapted in both cases. The Maisano's explanation of the Global Climate Coalition's advertising and lobbying strategy against the Kyoto Protocol in Chapter IV provides an excellent summation of industry's approach in the climate case.

Many news stories focused on industry's role in developing and promoting "green" practices and products from so-called "clean coal" burning to hybrid cars, hydrogen fuel cells and wind power. The industry stakeholder group's arguments were overwhelmingly economic in nature and for the most part firmly in the Promethean and Economic Rationalist camps. Great deference is given to the notions of consumer demand and market forces – both which are shaped by industry advertising. John Manzoni, a regional president for BP Amaco, discussed the role of policymaking from this perspective in a UPI story:

> On renewable technology, Manzoni predicted that renewable energy would remain a tiny fraction of the mainstream power grid. BP Amoco, an oil company with annual revenues estimated at $148 billion, believes that energy policy and environmental policy must be linked, he said, but that connection must be made based on free market principles. "It's been proven time and time again that any other form of intervention – you see it in gas prices here

a few years ago, you see the result in California. Any other intervention such as price controls makes the problem worse," Manzoni said (Gambrell 2001).

Industry arguments promoting alternative energy technologies reside mostly in the realm of Ecological Modernization. In terms of outcomes, industry found a way in the ozone case to adapt to tough regulations on CFCs and halons. It's resistance was short lived. In the climate case however, industry has defeated U.S. involvement in the Kyoto Protocol and is moving now to promote an alternative agreement based on technology transfer.

United Nations

The United Nations stakeholder group encompasses the many agencies that played a role in both cases including the UNEP, IPCC and WMO. The work or words of these officials – which encompassed all aspects of the decision process – played prominently in arguments related to science reports and international negotiations but were seldom central to news stories in the sample. In the ozone sample, UN arguments were often synonymous with the promotion efforts of UNEP head Mostafa Tolba, who worked tirelessly to cajole nations to the bargaining table throughout the evolution of the Montreal Protocol. He receives high praise for his efforts from Bendick, who worked alongside him in the process. In the climate case, the intelligence gathering work of the IPPC reported over time in its three assessments drew the most attention from the American press. In terms of outcomes, the United Nations has presided over the prescription process of both treaties. Though its failure to date to draw the United States into Kyoto Protocol leaves the treaty's potential for success in doubt. Not surprisingly, themes of Sustainable development, social justice and the precautionary principle dominated UN-related arguments. To the extent the UN is a consensus building body, it practices the principles of democratic pragmatism – stressing the need for cooperative problem solving in both cases. This was reflected in the comments of Mostafa Tolba who as head of the UNEP helped cajole and inspire officials from many nations to develop, accept and carry out the Montreal Protocol. Reported the UPI:

> The ozone issue has been unique in inspiring broad consensus among nations, and observers believe a successful solution of the problem could serve as a template for international cooperation on the larger problem of global warming. "No country, no region, no group will ever be capable of solving any of these problems," Tolba said. "If failure is not an option, success is an imperative."

Watson, a former participant in both the climate and ozone regimes, reflected this outlook his interview for this study: "In general issues such as ozone depletion and issues such as global warming, climate change, whether we're in a globalized economy or not, the only way todeal with these issues is collectively."

<u>Environmentalists</u>

The Environmentalists represented most often in the press accounts were large mainstream groups such as Doniger's Natural Resources Defense Council, the Sierra Club and Friends of the Earth and Greenpeace. While certainly not all alike, they were routinely placed opposite in press accounts to their political and ideological opponents – industry. These groups played many roles in the policy process among them chiefly lobbying, public advertising and protesting. Greenpeace members were often quoted decrying slow progress at international negotiations (and cheering breakthroughs) and made headlines with dramatic protests at ozone conferences and actions including trespassing on BP Amoco's Northstar oil project on Alaska's north slope (Badger 2000). Environmentalists did not garner a large share of stakeholder arguments but they surely played a role in drawing press attention to the problems. In both cases, Earth Day served as an annual reminder of the ozone hole and climate change problems. Discourses within environmental stakeholder arguments are heavy on Survivalism in the ozone hole case and sustainability and ecological modernization in climate case – reflecting fear about the immediate dangers of the former and hope about shifting to renewable energy in the latter.

Europeans

The European stakeholder category served to track arguments coming from across the Atlantic as a group but was not intended to imply that European nations were on the same page. In very general terms, the European Community was split on the development of an ozone treaty but eventually signed on to it. On climate change, European nations have haggled over details but as a block stood against the United States in favor of mandatory carbon emission cuts. Discourses are varied but trend toward survivalism in the ozone case and sustainability in the climate case. Two examples from AP articles reflect this familiar dichotomy:

> "With a sky-is-falling urgency, European nations are rushing to ban ozone-eating chemicals after a study said a vast hole may open over their continent this winter. The action followed President Bush's Feb. 11 order for a U.S. ban on chlorofluorocarbons, or CFCs, by 1995." Story notes that any industry objections in Europe have been overwhelmed the "environmental fervor that has gripped the continent in the last month" (Fritz, 1992).

> Prime Minister Thatcher urges action on climate change on grounds of precautionary principle to protect "this and future generations" Move was "aimed at giving momentum to negotiations on global warming, due to start in February" (Czuczka 1990).

The Public

The public stakeholder group – saved for last in this section – exists in the news media coverage mostly to the extent it was defined by other stakeholders and the news reporters themselves. The public is referred to in new coverage most often as a series of collective bodies (as opposed to individuals with varied ideas) defined by broad terms ranging from "Americans" and "voters," to poll respondents, consumers, cancer statistics and potential victims of natural disasters caused by climate change. The media has come for criticism from scholars for leaving its climate change and ozone coverage devoid of individual vocies from the public street (Zehr, 2000, Wilkins, 1993). But that is not to say public comments are completely absent from coverage. The situations of the public citizen flow from these roles and the arguments about them are largely in favor of both protocols. Public opinion was the topic of a few stories in the sample which portrayed the public as confused or uninformed about climate change, including one in which farmers were asked to comment about a government report that global warming could help their crops (Ritter 2002). One survey found respondents "are so discouraged by the difficulty of solving Earth's environmental problems that they have begun losing interest" (Donn 1999). The release of the climate disaster movie *The Day After Tomorrow*, which depicted an instant ice age driven by a shutdown of the ocean conveyor, prompted a number of stories about the potential impact of the movie on public opinion. One of the more interesting themes related to the public was the emergence of support for the Kyoto Protocol from within a variety of religious traditions which led to some creative grassroots lobbying and consumer efforts to curb carbon emissions. In one, reported The AP, "religious leaders met with top officials at GM, Ford and the United Auto Workers, and introduced a "What Would Jesus Drive?" television campaign that encourages fuel-saving technologies" (Eggert, 2002). The public beyond U.S. borders was also a topic, including citizens of Pacific island nations worried about sea level rise and, in the ozone case, residents of Punta Arenas a city of 120,000 people of in Southern Chile within reach of the ozone hole. In a frightening story, the New York Times interviewed the region's only dermatologist who did not have the resources to study the skin cancer risk. The story included disturbing anectdotes of blinded sheep and rabbits that could be snatched by their ears by hunters (Nash 1991). In terms of outcomes, the role of the public characterized in news media reports is perhaps best summed up by Watson, who noted in his interview that the ozone case was perceived as a serious public health threat by policymakers in the North, who were in a position to solve the problem. By contrast, the climate change problem – which to hear it from the news media still has the public scratching its head – is less of a concern to the developed world.

Polls taken within two months of this dissertation's publication reveal a combination of apathy, ambivalence and confusion among the public about addressing the climate change problem. This echoes earlier poll results reported in Chapter I. *Remarkably, a nationwide Gallup survey conducted in March, 2006 found that more Americans, and in growing numbers, are worried about the ozone hole problem than climate change, despite the fact that the ozone problem is well on its way to being solved.* Between 2004 and 2006 the percent of people surveyed who worried "a fair amount" to "a great deal" about the ozone hole grew from 60 percent to 68 percent. In 2006, the response in these categories for climate change was 62 percent (Revkin, 2006b). *The survey found that among major issues of the day – including the war in Iraq, immigration and health care – environmental issues rated among the least important and that among environmental issues, global warming ranked among the least important.* Despite apparent apathy toward climate change, 58 percent surveyed agreed that the effects of global warming "have already begun," while an additional 15 percent agreed that it would happen within a few years or at least their lifetime.

A Time/ABC News/Stanford University poll conducted in March, 2006 found that a growing number of Americans – 85 percent of 1,002 surveyed – thought the earth's temperature had warmed over the past century. Surprisingly, despite an apparent belief among the public in the global warming phenomenon, *nearly two out of three surveyed were under the impression that within the scientific community there was "a lot of disagreement" about the issue.* Finally, when asked about the role of federal government in solving the problem, 68 percent of the Time/ABC/Stanford poll agreed the government "should do more" to "try to deal with global warming" (Kluger, 2006, 41). Far smaller percentages agreed with taxing energy to limit its use: 19 percent supported taxing electricity, 31 percent taxing gasoline. In sum, most Americans do not think global warming is important. They believe it is real but do not think that solving it is worth economic sacrifice. They mistakenly believe the ozone hole is a more dire issue and that, when it comes to climate change, there is widespread disagreement among scientists. These findings are essential to the analysis to come and will be taken up in this chapter's Critique and Recommendations section.

Conclusions

Central Findings

This section revisits the study's overall guiding research questions and channels some of the key points revealed in the more detailed accounts above into a handful of broad findings that collectively answer the questions. Recall that

Table 24 lists specific locations for more detailed summaries of answers these questions and their 15 sub questions.

> Overall Research Question 1: How have the sources, structure and content of arguments carried by mainstream American print media about the ozone hole and climate change evolved from 1980 to 2004?

Overall Research Question 2: What do the trends in social and decision process emerging from this analysis reveal about the relative success of the Montreal Protocol in the United States versus the failure of the Kyoto Protocol?

Finding 1: The timing and structure of arguments in American news coverage of the ozone hole has paralleled the policy success of the Montreal Protocol in the United States over the past quarter century.

In a landscape of positive, well-timed arguments there is much agreement that the Montreal Protocol as been a success and is now "yesterday's news." This sentiment was echoed by all seven of the key informants interviewed for this study. Coding data presented in Chapter III showed that overall, arguments supported the protocol "very strongly." Spikes in For/Natural, For/Political and For/Social categories rose in years of the protocol's approval and subsequent revisions – indicating arguments in articles accompanying these events were on the winning political side. This is visible in Figure 16. Moreover, U.S. government arguments were strongest in favor of the protocol when it arguably counted most – in the year of the Montreal Protocol's approval. In 2003, they dropped into negative territory in the "policy" and "support" categories over the efforts of U.S. agribusiness and its political supporters to void methyl bromide restrictions. But as the NRDC's Doniger noted, despite these efforts, the Montreal Protocol held. "It hasn't broken," he said. Throughout the coverage of the stratospheric ozone issue, a simple, clear story carried the discourse of Survivalism to victory over Promethean and economic concerns raised by industry. As Hebert noted: "... people can understand that a chemical is going into the air and is causing a chemical reaction that is causing this vapor or this cloud that's in the air of protective ozone to thin out and that in turn is kind of a hole. That's a pretty simple, straightforward thing." Watson said the alarming threat of cancer-causing UV radiation coursing through the hole in the sky provided ample motivation – what Ungar referred to as a "hot crisis" (Ungar 2000) – for policymakers to successfully grapple with the problem.

<u>Finding 2</u>: By contrast, the landscape of arguments about climate change is still very much a battleground – reflecting the mixed fortunes and current failure of the Kyoto Protocol in America.

The collective ambivalence of the United States toward the Kyoto Protocol is clearly reflected on the argument landscape over the past 25 years. The pool of key informants was sharply divided over whether the protocol would eventually succeed in the United States. Watson and Doniger gave the treaty hope. Maisano and the Congress member did not. While the ozone hole case was a story of strong support for policy action and well-timed arguments, the climate case was one of tepid overall support and well-timed opposition. Overall, arguments supported the Kyoto protocol only "moderately." Climate economic and political arguments dropped precipitously in 2001 when the U.S. walked away from the protocol. From this the lack of U.S. government support was clear. With the exception of small upticks in "For" territory in 1983 and 1997, the government policy issue criteria landscape differential hovered close to zero until it dropped into a deep, broad hole in 2001 across the "policy," "support" and "feasibility" categories when the Bush administration abruptly pulled away from the Kyoto Protocol process. This dramatic feature is shown in Figure 29. In the news coverage of climate change, Promethean concerns about the potential economic damage of the treaty and unfairness of exempting developing nations trumped a less defined narrative of environmental opposition – one that emphasized sustainable development ideals less than immediate life threatening concerns. The study's key informants reinforced this notion in their comments on the complexity of the climate change narrative. So did Ungar, who wrote: "Climate change, in contrast [to the ozone hole], is not readily tied to concrete events capable of operating as a beacon or sustaining a hot crisis. Scientists customarily define global warming as a future-oriented problem, with effects predominantly predicted for the middle or end of the next century" (2000, 307).

Finding 3: Over time, the climate change debate has shifted from one about the legitimacy of global warming science to one about what policy action should be taken. This is underscored by state efforts to address climate change in absence of federal action. Despite their disagreement over the viability of the Kyoto Protocol, each of the key informants agrees that the fundamental debate over climate change has moved beyond the issue of whether it indeed exists to what action should be taken to address it. This is underscored by the efforts chronicled in many stories of state governments – particularly California and New England – to begin regulating greenhouse gas emissions in absence of federal action, and a bi-partisan movement in Congress to enact emissions cuts – albeit less stringent than the Kyoto Protocol. Businesses are preparing for regulations. Reporter 2 noted:

> I think that the reality is that as the science continues to build, as businesses who have multinational portfolios are facing stricter rules abroad or stricter rules within the United States and different areas, you're going to see a progression toward more stringent approaches to dealing with greenhouse gases.

Finding 4: Uncertainty about the climate change phenomenon has been a hallmark of climate change news coverage in the 25-year sample and one that has buffered calls for policy action. It seems to have derived from a cocktail of deft lobbying by industry, reporters attempting to "balance" coverage of a confusing, controversial issue, and scientists unwilling or unable to place their work in context. There are very recent signs that this uncertainty is waning and being placed in tighter context.

The examination of articles in the climate sample bears out findings in other studies (Boykoff, 2004, Ungar, 2000, Zehr, 2000) that uncertainty is a dominant narrative in new reports on climate change science. This often took the form of a statement spelling out the theory of climate change immediately contradicted by one casting doubt on the idea. A paragraph tacked onto the end of an AP story is a good example of a poorly written, borderline incorrect statement sowing uncertainty: "Many scientists believe chemicals added to the atmosphere may be warming the planet, affecting climates worldwide. But others point to regular cycles of climate change and note that accurate temperature records go back only about a century" (State and Regional 1998). Potential causes of this emphasis on uncertainty include reporters' fixation on "balancing" all stories, scientists lack of communication skills, efforts on the part of opponents of greenhouse gas regulation to cast doubt on the research and, of course, the genuine incompleteness and complexity of the bigger scientific picture.

Reisinger predicted that uncertainty would persist (2002, 5}: "Uncertainty will remain a feature of climate change for decades to come, and therefore skepticism about required degree of action will remain even if the existence of climate change becomes universal." There are signs, however, that the media's long equivocation with climate science is ebbing or at least being placed in a more focused context. Subsequent to this study, two major news outlets have come forward with front-page declarations that the debate over global warming has been settled. In June, 2005 USA Today declared in a banner front page headline: "The debate's over: Globe is warming." The lead paragraph read:

> Don't look now, but the ground has shifted on global warming. After decades of debate over whether the planet is heating and, if so, whose fault it is, divergent groups are joining hands with little fanfare to deal with a problem they say people can no longer avoid (Vergano 2005).

An April, 2006 cover story in Time Magazine is the latest in a set of recent stories that declares that "The climate is crashing and global warming is to blame."

> No one can say exactly wheat it looks like when a planet takes ill, but it probably looks a lot like Earth. Never mind what you've heard about global warming as a slow-motion emergency that would take decades to play out. Suddenly and unexpectedly, the crisis is upon us. (Kluger, 2006).

New York Times climate reporter Andrew Revkin observed in an April 23, 2006 Week in Review cover story that "Global Warming has the feel of breaking news these days" and wrote that "Between the poles of real-time catastrophe and nonevent lines lies the prevailing scientific view: without big changes in emissions rates, global warming from the buildup of greenhouse gases is likely to lead to substantial and largely irreversible, transformations of climate, ecosystems and coastlines later this century" (Revkin, 2006b). Taken together, these reports seem to reflect a growing certainty among mainstream scientists and leading news outlets about the likelihood of dramatic effects from climate change in our lifetimes or at least those of our children.

<u>On Policy Problems and Advocacy</u>

The inescapable central feature of this case comparison is the evidence in the argument landscape of support for the Montreal Protocol and opposition to the Kyoto Protocol. For opponents of the climate treaty in the United States this is not a problem, but a cause for celebration. They, along with supporters of the Kyoto treaty can see in this study's findings evidence that can help explain and provide context for the status in America of both treaties. The methodology outlined here to map the argument landscape, interview key stakeholders, characterize, sort and analyze their views is apolitical. The data it produces can be used to develop policy – a wide range of prescriptions and promotion strategies – that certainly not everyone would agree on. Recall that the author noted earlier, in his opinion, climate change requires a global political solution that includes immediate and extensive cuts in the use of fossil fuel in developed and developing nations and a serious commitment to renewable energy. What follows under the subheading *Challenges to Climate Policy* is an assessment of the challenges in the argument landscape to this goal. The assessment is followed by a set of *Policy Recommendations* to counter those challenges. What is important for readers to see, regardless of where they stand on the issue of climate change, is how an analysis of an argument landscape generated by this study can be used in the policymaking process. The critique of the challenges to limiting emissions is as potentially useful to opponents of emissions regulations as the suggestions to overcome those challenges are to proponents. It is the author's hope, and a common theme that runs through the study's recommendations, that this method be used to increase mutual understanding and find common ground on difficult issues. At a minimum it can aid in making transparent and well-informed – if not universally agreed upon – policy decisions.

<u>Challenges to Climate Policy</u>. Americans who wish to play a larger role in solving the climate change problem cannot help but be daunted by the fact that while the United States comprises only five percent of the world's population it is responsible for a quarter of the world's greenhouse gas emissions (Kluger, 2006). In the April 26 article, Revkin added further glum context: "Without a connection to current disasters, global warming is the kind of problem people, and democratic institutions, have proved singularly terrible at solving: a long-term threat that can only be limited by acting promptly, before the harm is clear" (2006b). Global climate change has become understood in the public arena as an unfolding "tragedy of the commons" – the archetype noted earlier in which common resources (in this case the atmosphere's capacity to absorb carbon at a rate that won't disrupt climate) is exhausted by takers motivated by their

individual wants and blind to the need for a communal solution to manage the fragile resource (Senge 1990; Dryzek 1997). Revkin bemoans that "there is enough static in the air to simultaneously confuse, alarm and paralyze the public." This study has sampled the air and confirmed that static. It is not surprising – knowing that news reporters both reflect and influence public opinion – that the polling data reflect this paralysis: The American public knows it's walking on the railroad tracks and indeed sees the freight train coming but the potential collision is very low on its priority list. While acknowledging it might be a good idea to change course, the public thinks it is not worth significant effort to do so.

These poll results seem to reflect what psychologists call *cognitive dissonance* – a situation in which "we become aware that our attitudes and actions don't coincide" and thus "we experience tension or cognitive dissonance" (Myers, 2007, 728). Writes Myers, who explains the theory developed by Leon Festinger: "The less coerced and more responsible we feel for a troubling act, the more dissonance we feel. The more dissonance we feel, the more motivated we are to find consistency, such as changing our attitudes to justify the act."

In the argument landscapes examined here, opponents of U.S. involvement in the Kyoto Protocol have taken advantage of this principle by nourishing the need for consistency with diverse and ample arguments to "to justify the act" of continuing heavy use of fossil fuels and opposing regulation of greenhouse gases. Among those arguments in this successful formula are: 1) There is little scientific consensus on climate change. Though this not true, the public polls show the argument has stuck; 2) The United States should not commit to fossil fuel reductions before India and China. This fairness argument has resounded with the public, the media and Congress; 3) The Kyoto Protocol would harm your every day quality of life and jeopardize the nation's economy. Unwilling yet to commit to expensive measures, the public seems to agree; 4) Consumer choice and safety would be hampered by downsizing vehicles and gas mileage.

This and other studies note that similar arguments were made but overcome in the case of regulating CFCs to protect the stratospheric ozone layer (Benedick, 1998; Reisinger, 2002).

Recall that among the trump cards on the side of regulating CFCs were 1) A frightening and easily understood problem: skin cancer from a damaged sky caused by man-made chemicals; 2) Ready product substitutes that could allow the public to continue using spray cans, refrigerators and air conditioners. The former was reflected in the differential time-series argument landscapes (Figure 16) by high ridges of For/Natural and For/Social arguments. The latter is reflected in the relative lack of economic opposition in the landscape. As noted in Chapter I, the challenge to proponents of climate regulations is greater and more complex for many reasons: The climate change threat works on a longer timescale than the ozone hole and has been perceived as a slow-moving problem for future generations to deal with. The notion of a slowly warming planet with uncertain consequences simply cannot compete against the metaphor of a hole burned into the sky by human hands inviting death by cancer. A realistic solution to climate change requires a more discernable sacrifice from the public in terms of lifestyle changes (cutting back on energy, automobile use) and expense. The fight between the Promethean, Economic Rationalist discourse of interests opposed to regulation versus the primarily Sustainable Development discourse of proponents is "the static in the air" that has fed the public cognitive dissonance over climate change.

Policy Recommendations. The above section described the features of the argument landscape that have worked against greenhouse gas regulation and renewable energy development in the United States. This section notes where leverage can be found in the argument landscape to empower a move toward emissions cuts and renewable energy. Four broad suggestions below, collectively aim to shift the public's reaction to the cognitive dissonance over climate change from denial to constructive action.

Set the record straight that mainstream scientific consensus is solid that climate change is a real problem and growing threat.

Scientists and environmentalists who have been at this task for years attest that this is easier said than done. One conundrum highlighted by this study is that while the great majority of arguments of scientists in news reports are supportive of Kyoto's goals and principles, the impression that has emerged from press reports is one of uncertainty. Regular reporting that the thousands of scientists of the IPCC are on the same broad page is apparently not enough to wipe away the impression of uncertainty left behind by scientists' own boilerplate and culturally endemic qualifications of their findings along with persistent calls for further study of the problem. This is only amplified by skeptics who come across loud and clear in the same or subsequent reports. As the scientific community speaks with greater unanimity about what it does agree upon – and it agrees upon much – the window for skeptical voices in the mainstream press should shrink in the argument landscape along with a key justification for policy inaction. Note again the certitude on climate science in the latest Washington Post, USA Today and New York Times reports referred to earlier (Eilperin, 2006; Vergano, 2005; Revkin, 2006). Separately, proponents of emissions cuts in the United States can take heart that the precautionary principle was followed in the case of CFC cuts before there was hard evidence that they were the primary cause of stratospheric ozone depletion (Benedick, 1998). Arguably, the evidence for human induced climate change today builds a far stronger case. Scientists, environmentalists and politicians who favor aggressive action against climate change need to find ways to confirm for the public that they understand what the public says it already knows – that climate change is real. Moreover, they need to find ways to simultaneously motivate and empower the public into action – ways to demonstrate that climate change is not a problem of the future, but of the present. That it is real and it has arrived. This is a first step to discouraging excuses for action. The next step is to empower the public to work on the problem.

Engage and empower the public to act in useful ways to address climate change.

Painting a crisis as unpreventable is a recipe for inaction. Recall the ASL argument reported in Chapter III: “Americans are so discouraged by the difficulty of solving Earth’s environmental problems that they have begun losing interest, researchers say.” (Donn 1999). Independently, psychologists and mass communications researchers studying the intersection of climate change and ecological sustainability within their disciplines, argue for including the public in the solution. This study has confirmed that individual public voices are notably absent from the debate – especially in discussions of solving the climate change problem. Arguments linked to the public stakeholder groups tend to focus on the public as a victim – of heat waves, floods, hurricanes on one hand, and potentially onerous costs of the Kyoto treaty on the other. These are important points and underscore the importance of the public having a voice in the process. But everyday citizens – beyond their role as victims, voters, poll respondents or drivers of SUVs – are seldom mentioned as part of the climate solution.

In his study of climate change coverage, Zehr reported that the press and their climate change scientists sources has treated the public as a monoculture whose thinking about global warming has been characterized by “apocalyptic thought, quickness to jump to conclusions, and carelessness.” He argued that this is a false construction and that the public is far more tuned in (Zehr, 2000, 98): “[The public’s] attitudes toward global warming and other environmental problems are well integrated with such values as parental responsibility, obligation to descendants, traditional religious teaching and protecting nature for its own sake. These values, and the ‘cultural models’ that emerge with them incorporate concern about future effects of global warming and associated climate changes.” Zehr concludes: “Quite possibly, the limited role given to the public in the press and delegitimation of their knowledge have contributed to this inaction.”

A set of articles in the May 2000 issue of American Psychologist, which outlined the role psychology can play in promoting ecological sustainability, stressed the need to move the public from concern about the environment to action. Wrote Winter: "Ecological awareness may feel good, but sooner or later we must translate our feelings into behavioral change if we are going to build a sustainable culture. Neither transcendent connection with the ecological self nor clever technological advances will build a sustainable culture without behavioral change" (Winter, 2000, 518). Stern writes that "environmentally relevant behavior lies at the end of a long causal chain involving a variety of personal and contextual factors" and that "several conditions must be favorable for behavior to change in a pro-environmental direction, and the absence of any one is likely to prevent behavioral change" (Stern, 2000). Stern notes that these factors include environmental concern, attitudes, information, beliefs, abilities and external conditions that facilitate or impeded particular actions.

In sum, the public has thus far been cast in the media as victim and occasionally perpetrator in the climate change problem that has been characterized as potentially insolvable. Suggestions about what the public can do to help the problem and voices of everyday individuals about this process have been largely absent from the argument landscape. Proponents of solving the climate change problem would do well to change this, knowing that good intentions alone will not solve the problem. The public needs a stake in the solution. It is beyond the scope of this discussion and expertise of the author to outline a strategy to carry this out. However, it is fair to say that the news media – in the interest of telling a more complete story and providing a service to its readers – has a role to play. This is discussed below. A wide range of literature by environmental scholars and advocates of sustainable living addresses conceptual and practical tools that can engage the public in playing a role in a climate solution (Sitars, 1993; Winter, 2000; Oskamp, 2000; Daly, 1996; Balaton Group, 1996; Cobb, 1995; Costanza, 1997; Miller, 1996; Robert, 1995; Stern, 2000). One powerful unifying approach that can pull individuals into the discussion is the calculation of one's own "ecological footprint" which determines though an estimation of an individual's daily material and energy use how many planet Earths would be required to sustain a world full of people with the same needs (Wackernagel, 1994). This engaging exercise personalizes the challenge and can enable individuals to set a concrete goal for improvement.

Finally, the emergence of state and local government action on the climate change issue provides a valuable opportunity for public participation. The carbon-cutting initiatives noted in California and Northeastern states have connected local constituencies with real solutions in the face of federal inaction. In a column on the topic, Boston Globe columnist Scott Lehigh noted: "The states have long been the laboratories of democracy – and these days, those public policy workshops are striving to fill a vacuum by the federal government … With the president basically ignoring global warming – and administration operatives having been accused of attempting to muzzle government scientists who insist immediate measures are a must – a number of states are trying to reduce greenhouse gases themselves."

Counter the most challenging aspect of the argument terrain – domestic economic arguments – with the cost-saving logic of ecological economics.

One of the central battlegrounds on the news media argument landscape is over the domestic cost of regulating carbon emissions. Industry and government officials opposed to the Kyoto Protocol turned repeatedly to local economic arguments to make their case that it would be a bad deal for Americans and the economic health of the nation. In the Promethean, Economic Rationalist view – captured by industry spokesman Frank Maisano – emissions are synonymous with economic health. Said Maisano:

> In the case of carbon, you don't really have a vehicle to reduce emissions other than constraining the carbon, constraining supply of energy … [We found] that emissions go up or

down depending on the state of the economy. So, we can, we've actually reduced emissions in the United States between 2000 and 2003. Well, we've done that because our economy was not good. And clearly, that's not the situation that we want to be in. The Europeans have struggled to make emissions reductions and part of that is because their economy is in the tank. And what would happen with their emissions reductions that they can't meet currently if their economy started to grow some? You know, so there's that link there that creates a false scenario which many times, again, has said, OK, there's got to be a better way for us to do this then just try and decided to do it in this Kyoto process.

This logic is hard to argue with when one accepts the assumptions of the dominant neoclassical economic model followed by our government and financial institutions. But the reward of cost-savings is not a monopoly of the neoclassical model.

Recall that many economic scholars argue that if the world is to successfully grapple with long-term ecological threats like climate change, it needs a more adaptable alternative to pure market economics that takes into account the limited nature of resources and the critical services provided by nature that are excluded from current cost-benefit calculations and indicators of well-being and discounted in investments in the future. The shift to a more ecological economic model will not happen overnight but some scholars are working to demonstrate its necessity. Costanza attempted to do so in a controversial paper that placed an estimate on the value of "ecological systems and the natural capital stocks … critical to the functioning of the Earth's life support systems" (1998, 4). He termed his annual estimate of the biosphere's average annual net worth – U.S. $33 trillion – a "minimum." While delivered in the vernacular of market economics, the message was a staunchly ecological: Costanza advocated in this and other papers a more inclusive framework for valuing the natural systems on which humanity relies. He wrote (Costanza, 1997, 51):

> Ideally a framework for economic analysis should contain information about the full implications (economic, social, and ecological) of various alternative policy options relative to existing policy. For every policy option, the various ecological-social-economic linkages should be traced to determine the various consequences for human welfare associated with that option, and where possible the various positive and negative impacts should be quantified and valued.

Proponents of carbon cuts and renewable energy would do well to take a page from Costanza in clarifying the necessity and reward of making consumer decisions along more ecological lines. Costanza's work fits naturally with the discourse of Ecological Modernization which provides a broad common ground for environmentalists and officials in the energy industry who can both celebrate the virtues of saving money and doing good for the environment. Indeed, industry-environmental partnerships have grown from this common ground in both the climate and ozone cases. While the Kyoto Protocol gave diverse and competitive industries a common enemy, rising fuel costs and growing concern about climate change provide a context that can reward companies and consumers for investment in renewable energy and other ecologically sound practices. "Many forces are lining up to drive a change in energy policies," Paul Epstein, associate director of the Center for Health and Global Environment and State Representative Frank Smizik wrote in a Boston Globe column. "Oil and gas prices are climbing; conflicts in supply regions are multiplying. Oil will run out at some point, and climate volatility is sending shivers throughout insurance and investment communities." The writers note that, among other positive signs, venture capitalists are investing heavily in hybrids, solar, wind, tidal wave and geothermal energy.

On the Press

The preceding section was geared to demonstrate the relevance of this analysis of arguments in news media to policymaking and advocacy. The following section is intended to show its use for critiquing the performance of the news media itself and generating some recommendations for reporters, readers and sources. These recommendations are independent of those above for policymakers with one important exception – the call to play closer attention to the voices in the lay public on global environmental issues. This specific idea serves the larger interest of democracy – a value shared by many in both the news media and policy making circles.

Media Accuracy, Balance and Bias. As environmental news stories go, the ozone hole and climate change problems were complicated on many levels. Unlike a toxic spill or a season of poor air quality, the causes and threats posed by both phenomenon were less easily understood and more hotly disputed by experts. As noted by the news reporters in the interview chapter, the press has had to sort its way through reams of conflicting scientific reports and claims and counter claims by representatives of industry and environmental groups. The confusion presented by the sources in this story cannot helped but be passed on to the readers. News reporters and editors, who are often outstanding generalists but rarely experts on their beat, are left to do their best to place conflicting arguments in a context that at a minimum conveys the state of understanding among experts of the issues. Recall the coping strategy outlined in Chapter IV by Reporter 3 for tackling this "mountain" of information:

> The material, the data, is so incredibly complicated and I think it's difficult for a lot of reporters to sort of grapple with it and evaluate it. And so in the end you have to – most reporters have to find sort of reliable sources, scientists, analysts, public officials, bureaucrats who have sort of dealt with this issue over the years. You know, and some members of

> advocacy groups – some of the environmental groups who cover this stuff, follow this stuff intensely, you know, year round – and try to find some people you are comfortable with whose opinion and evaluation you sort of trust.

This approach, taken by a veteran environmental reporter, is a far cry from the cold calls described by Watson in which reporters asked him to explain the nuts and bolts of climate change science. Though, in the event a news agency's environmental writer is unavailable to cover a breaking story about climate change or another big complicated issue, it is far better than not for the uninformed substitute to ask "dumb questions" of an expert – however embarrassing – to get the most basic facts straight. A plea for patience from an exacerbated scientist is better than a complaint from readers about a paragraph like this one in the New York Times which confuses climate change with the ozone hole:

> Eliminating energy subsidies would improve trade balances, shrink government budget deficits and reduce wasteful energy consumption. But it would also cut emissions of carbon, the substance whose buildup, scientists fear, could eventually destroy the ozone layer, resulting in higher average temperatures and harmful climate changes around the world (Nasar, 1992).

Straightforward factual errors happen, be they from laziness, rushing, or an honest misunderstanding. It seems from this study's review of more than 1,000 ozone and climate change articles that such mistakes were relatively rare exceptions. Separately, as noted earlier, the news media has been criticized for following the journalistic norm of "balance"– a charge that is central to conclusions from a content analysis by Boykoff and Boycoff of climate change reports in the New York Times, Washington Post, Los Angeles Times and Wall Street Journal. The authors charge that "balanced reporting has allowed a small group of global warming skeptics to have their views amplified" (Boycoff, 2004, 126) and conclude:

> "In light of the general agreement in the international scientific community that mandatory and immediate action is needed to combat global warming, US prestige-press coverage has been seriously and systematically deficient … The failed discursive translation between the scientific community and the and popular, mass mediatized discourse is not random; rather the mis-translation is systematic and occurs for perfectly logical reasons rooted in journalistic norms, and values" (Boycoff, 2004, 134).

This critique of balance is fair to a point. In daily news reporting, balancing opposing views equally is often used as a default when claims and counter claims are too complicated to sort out on a deadline. But this study's content analysis demonstrates that this is far from so in the case of scientific arguments about the ozone hole and climate change. Relative to the goals and principles of the ozone and climate change protocols – the vast proportion of science-related arguments carried in the mainstream press were strongly supportive of the protocols. Furthermore, there is more at play in the construction of narratives in news reports than the norms of the press itself. The discourses and norms of media *sources* – outlined in the seven stakeholder categories above – also play a significant role in messages that get out. While beyond the scope of their study, the authors above offer no critique of the way scientists communicate their findings to the press and that is certainly part of the equation. Pressed about the balance issue, the reporters interviewed for this study said they have given far more credence to the consensus of the IPCC than skeptics on the climate change issue – a finding borne out by the data. Hebert said in his interview that balance in an ongoing news story is something achieved over time. "Well, as journalists, you can only – you can only report what you're told," he said. "And, you ask the question, 'Well, should I ignore the skeptic completely?' No, because he may have something.

But you have to kind of try to put it in context by having other people at least respond to it." It is unrealistic to expect news accounts to eliminate all mention of dissenting opinion – especially political opinion – on such controversial issues. Writers and editors can, however, place them in a realistic context with a long view of the issue that serves the laudable ends of both thorough and fair reporting. A good example is found in a 1999 New York Times story under the headline "Human Imprint on Climate Change Grows Clearer."

> The amount of warming projected by the IPCC ... would create widespread climatic and ecological changes, including a shift in climatic zones, an increase in heat waves, warmer northern winters, increased precipitation when it rains but worse droughts when it does not, and a rise in sea level that could inundate many small island nations and drive tens of millions of people away from the coasts when storm surges develop. For a long time, the global warming debate focused on how much warming a given increase in greenhouse gases – say, a doubling of atmospheric concentrations – would produce. Though skeptics say it would be small, the dominant view for 20 years has been that a doubling would produce a warming of 3 to 8 degrees, other things being equal. This is a measure of the climate system's sensitivity to "forcing," as experts call it, by external heating and cooling influences, and many mainstream scientists say confidence that it is right has grown.

<u>Recommendations for Reporters, Readers and Sources</u>. What follows are some recommendations grounded in the research above aimed at improving communication between the media, their sources and the public about global environmental problems – particularly stratospheric ozone destruction and climate change. They are delivered with humility and an understanding that this task poses all parties with an enormous challenge. A general theme that runs through the remarks is of encouraging better communication among these groups and higher expectations for one another. As Dryzek noted: "For Democracy, if it is about anything, is about

authentic communication. Overcoming the impediments that distort such communication is crucial" (Dryzek, 1997, 200)

Use this study's maps to better know thyself in the news coverage.

This study offers reporters, sources and readers forgive the cliché, "news they can use" – a large map of the arguments in a sample of a quarter century of ozone and climate reporting. The maps, which describe the source, structure and proportion of arguments in the news coverage, are a reflection and a visual representation of how the story was told. For reporters, it can be examined as a reflection of their "news judgment" – a critical but amorphous value informed by long experience and personal views. How big a role, they might ask themselves, did their news judgment play in shaping the argument patterns that emerged? Such questions enable reporters and editors to assess for themselves the shape and potency of their own deadline decisions. Sources – be they scientists, lobbyists or politicians – can gauge for themselves how their arguments come across in the press. Does the slice of the coverage and character and proportion of arguments linked to their stakeholder group match the effort they have put in to being heard or would expect to be heard? What consequences might it have for your interests, or the interest of fair and accurate reporting from your point of view? This is also valuable consumer information for readers akin to a nutrition label or stock market figure showing performance over time.

Invest in education.

For the media, this is a message first to the elites that control the newsroom schedules and financial resources. Reporters given responsibilities for specific news beats can learn a tremendous amount very quickly on the job. Many environmental reporters do excellent work. But they are entitled to some formal education beyond their on-the-job training, especially if they are to effectively cover the climate change problem and sort through conflicting and dubious claims for the readership. Reporters should have the opportunity to learn, away from a crushing deadline, about the most basic elements of earth system science and the institutions and process involved in making global environmental policy. Watson, Maisano and Doniger each lamented a lack of understanding among reporters on the climate issue. All three reporters interviewed acknowledged this challenge. For their part, researchers who grumble about the press coverage should be first in line to offer their teaching services – if only to shame the publishers into supporting the effort. Media elites should encourage education about environmental science and policy in the newsroom by devoting real time and resources to the task. In an era where climate change is likely to worsen this investment will provide a critical public service that flows to the readers and back to the bottom line.

Just as the media should invest in learning more about climate science and policy, so too should media sources learn about working with the press – particularly scientists. Beyond a lack of understanding on the part of reporters, poorly written descriptions of scientific findings, are symptomatic of poor communication skills on both ends. Scientists should not be afraid of interpreting their efforts for reporters in lay terms. Many politicians and lobbyists, whose agendas are often more transparent, are already skilled at this.

Encourage exchange of content study results.

News reporters are generally aware that their work has an effect on public attitudes and the making of public policy. Unlike researchers of news media content – this author included – daily news reporters have neither the time nor the resources to systematically examine their pros beyond the occasional critique. That said, researchers of the press who have pragmatic conclusions and suggestions should consider reaching beyond their peer-reviewed publications to share their findings directly with reporters. An approach to doing just that with this study is discussed briefly in this chapter's final section. Disparate professional cultures, egos and busy schedules preclude this from happening more regularly. It is understandable that a news reporter working in the trenches – in the real world – would not want to be critiqued by someone in the Ivory Tower. But both camps – academic researchers and press – can learn from one another. They have common interests, above all, keeping the readers informed with accurate information. The self-reflection of the reporters interviewed for this study, among the best in their field, demonstrates that potential.

Involve and provoke the reading public.

This recommendation applies to reporters, editorial writers, researchers, politicians, lobbyists and the reading public itself. It means simply to make a greater effort to encourage public participation grappling with climate change. For reporters that translates into recognizing the value of non-expert citizens' voices to the debate. While interviews with Inuits watching their hunting grounds melt away are compelling, discussions about climate change with drivers of gas guzzlers or hybrids also matters. Zehr and Wilkins make a good point when they called upon the news media to broaden the diversity of voices heard in its stories about the scientific and political debate. "Different values need to be recognized, acknowledged, and finally, reported," wrote Wilkins. "Without such an effort, the story itself will remain incomplete, an inadequate response from a profession facing the greenhouse century" (Wilkins, 1993, 82).

For members of the reading public this is a recommendation to hold the sources of information that empower your political involvement to a higher standard. Good reporting – be it from the news media, the government, a research institute or a neighbor – is needed to make informed decisions. Recall again Watson's remark: "If we live in a democracy, which I would argue we do in the U.S., then public opinion is absolutely critical for policy formation by government." On this count, Wilkins and Zehr are in the corner of the average citizen. Reporters are, too. They are there day in and day out when it seems no one is paying attention. It is the opinion of this author that the public needs to become more involved in global environmental issues – especially climate change. Calling for stories and high standards from the local newspaper is a start followed up by contacting lawmakers and expressing an opinion. The proverbial media spotlight – ever critical in this important topic – shines brighter when public interest and energy is behind it.

Closing Remarks

This section briefly reviews the journey of this project from conception to final form, noting some of the pitfalls and successes encountered along the way. It concludes with some potential uses for the study's methodology and a hope for how its results might be used.

The Study's Evolution

This dissertation arose from my general interest in comparing news coverage of controversial environmental problems. Specifically, I wondered whether there was a difference between the type of arguments in news coverage of a *successful* environmental policy versus a *failed* environmental policy, and whether differences between them could shed light on why the former problem was solvable and the later problem not. Originally, I proposed examining news coverage of three cases – the ozone hole, climate change, and the Great Lakes pollution problem. Being a visual and spatially-oriented person, I wanted to construct "maps" that could reveal how the arguments developed in the press coverage over time – not unlike a streaming sonar image of ocean bottom. But the whole concept needed more focus and begged many questions, for example: How would news coverage be examined? How would the study be bound in time and space? What methodological tools and analytic frameworks would be applied? These answers were hashed out largely in the trial-and-error process of developing the categorical content analysis system detailed in Chapter II.

The first version of the system, assembled in early 2001, did not include policy issue criteria. Instead, it comprised the 16 current direction and substance categories plus an additional layer that sorted arguments by their emphasis on "short-term" versus "long-term" outcomes. This made for a total of 32 nested direction and substance categories. This initial approach was tested in a small pilot study of news articles about the Clinton administration's ill-fated BTU (British Thermal Unit) tax proposal and was presented in a poster I drafted with Drs. Mimi Becker and Dork Sahagian for a conference of the International Geosphere-Biosphere Programme in Amsterdam, Netherlands. The poster, which included an early version of the "landscape maps" presented in this study, took first place in its category and was published by The Royal Swedish Academy of Sciences in the *Global Change Newsletter*. At this stage, I had proposed a research design that could couple the results of a content analysis of news coverage of my three cases with a separate analysis of stakeholders and their discourse preferences. The results would be evaluated against an original definition of globalization to discern what, if any, role globalization played on the evolution of the three cases.

The questions developed by the committee for my qualifying exam – taken in August, 2002 – covered a wide range of material essential to tackling the topics ahead, including the science of climate change and ozone, systems thinking and systems dynamics, ecological and neoclassical economic and the policy analytic framework. The following year, Professor Becker and I won approval from the university's Institutional Review Board for plans to have undergraduate students test the coding scheme and also to interview key informants for the study. Before the reliability test, I dropped the additional layer of directional codes – which proved confusing – and instead added the new policy issue criteria to directly link arguments in articles to the policy process. The inter-coder reliability tests on 49 articles were encouraging, demonstrating that the method could be successfully taught to and applied by students. As I worked to write up he results of the pilot study of 90 stratospheric ozone articles (including the original 49 tested), it became clear that my overall dissertation proposal was too large and I would need to narrow the scope of my work. With my committee's assent, I dropped the Great Lakes case and later scaled back the ambitious globalization analysis. In fall of 2005, I began conducting the research interviews and worked with Drs. Becker and Prelli on the manuscript for *Policy Sciences*. Several excellent reviews pushed me to ground the categorical system more firmly in the communications literature and to distinguish it from existing content analysis systems. That experience and the exercise of writing these five chapters has underscored for me the importance of having a strong and consistent methodological framework. It is ultimately what has made this analysis work.

What Next?

The rhetorical landscape maps, interviews, and general conclusions drawn from them in this study add to the literature another layer of understanding of the news media's handling of these important environmental issues. But the conclusions and recommendations can do little good if left on the shelf. Thus, an effort will be made to share them with the working press and members of the different stakeholder groups noted throughout who could evaluate and put them into practice. Among other options, an online white paper and/or news release summarizing the results with links to the paper could be drafted. This format is used to convey information to news professionals by the Association for Education in Journalism and Mass Communication from studies in *Journalism and Mass Communication Quarterly*. In addition, the results can be shared at presentations and posters at conferences geared for reporters and editors and members of the other stakeholder groups including climate scientists, industry representatives, environmentalists and policy makers. Most importantly, and in line with a central theme of advice in this chapter, an effort should be made to reach the general public with this research. Here again the Web site can help along with talks open to the public, for example, on college campuses and in public libraries.

Meanwhile, the data set compiled for this case study can be mined more deeply and augmented with subsequent years' coverage to create a rich, growing longitudinal record of both cases. The existing record holds a good deal of potential for more focused analyses of argument categories, stakeholder groups, and their relationship to the policy process. Also, the descriptive accounts of social process and discourse analysis aided by this system can add context to a variety of other studies, including agenda setting research that looks for causal links between messages and outcomes in public opinion or policy. Separately, as noted in Chapter II, the coding system could be used to examine other issues and other forms of communication media – from television accounts and political advertising to newsletters and scholarly journals. A number of topics garnering volumes of news coverage and deemed important by the public could be examined including the war in the Middle East, the economy and jobs, terrorism and health care.

This dissertation and its methodology embodies a transparent and systematic effort, in the words of Schwandt, to accurately represent the social phenomena that it examines: the every-day reporting in America of humanity's struggle to understand and address the ozone hole and climate change problems. The characteristics of arguments that appear in the press have profound implications for public opinion and policy making on these critical environmental issues. It is hoped that this study can help news reporters, their sources and their readers – all who shape the first draft of history – reflect on their own assumptions. With the help of a common landscape map of the many arguments and perspectives that inhabit the ozone and climate debates, these stakeholders can more accurately place their own views into context with others. No map can assure anyone will walk in the same direction, but the odds are they can more easily find common ground. And today, that is needed more than ever.

SOURCES CITED

Akre, Brian S. 1999. Ford 2000 Excursion to be biggest sport utility vehicle on the market. *The Associated Press*, February 27.

Allen, Jane E. 1995. Chemistry, Physics Awards to Four Americans and a Dutch Scientist. *The Associated Press*, October 11.

Anderson, Hil. 2000. GOP can use ammo in Gore's environment book. *United Press International*, August 14.

Associated Press. 2001. U.S. Won't Follow Climate Treaty Provisions, Whitman Says. *The Associated Press*, March 28.

———. 2003. Global warming debate echoes between Augusta, Washington. *The Associated Press*, June 25.

Atlas.ti, The Knowledge Workbench WIN 4.2 (Build 058). Scientific Software Development, Berlin.

Ayres, Robert U. 2002. *How Economists Have Misjudged Global Warming*. Worldwatch Institute 2001 [cited 2002].

Backus, Emily. 2003. U.S. tries to convince climate conference it's serious about fighting greenhouse gas emission. *The Associated Press*, December 8.

Badger, T.A. 2000. Five more Greenpeace activists arrested on North Slope. *The Associated Press*, April 12.

Balaton Group, The. 1996. Indicators and information systems for sustainable development. Plainfield, NH.

Barbassa, Juliana. 2004. Farmers continue using chemical slated for phase-out. *The Associated Press*, December 20.

Barrow, C. J. 1997. *Environmental and Social Impact Assessment*. New York: John Wiley & Sons Inc.

Becker, Mimi L. 1996. *Implementing a Binational Ecosystem Strategy in the Great Lakes Basin*. Ann Arbor: UMI.

Benedick, Richard Elliot. 1998. *Ozone Diplomacy*. Second ed. Cambridge: Harvard University Press. Original edition, 1991.

———. 2001. Contrasting Approaches: The Ozone Layer, Climate Change, And Resolving the Kyoto Dilemma. In *Global Biogeochemical Cycles in the Climate System*. San Diego: Academic Press, Inc.

Bengston, D.N., D.P. Fan, and D.N. Celarier. 1999. A new approach to monitoring the social environment for natural resource management and policy: The case of US national forest benefits and values. *Journal of Environmental Management* 56:181-193.

Bitzer, Lloyd F. 1959. Aristotle's Enthymeme Revisited. *Quarterly Journal of Speech* 45:399-408.

Bodansky, Daniel M. 2001. History of the Global Climate Change Regime. In *International Relations and Global Climate Change*. Cambridge, MA: The MIT Press.

Boykoff, Maxwell T., and Jules M. Boykoff. 2004. Balance as bias: global warming and the US prestige press. *Global Environmental Change* 14:125-136.

Bradley, Jeff. 1987. Ozone Treaty Signed by 24 Countries, EEC. *The Associated Press*, September 16.

Breitmeier. 1997. International Organizations and the Creation of Environmental Regimes. In *Global Governance, Drawing Insights from the Envirnomental Experience*, edited by O. R. Young. Cambridge, MA: The MIT Press.

Brewer, Gary D., and Peter deLeon. 1983. *The Foundations of Policy Analysis*. Homewood, Illinois: The Dorsey Press.

Bridges, Andrew. 2001. NASA terminates mission that measured ozone hole, saying it can't afford annual cost. *The Associated Press*, August 24.

Broad, William J. 1994. 2 Environmental Camps Feud Over Noisy Ocean Experiment. *The New York Times*, April 5.

Brockriede, Wayne E., and Douglas Ehninger. 1960. Toulmin on Argument: An Interpretation And Application. *Quarterly Journal of Speech* 46:44-53.

Broecker, Wallace S. 1987. The Biggest Chill. *Natural History.*

———. 1987. Unpleasant surprises in the greenhouse? *Nature* 328.

———. 1997. Thermohaline Circulation, the Achilles Heel of Our Climate System: Will Man-Made CO2 Upset the Current Balance? *Science* 278:1582-1588.

Broecker, Wallace S., and George H. Denton. 1990. What Drives Glacial Cycles? *Scientific American*:49-56.

Browne, Malcolm W. 1989. Growing Hole in Ozone Shield Is Discovered Over Antarctica. *The New York Times*, September 23, 2.

Bryant, Elizabeth. 1998. Meeting to tackle smuggling of CFCs. *UPI*, November 17.

Bryner, Gary C. 1995. *Blue Skies Green Politics*. Washington, D.C.: CQ Press.

Bryson Hodel, Martha. 1999. Miners and their friends rally at the Statehouse. *The Associated Press*, March 13.

Capozza, Koren. 2002. Record year for Greenland ice sheet melt. *United Press International*, December 7.

Cicerone, R. J., R. S. Stolarski, and S. Walters. 1974. Stratospheric Ozone Destruction by Man-Made Chlorofluoromethanes. *Science* 185 (4157):1165-1167.

Clark, Norman, Francisco Perez-Trejo, and Peter Allen. 1995. *Evolutionary Dynamics and Sustainable Development, A Systems Approach*. Brookfield, VT: Edward Elgar Publishing Company.

Clark, Tim W. 2002. *The Policy Process, A Practical Guide for Natural Resource Professionals*. New Haven, CT: Yale University Press.

Cobb, Clifford, Ted Halstead, and Johnathan Rowe. 1995. The Genuine Progress Indicator, Summary of data and Methodology. *Redefining Progress*:1-12.

Coleman, Joseph. 1997. Environmentalists: World can cut greenhouses gases - and make money. *The Associated Press*, December 8.

Connell, Christopher. 1982. Experts at the National Academy of Sciences. *The Associated Press*, March 31.

Cordato, Roy. 2003. A state global warming policy could destroy the economy. *United Press International*, February 28.

Costanza, Robert et al. 1998. The value of the world's ecosystem services and natural capital. *Nature* 387:253-260.

Creswell, John W. 1998. *Qualitative Inquiry and Research Design, Choosing Among Five Traditions*. Thousand Oaks, CA: Sage Publications Inc.

Cushman, John H. Jr. 1997. In Shift, U.S. Will Seek Binding World Pact to Combat Global Warming. *The New York Times*, July 7, 6.

———. 1998. Industrial Group Plans to Battle Climate Treaty. *The New York Times*, April 26, 1.

Czuczka, Tony. 1990. European Leaders Urge Worldwide Action to Fight Global Warming. *The Associated Press*, November 6.

Daly, Herman E. 1996. *Beyond Growth*. Boston, MA: Beacon Press.

Danielson, Wayne A., and Dominic L. Lasorsa. 1997. Perceptions of Social Change: 100 Years of Front-Page Content in The New York Times and The Los Angeles Times. In *Text Analysis for the Social Sciences, Methods for Drawing Statistical Inferences from Texts and Transcripts*, edited by C. W. Roberts. Mahwah, NJ: Lawrence Erlbaum Associates Inc.

Darst, Guy. 1986. DuPont Backs Production Limits on Ozone-Destroying Chemicals. *The Associated Press*.

———. 1987. Hodel offends environmentalists with lotion-and-hats policy. *The Associated Press*, May 30.

———. 1987. Researcher Says Evidence In Depletion Case Is Strong But Incomplete. *The Associated Press*, May 12.

Darwin, Roy, Marinos Tsigas, Jan Lewandrowski, and Anton Raneses. 1996. Land use and cover in ecological economic. *Ecological Economics* 17:157-181.

Diamond, Jared. 2005. *Collapse: How Societies Choose to Fail or Succeed.* New York: Viking.

Dixon, Travis L., and Daniel Linz. 2002. Television News, Prejudicial Pretrial Publicity, and the Depiction of Race. *Journal of Broadcasting & Electronic Media* 46 (1).

Donn, Jeff. 1999. Frustration sapping environmental concern, researcher says. *The Associated Press*, June 2.

Dr. Seuss. 1971. *The Lorax.* New York: Random House.

Dryzek, John S. 1997. *The Politics of the Earth, Environmental Discourses.* New York: Oxford University Press.

Eddy, John A. 1994. Solar History and Human Affairs. *Human Ecology* 22 (1):23-35.

Eggert, David. 2002. Global Warming Resolution at Ford, GM. *The Associated Press*, December 11.

Eilperin, Juliette. 2006. Debate on Climate Shifts to Issue of Irreparable Change; Some Experts on Global Warming Foresee 'Tipping Point' When It Is Too Late to Act. *The Washington Post*, January 26, 1.

England, Richard. 1994. On Economic Growth and Resource Scarcity: Lessons from Nonequilibrium Thermodynamics. In *Evolutionary Concepts in Contemporary Economics*, edited by R. England.

———. 1998. Measurement of social well-being: alternatives to gross domestic product. *Ecological Economics* 25:89-103.

———. 2001. Econ 802 Class Handout: Intertemporal Structure of Nordaus Model of Climate Change, compiled from 1992 Science article.

Farman, J.C, B.G. Gardiner, and J.D. Shanklin. 1985. Large losses of total ozone in Antarctica reveal seasonal ClOx/NOx interaction. *Nature* 315:207-210.

Fellenberg, Gunter. 2000. *The Chemistry of Pollution.* Chichester, UK: John Wiley & Sons Ltd.

Fordahl, Matthew. 2000. Iron May Increase Gas-Eating Algae. *The Associated Press*.

Francis, George R., and Henry A. Regier. 1995. Barriers and Bridges to the Restoration of the Great Lakes Basin Ecosystem. In *Barriers and Bridges*, edited by L. Gundersoro. New York: Columbia.

Fransen, Weiger. 1993. Ozone Hole, Biosphere and the Air Around Us. *The New York Times*, October 12.

Freudenheim, Milt, James F. Clarity, and Laura Mansnerus. 1986. Chemicals Linked To an Ozone 'Hole'. *The New York Times*, October, 26.

Fritz, Mark. 1992. Heaven and Hole: Europe Races to Stop Ozone Rip. *The Associated Press*, March 5.

Gambrell, Kathy. 2001. Oil execs give take on energy policy. *United Press International*, April 25.

Ghioto, Gary. 1992. Last showdown for Democrats in New Hampshire. *United Press International*, February 16.

Gibbs, Walter. 2000. Research Predicts Summer Doom for Northern Icecap. *The New York Times*, July 11.

Gillespie, Noreen. 2003. States go to court to force EPA to regulate carbon dioxide emissions. *The Associated Press*, October 23.

Goeller, David. 1987. McDonald's to stop serving U.S. customers food in containers made with CFCs. *The Associated Press*, August 5.

———. 1987. Scientists: Greater Reductions Needed In Ozone-Destroying Chemicals. *The Associated Press*, October 27.

———. 1988. Subcommittee Witnesses Call For Quicker Action. *The Associated Press*, March 31.

Goeller, H. E., and Alvin M. Weinberg. 1978. The Age of Sustainability. *Am. Econ. Rev.*

Goodstein, Eban S. 1999. *Economics and the Environment*. Second ed. Upper Saddle River, NJ: Prentice-Hall Inc.

Gottschalk, Louis A., Janny Fronczek, and Monte S. Buchsbaum. 1993. The cerebral neurobiology of hope and hopelessness. *Psychiatry* 56 (3):270-281.

Hakim, Danny. 2002. Detroit and California Rev Their Engines Over Emissions. *The New York Times*, July 28.

Hanley, Charles J. 1987. Report Ozone 'Hole' in North Has Eased. *The Associated Press*, August 19.

———. 2004. The 'hole' pulls back, but 'red days' and danger linger on. *The New York Times*, December 14.

Hansen, Bogi. 2001. "Decreasing overflow from the Nordic seas into the Atlantic Ocean through the Faroe Bank channel since 1950". *Nature* 411.

Harris, Johnathan M. 2002. *Environmental and Natural Resource Economics*. Boston, New York: Houghton Mifflin Company.

Hasselmann, K. 1999. Intertemporal accounting of climate change-Harmonizing economic efficiency and climate stewardship. *Climatic Change* 41:333-350.

Hauser, Gerald A. 1986. *Introduction to Rhetorical Theory*. New York: Harper & Row, Publishers Inc.

Hebert, Josef H. 1990. Bush Says Global Warming Response Mustn't Hurt Economic Growth. *The Associated Press*, February 5.

Hebert, Josef H. 1994. EPA Chief Vows to Push For Greenhouse Gas Control. *The Associated Press*, June 14.

———. 2001. Bush Won't Regulate Carbon Dioxide. *The Associated Press*, March 14.

Heilbronner, Steven. 1992. Bush announces phaseout of ozone depleting elements. *United Press International*.

Heilprin, John. 2004. Bush stands by rejection of limits on gases blamed for global warming. *The Associated Press*, November 6.

Held, David, Anthony McGrew, David Goldblatt, and Johnathan Perraton. 1999. *Global Transformations Politics, Economics and Culture*. Stanford, CA: Standford University Press.

Henslin, James M., and Paul M. Roesti. 1976. Trends and Topics in "Social Problems" 1953-1975: A Content Analysis and a Critique. *Social Problems* 24 (1):54-68.

Henson, Carolyn. 1996. International news. *The Associated Press*, July 17.

Howarth, Richard B. 2001. Discounting and Uncertainty in Climate Change Policy Analysis. Hanover, NH.

Howland, Dave, Mimi L. Becker, and Lawrence J. Prelli. In Press. Merging content analysis and the policy sciences: A system to discern policy-specific trends from news media reports. *Policy Sciences*.

Howland, Dave, Mimi Becker, and Dork Sahagian. 2001. Globalization and Climate Change. *Global Change Newsletter* (48).

Huebner, J., DP Fan, and J. Finnegan. 1997. "Death by a thousand cuts": The impact of media coverage on public opinion about Clinton's Health Security Act. *Journal of Health Communication* 2 (4):253-270.

Huuhtanen, Matti. 1989. Conference Asks Ban on Ozone-Destroying CFCs by 1999. *The Associated Press*.

IPCC. 2001. *Climate Change 2001: The Scientific Basis. Contribution of Working Group I to Third Assessment Report of the Intergovernmental Panel on Climate Change*. Edited by J. T. Houghton, Y. Ding, D.J. Griggs, M. Nouger, P.J. van der Linden, X. Dai, K. Maskell, and CA Johnson. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.

IPCC Group I. 2001. *Climate Change 2001: The Scientific Basis. Contribution of Working Group I to Third Assessment Report of the Intergovernmental Panel on Climate Change*. Edited by J. T. Houghton, Y. Ding, D.J. Griggs, M. Nouger, P.J. van der Linden, X. Dai, K. Maskell, and CA Johnson. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.

IPCC Group II. 2001. *Climate Change 2001: Impacts Adaptation and Vulnerability. Contribution of Working Group II to Third Assessment Report of the Intergovernmental Panel on Climate Change*. Edited by O. F. C. J.J. McMarthy, N.A. Leary, D.J. Dokken, Kasey S. White. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.

Isachenkov, Vladimir. 2004. Russia's upper house of parliament ratifies Kyoto Protocol. *The Associated Press*.

Jablon, Robert. 2002. Automakers say they will sue to block California bill restricting carbon dioxide emissions. *The Associated Press*, July 23.

Jamieson, Kathleen Hall, and Karlyn Kohrs Campbell. 1988. *The Interplay of Influence: Mass Media and Their Publics in News, Advertising, Politics*. Belmont, CA: Wadsworth Publishing Company.

Jordan, Donald L., and Benjamin I. Page. 1992. Shaping Foreign Policy Opinions: The Role of TV News. *The Journal of Conflict Resolution* 36 (2):227-241.

Kappa 2003. Medical University of South Carolina 2000 [cited 2003]. Available from http://www.musc.edu/dc/icrebm/kappa.html.

Kauffman, Draper L. Jr. *Systems One: An Introduction to Systems Thinking*: Future Systems, Inc.

Kelliher, Adam. 1990. Delegates make pledge at ozone conference. *United Press International*, June 20.

Kluger, Jeffrey. 2006. Be worried, be very worried. *Time*, April 3.

Korsmo, Fae L. 1990. Problem Definition and the Alaska Natives: Ethnic Identity and Policy Formation. *Policy Studies Review* 9 (2):294-306.

Kump, Lee R., James F. Kasting, and Robert G. Crane. 1999. *The Earth System*. Saddle River, New Jersey: Prentice Hall.

Lammi, Elmer W. 1988. Scientists: Ozone eroding at faster pace. *United Press International*, March 30.

Landis, JR, and GG Koch. 1977. The measurement of observer agreement for categorical data. *Biometrics* 33:159-174.

Lang, Gladys Engel, and Kurt Lang. 1983. *The Battle for Public Opinion*. New York: Columbia University Press.

Lasswell, Harold D. 1968. The uses of content analysis data in studying social change. *Social Science Information* 7 (1):57-70.

———. 1971. *A Pre-View of the Policy Sciences*. New York: American Elsevier.

———. 1972. Communications Research and Public Policy. *Public Opinion Quarterly* 36 (3):301.

Lasswell, Harold D., D. Lerner, and I. de Sola Pool. 1952. *The comparative study of symbols*. Stanford, CA: Stanford University Press.

Lave, Letser B., and Hadi Dowlatabadi. 1993. Climate Change, The Effects of Personal Beliefs and Scientifc Uncertainty. *Environmental Science & Technology* 27 (10):1962-1972.

Layzer, Judith A. 2002. *The Environmental Case: Translating Values Into Policy*. Washington, D.C: CQ Press.

Leary, Warren E. 1983. Scientists Urge 'Caution Not Panic' As Weather Changes. October 21.

Lehigh, Scott. 2006. Look to states for leadership. *The Boston Globe*, April 25

Lindlaw, Scott. 2001. Bush Won't Regulate Carbon Dioxide. *The Associated Press*, March 13.

Lombard, Matthew, Jennifer Snyder-Duch, and Cheryl Campanella Bracken. 2002. Content Analysis in Mass Communication Assessment and Reporting of Intercoder Reliability. *Human Communications Research* 28 (4):587-604.

Luterbacher, Urs, and Detlef F. Sprinz, eds. 2001. *International Relations and Global Climate Change*. Cambridge, MA: The MIT Press.

MacKenzie, Susan. 1993. Great Lakes Intergovernmental Cooperation: A Framework for Endangered Species Conservation. In *Endangered Species Update*.

Maddison, Angus. 1991. *Dynamic Forces in Capitalist Development, A Long-Run Comparative View*. New York: Oxford University Press.

Maliti, Tom. 2003. U.S. fails to win exemption from a requirement to phase out chemicals that destroy ozone layer. *The Associated Press*, November 14.

Malone, Michael D., and Dennis K. Orthner. 1988. Infant Care as a Parent Education Resource: Recent Trends in Care Issues. *Family Relations* 37:367-372.

Mansnerus, Laura , and Katherine Roberts. 1986. A Dire Warning on Ozone Depletion. *The New York Times*, November 9, Page 7, Column 1.

Marquis, Christopher. 2003. U.S. Seeks 54 Exemptions on Pesticide Ban. *The New York Times*, Page 19, Column 1.

Martin, Mike. 2001. Energy groups pounce on poll's message mix. *United Press International*, June 17.

Mastro, Dana E., and Charles Atkin. 2002. Exposure to Alcohol Billboards and Beliefs and Attitudes toward Drinking among Mexican American High School Students. *The Howard Journal of Communication* 13:129-151.

Max, Arthur. 2001. Kyoto pact may prompt changes in landscape and lives. *The Associated Press*, November 10.

Maxwell, Joseph A. 1996. *Qualitative Research Design, an Interactive Approach*. Vol. 41, *Applied Social Research Methods Series*. Sage Publications.

McComas, Katherine, and James Shanahan. 1999. Telling Stories About Global Climate Change Measuring the Impact of Narratives on Issue Cycles. *Communication Research* 26 (1):30-57.

McElhenny, John. 2001. Beacon Hill awaits new rules on wind, sun power. *The Associated Press*, September 7.

McKibben, Warwick J., and Peter J. Wilcoxen. 2002. The Role of Economics in Climate Change. *Economic Perspectives* 16 (2):107-129.

McKinley, Clark. 1995. Special pest session of Legislature. *UPI*.

Meadows, Donella H., Dennis L. Meadows, Jorgen Randers. 1992. *Beyond the Limits*. White River Junction, VT: Chelsea Green Publishing Company.

Merriam, John E., and Joel Makower. 1988. *Trend Watching, How the Media Create Trends and How to be the First to Uncover Them.* New York: American Management Association.

Milius, Susan. 1995. Scientists duel over ozone. *United Press International,* September 20.

Molina, Mario J, and Sherwood F. Rowland. 1974. Stratospheric sink for chlorofluoromethanes-chlorine atom catalyzed destruction of ozone. *Nature* 249:810-812.

Molitor, Michael R. 1999. The United Nation's Climate Change Agreements. In *The Global Environment, Institutions, Law and Policy,* edited by N. Vig and R. Axelrod. Washington D.C.: Congressional Quarterly Inc.

Munn, R.E. 1993. Monitoring for Ecosystem Integrity. In *Ecological Integrity and the Management of Ecosystems,* edited by S. e. a. Woodley: St. Lucie.

Musso, Juliet, Christopher Weare, and Matt Hale. 2000. Designing Web Technologies for Local Governance Reform: Good Management or Good Democracy? *Political Communications* 17 (1):1-19.

Mwangi, George. 2001. Report: Climate change to cost the world $300 billion a year. *The Associated Press,* February 3.

Naisbitt, John. 1982. *Megatrends: Ten New Directions Transforming Our Lives.* New York: Warner Books Inc.

NASA team plans to investigate ozone hole above the Antarctic. 1987. *The Associated Press,* July 30.

Nasar, Sylvia. 1992. Can Capitalism Save the Ozone? *The New York Times,* February 7.

Nash, Nathaniel. 1991. Unease Grows Under the Ozone Hole. *The New York Times,* July 23.

Natural Step, The. *The Natural Step's System Conditions.* The Natural Step 2002 [cited August 20, 2002. Available from http://www.naturalstep.org/framework/framework_conditions.html.

Nelkin, Dorothy. 1995. *Selling Science.* New York: W.H. Freeman and Company.

Neuendorf, Kimberly A. 2002. *The Content Analysis Guidebook.* Thousand Oaks, CA: Sage.

New England Governors/ Eastern Canadian Premiers. 2001. Climate Change Action Plan. Halifax, NS: New England Governors/ Eastern Canadian Premiers.

Nordhaus, William D. Reflections on the Concept of Sustainable Economic Growth. Paper read at Economic Growth and the Structrure of Long-Term Development, at Varenna, Italy.

———. 1999. Discounting and Public Policies That Affect the Distant Future. In *Discounting and Intergenerational Equity*, edited by P. Portney and J. Weyand.

Norgaard, Richard. 1984. *Development Betrayed.*

O'Brien, Karen L., and Robin M. Leichenko. 2000. Double exposure: assessing the impacts of climate change within the context of economic globalization. *Global Environmental Change* 10 (3):221-232.

Ozone hole closes. 1992. *United Press International*, December 9.

The Ozone Hole Over Mr. Bush's Head. 1992. *The New York Times*, February 5, Page 22.

Paarlberg, Robert L. 1999. Lapsed Leeadership: U.S. International Envrionmental Policy Since Rio. In *The Global Environment, Institutions, Law and Policy*, edited by R. Axelrod. Washington D.C.: Congressional Quarterly Inc.

Passel, Peter. 1991. Warmer Globe, Greener Pastures? *The New York Times*, September 18.

Pielke, Roger A. Jr. 1998. Rethinking the role of adaptation in climate policy. *Global Environmental Change* 8 (2):159-170.

Pielke, Roger A. Jr., Roberta Klein, and Daniel Sarewitz. 2000. Turning the Big Knob: An Evaluation of the Use of Energy Policy to Modulate Future Climate Impacts. *Energy and Environment*:In Press.

Raustiala, Kal. 2001. Nonstate Actors in the Global Climate Change Regime. In *International Relations and Global Climate Change*, edited by U. Luterbacher and D. F. Sprinz. Cambridge, MA: The MIT Press.

Recer, Paul. 1991. Scientists Say Ozone Could Be Erased With Hydrocarbon Spray. *The Associated Press*, MP 11-22-91 AP.

Recer, Paul. 1992. Scientists Find 'Alarming' Northern Hemisphere Ozone Depletion. *The Associated Press*, MP 02-03-92 AP.

Recer, Paul. 1998. Warm water trend may be part of climate change, researchers say. *The Associated Press*, 7-10-98b AP.

Record warm intensified in early 1998. 1998. *United Press International*, June 8.

Reisinger, Andy R. 2002. From Montreal to Kyoto – Can we learn some lessons? Paper read at Proceedings of a Workshop on: UV Radiation and its Effects - An Update 2002., at Wellington, New Zealand.

Revelle, Roger, and Hans Seuss. 1957. Carbon dioxide exchange between atmosphere and ocean and the question of an increase in atmospheric CO2 during the past decades. *Tellus* 9:18-27.

Revkin, Andrew. 2003. Ozone Layer Is Improving, According To Monitors. *The New York Times*, July 30, Page 11, Column 6.

———. 2003. U.S. to Seek Support for Ozone Exemptions at Meetings. *The New York Times*, Page 14, Column 3.

———. 2004. NASA Curbs Comments On Ice Age Disaster Movie. *The New York Times*, April 25.

———. 2006a. Climate expert says NASA tried to silence him. *The New York Times*, January 29, 1.

———. 2006b. Yelling 'Fire' On A Hot Planet. *The New York Times*, April 23.

Ricks, Delthia. 1986. Methane gas adding to greenhouse effect. Anaheim, California.

Ritter, Malcolm. 2002. Talk of global warming gets chilly reception in North Dakota farming community. *The Associated Press*, August 12.

Robert, Karl-Henrik. 1995. Educating a Nation: The Natural Step. *In Context* (Number 28):10-15.

Sagoff, Mark. 1997. Do we consume too much? *Atlantic Monthly*, 80-96 quoted in Ehrlich, Paul L., Gary Wolff, Gretchen C. Daily, Jennifer B. Hughes, Scott Daily, Michael Dalton, and

Lawrence Goulder. 1999. Knowledge and the Environment. Ecological Economics 30:267-284.

Sahagian, Dork. 2000. Global physical effects of anthropogenic hydrological alterations:sea level and water distribution. *Global and Planetary Climate Change* 25:39-48.

Sangeorge, Robert. 1983. EPA report predicts catastrophic global warming. *United Press International*, October 1983.

Sarewitz, Daniel, and Roger A. Jr. Pielke. 2000. Breaking the Global-Warming Gridlock. *The Atlantic Monthly*, July.

Schrondt, Philip A. 2001. Potentials and Pitfalls in the Application of Event Data to the Study of International Mediation. Paper read at International Studies Association 41st Annual State and Regional. 1998. *The Associated Press*.Convention, at Los Angeles, CA.

Schwandt, Thomas A. 1997. *Qualitative Inquiry A Dictionary of Terms*. London: Sage Publications Inc.

Scientists Say Ozone Layer Significantly Depleted. 1991. *The Associated Press*, July 18.

Searles, Dennis M. 1988. Solar Research Could Play Major Role In Curbing 'Greenhouse Effect'. *The Associated Press*, July 4.

Senge, Peter M. 1990. *The Fifth Discipline, The Art and Practice of Learning Organization*. New York, NY.

Shabecoff, Philip. 1989. Scientist Says Budget Office Altered His Testimony. *The New York Times*, May 8.

Siegel, Lee. 1987. Theory Blames Ozone Loss On Snowballs From Space. *The Associated Press*, May 27.

———. 1988. Atmospheric Methane Up 11 Percent; May Worsen Ozone Hole, Global Warming. *The Associated Press*, March 3.

Silberberg, Martin S. 2000. *Chemistry The Molecular Nature of Matter and Change*: McGraw Hill. Original edition, 1996.

Sitars, Daniel. 1993. *Agenda 21: The Earth Summit Strategy to Save Our Planet*. Boulder, Colo: Earthpress.

Sprinz, Detlef F. 2001. Comparing the Global Climate Regime with Other Accords. In *International Relations and Global Climate Change*, edited by U. Luterbacher and D. F. Sprinz. Cambridge, MA: The MIT Press.

Sprinz, Detlef F., and Martin Weiss. 2001. Domestic Politics and Global Climate Policy. In *International Relations and Global Climate Change*. Cambridge, MA: The MIT Press.

Stamm, Keith R., Fiona Clark, and Paula Reynolds Eblacas. 2000. Mass communication and public understanding of environmental problems: the case of global warming. *Public Understanding of Science* 9:219-237.

State and Regional. 2000. *The Associated Press*, February 3.

Steen, Eliel. 1999. Sustainable Development in Dry Climates: The Mediterranean Area. *Ambio* 28 (4).

Stern, Paul S. 2000. Psychology and the Science of Human-Environment Interactions. *Climatic Change* 55 (5):523-530.

Stern, Susannah R. 2005. Messages from Teens on the Big Screen: Smoking, Drinking, and Drug Use in Teen-Centered Films. *Journal of Health Communication* 10 (4):331-346.

Stevens, William K. 1995. 3 Win Nobel Prize for Work on Threat to Ozone. *The New York Times*, October 12, Page 1, Column 2.

Stone, Philip J. 1997. Thematic Text Analysis: New Agendas for Analyzing Text Content. In *Text Analysis for the Social Sciences, Methods for Drawing Statistical Inferences from Texts and Transcripts*, edited by C. W. Roberts. Mahwah, NJ: Lawrence Erlbaum Associates Inc.

Sullivan, Walter. 1987. Ozone Hole Raising Concern for Scientists' Safety. *The New York Times*, October 28, 13.

Systems Dynamics Society. 2002. *What is Systems Dynamics* [Internet Web site] 2002 [cited August 7 2002]. Available from http://www.albany.edu/cpr/sds/.

Taber, Charles S. 1992. POLI: An Expert System Model of U.S. Foreign Policy Belief Systems. *The American Political Science Review* 86 (4):888-904.

The Associated Press. 2003. *The AP's Mission.* The Associated Press 2003 [cited 2003]. Available from http://www.ap.org/pages/history/mission.htm.

The New York Times. *Ethical Journalism, Journalism Ethical Code of Conduct for the News and Editorial Departments* 2003 [cited 2003. Available from https://www.nytco.com/pdf/nyt-code-of-ethics-1-03.pdf.

———. 2003. New Players on Global Warming. January 15, 20.

Thomson, Nick. 2001. Climate shift seen possible. *The Boston Globe.*, December 12, 2001.

Toulmin, Stephen. 1958. *The Uses of Argument.* London: Cambridge University Press.

Toulmin, Stephen, Richard Rieke, and Allan Janik. 1979. *An introduction to reasoning.* New York: Macmillan Publishing Co., Inc.

Trumbo, Craig. 1995. Longitudinal Modeling of Public Issues: An application of the Agenda-Setting Process to the Issue of Global Warming. *Journalism and Mass Communication Monographs* (152):1-57.

———. 1996. Constructing Climate Change: claims and frames in US news coverage of an environmental issue. *Public Understanding of Science* 5:269-283.

Turekian. *Global Environmental Change.* Upper Saddle River: Prentice Hall, NJ.

UNEP. 1985. Vienna Convention on the protection of the ozone later. In *Ozone Diplomacy*: Harvard Univesity Press.

———. 1987. The Montreal Protocol on Substances that Deplete the Ozone Layer. In *Ozone Diplomacy.* Cambridge: Harvard University Press.

———. 2000. The Montreal Protocol on Substances that Deplete the Ozone Layer as adjusted and/or amended in London 1990, Copenhagen 1992, Vienna 1995, Montreal 1997, Bejing 1999. Nairobi, Kenya: Secretariat for The Vienna Convention for the Protection of the Ozone Layer & The Montreal Protocol on Substances that Deplete the Ozone Layer.

———. 2005. Report of the Sixth Meeting of the Ozone Research Managers of the Partices to the Vienna Convention for the Protection of teh Ozone Later. Vienna: WMO Global Ozone Research and Monitoring Project.

Ungar, Sheldon. 2000. Knowledge, ignorance and the popular culture: climate change versus the ozone hole. *Public Understanding of Science* 9:297-312.

United Nations. 1992. Rio Declaration on Environment and Development. Paper read at United Nations Conference on Environment and Development, at Rio de Janeiro.

———. 1992. United Nations Framework Convention on Climate Change.

———. 1997. Kyoto Protocol to the United Nations Framework Convention on Climate Change.

———. 2006. Kyoto Protocol Status of Ratification.

United Press International. 2003. *About Us* 2002 [cited 2003]. Available from http://www.upi.com/about/index.cfm.

———. 2004. Vladimir Putin signs Kyoto Protocol bill. *United Press International*, November 5.

Uses and Abuses of Science. 2004. *The New York Times*, February 23.

Vergano, Dan. 2005. The debate's over: Globe is warming. *USA Today*, June 12.

Vig, Norman, and R. Axelrod. 1999. *The Global Environment, Institutions, Law and Policy.* Washington D.C.: Congressional Quarterly Inc.

Wackernagel, Mathis. 1994. How Big is Our Ecological Footprint? Using the Concept of Appropriated Carrying Capacity for Measuring Sustainability: The Write Stuff.

Wanta, Wayne, Guy Golan, and Lee Cheolhan. 2004. Agenda Setting and International News: Media Influence on Public Perceptions of Foreign Nations. *Journalism and Mass Communication Quarterly* 81 (2):364-377.

Washington News. 1987. *United Press International*, December 21.

Weber, Robert Phillip. 1990. *Basic Content Analysis*. Second ed. Newbury Park, CA: Sage.

Wettestad, Jorgen. 2002. The Vienna Convention and Montreal Protocol on Ozone-Layer Depletion. In *Environmental Regime Effectiveness, Confronting theory with evidence. Cambridge*, edited by E. L. Miles, A. Underal, S. Andersen, J. Wettestad, J. B. Skjaerseth and E. M. Carlin. Cambridge, MA: MIT Press.

Weyant, John P. 1993. Costs of Reducing Global Carbon Emissions. *Journal of Economic Perspectives* 7 (4):29-45.

Whipple, Dan. 2004. Climate: Global warming's latest hot topic. *United Press International*, May 10.

Whipple, Dan. 2004. Climate: Worrisome trends in Antarctica. *United Press International*, October 11.

Wilkins, Lee. 1993. Between facts and values: print media coverage of the greenhouse effect, 1987-1990. *Public Understanding of Science* 2:71-84.

Williams, Wendy. 2002. Cooling the Earth. *The Boston Globe*, June 11, B7 & B10.

Winter, Deborah Du Nann. 2000. Some Big Ideas for Some Big Problems. *Climatic Change* 55 (5):516-522.

Woodward, Gary C., and Robert E. Denton. 2000. *Persuasion and Influence in American Life*. 4th ed. Prospect Heights, IL: Waveland Press.

World Meteorological Organization. 1988. The changing atmosphere: implications for global security, June 27-30, at Toronto, Canada.

Myers, David G. 2007. *Psychology*. New York: Worth Publishers.

Zehr, Stephen C. 2000. Public representations of scientific uncertainty about global climate change. *Public Understanding of Science* 9:85-103.

APPENDIX

Institutional Review Board Letter

UNIVERSITY of NEW HAMPSHIRE

March 20, 2006

David Howland
Natural Resources
James Hall
Durham, NH 03824

IRB #: 2866
Study: Hidden Influence: A new method to discern globalization's impact on environment policy
Approval Date: 01/10/2003

The Institutional Review Board for the Protection of Human Subjects in Research (IRB) has reviewed and approved the protocol for your study as Expedited as described in Title 45, Code of Federal Regulations (CFR), Part 46, Subsection 110.

Approval is granted to conduct your study as described in your protocol for one year from the approval date above. At the end of the approval period, you will be asked to submit a report with regard to the involvement of human subjects in this study. If your study is still active, you may request an extension of IRB approval.

Researchers who conduct studies involving human subjects have responsibilities as outlined in the attached document, *Responsibilities of Directors of Research Studies Involving Human Subjects.* (This document is also available at http://www.unh.edu/osr/compliance/irb.html.) Please read this document carefully before commencing your work involving human subjects.

If you have questions or concerns about your study or this approval, please feel free to contact me at 603-862-2003 or Julie.simpson@unh.edu. Please refer to the IRB # above in all correspondence related to this study. The IRB wishes you success with your research.

For the IRB,

Julie F. Simpson

Julie F. Simpson
Manager

cc: File
Mimi Larsen Becker

Research Conduct and Compliance Services, Office of Sponsored Research, Service Building, 51 College Road, Durham, NH 03824-3585 * Fax: 603-862-3564