The Press and Global Environmental Change: An International Comparison of Elite Newspaper Reporting on the Acid Rain Issue from 1972 to 1992

Edited By

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CENTER FOR SCIENCE AND INTERNATIONAL AFFAIRS
AND
JOAN SHORENSTEIN BARONE CENTER ON THE PRESS, POLITICS AND PUBLIC POLICY

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Despite this assistance, some errors may remain. The responsibility for these is solely ours.

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THE PRESS AND GLOBAL ENVIRONMENTAL CHANGE: AN INTERNATIONAL COMPARISON OF ELITE NEWSPAPER REPORTING ON THE ACID RAIN ISSUE FROM 1972 TO 1992

Foreword

Almost everyone has an opinion on how the press covers public policy issues. Some people believe that reporters and their editors have a preconceived agenda and focus on those facts and stories that support that agenda, while others believe the press is more benign and has a limited effect in shaping public perceptions. Still others embrace the notion that press coverage reflects the biases and viewpoints of the government or the "establishment."

Environmental issues seem to trigger this debate over the accuracy and fairness of the media. Does the press deliberately exaggerate environmental threats? Are they beholden to one political interest or another? Where do reporters get their information? Why do they decide to pay attention to one aspect of a "story" rather than pursue a different tact? Finally, what factors tend to change a reporter's slant on an environmental issue?

Surprisingly, there has been a paucity of analysis about how the press covers environmental issues. Anecdotal descriptions are the rule, not the exception. Prompted by the vacuum in the scholarly literature and fueled by a generous grant from the IBM Environmental Research Program, scholars at Harvard's John F. Kennedy School decided to explore how the press in six different countries covered the issue of acid rain over a twenty-year period, 1972-1992. Under the direction of Prof. William Clark, teams of researchers were formed in six countries to analyze how one or two elite newspapers in each country selected for attention a subset of events, ideas, and perspectives related to the problem of acid rain and how it diffused these perspectives through society at large. The information obtained from each country was then compared to identify the similarities and differences between the countries.

This paper describes the results of this project. Professor Clark and Nancy Dickson plan to publish a book expanding on these themes which should be available in early 1997.

We at the Kennedy School deeply appreciate the confidence and support provided to us by IBM and particularly by Art Hedge (now retired), and Joe Sarsanski without whom this project would not have been possible.

Henry Lee

THE PRESS AND GLOBAL ENVIRONMENTAL CHANGE: AN INTERNATIONAL COMPARISON OF ELITE NEWSPAPER REPORTING ON THE ACID RAIN ISSUE FROM 1972 TO 1992

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UNITED STATES: ELITE NEWSPAPER REPORTING ON THE ACID RAIN ISSUE FROM 1972 TO 1992

Nancy M. Dickson, William C. Clark, Roderick Scheer, Renate Ell, and Amy Blitz[1]

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Press coverage of acid rain in the United States shows that the issue was framed as a domestic issue that was dominated by intra-national equity concerns, and only secondarily as a US-Canada transboundary issue. By analyzing coverage of the issue by the New York Times, the paper addresses the timing and context in which the issue emerges, as well as the role of key actors in the debate. Content analysis of news articles and interviews with key actors identifies similarities and differences from other countries in terms of how the issue is framed and how different actors affect press coverage.

1 OVERVIEW

This chapter examines elite press coverage of the acid rain issue in the United States of America over the twenty year period between the 1972 United Nations Conference on the Human Environment and the 1992 United Nations Conference on Environment and Development. We focus on the *New York Times* (here after referred to as the *Times*) as one of the nation's premier elite daily newspapers.

The *Times*' reporting on acid rain can be divided into three phases. As the issue was initially defined in the mid-to late 1970s, it was portrayed as a scientific issue, and received little media attention. In the 1980s the collective activities of politicians, environmental groups, industry lobbyists, government officials in environmental agencies, scientists and the Canadian government raised the prominence of acid rain. Attention to the issue peaked in 1984 as major elections took place in both the United States and Canada in which both the transboundary and the intra-national dimensions of the acid rain problem were central campaign issues. Then too, state officials concerned about the intra-national equity issue as well as representatives of the Canadian government concerned about the transboundary pollutants had mounted energetic media strategies. Further, the Reagan Administrations' adamant opposition to additional environmental regulations fueled a Congressional debate with high media interest. In the third phase, beginning in the late-1980s, new domestic political power configurations emerged. The Congressional stalemate began to break up as the arrangement of influential congressional committee positions shifted. Presidential opposition to action by Ronald Reagan gave way to proactive leadership by George Bush. Passage of the 1990 Clean Air Act Amendments had essentially satisfied the demands of major actor groups. No longer would Canadian officials, northeast State officials or environmentalists -- all of whom had provided input to the drafting of the regulations -- feel compelled to attract media interest to the acid rain problem.

Our content analysis of the *Times'* coverage explores how that newspaper framed acid rain debate, who it relied upon as news sources, and what biases it reflected.

2 CONTEXT

2.1 Political System

Our expectations regarding America's encounter with global environmental risks are conditioned by four general and enduring characteristics of the nation's politics and policy making.

First, American political institutions were explicitly designed to "distribute authority in such a way that it would be difficult for any single official or institution to exercise power arbitrarily (Porter and Vernon 1989; Vernon et al. 1991)." This applies to relations among federal, state and local layers of government; among the branches of the national government; and -- most significantly for our study -- within the federal executive bureaucracy itself. The resulting fragmentation and overlap of responsibility allow exceptional latitude for independent initiatives on the part of multiple government

actors, even on international issues. Efforts to coordinate these initiatives have been designed more to provide a forum for debate within government than to project a coherent American policy to the outside world. We should therefore expect that there will seldom exist such a thing as "the American government's position" on an environmental risk such as acid rain. Government officials will be expected to speak with a variety of voices.

Second, the American government's propensity for independent, uncoordinated policy initiatives has been accentuated by the absence of a career civil service at the highest levels of the federal bureaucracy. The U.S. reliance on short term political appointments to fill its top spots has provided a steady supply of new recruits and ideas coming into government from the business and academic communities. A less desirable consequence, however, has been described as "a government of strangers": individually motivated to make their marks quickly, but short on institutional memory, long term perspective or motivation to collaborate (Heclo 1977). We thus expect that, when compared to governments with a more permanent senior civil service, this itinerant American government should be relatively good at innovation, but relatively poor at providing continuity across the decadal time periods that interest us in this study.

Third, the American political system has been characterized as particularly open to parties outside of government who wish to influence policy agendas and outcomes, or to reopen issues government has temporarily set aside. The influence of the press, business and other monied interests in this open system have long been noted (Lindblom 1980). These traditional non-governmental participants in the American policy making process were joined during the period of our study by an increasing number of non-profit, "public interest" groups. Some of the most active of these had environmental agendas at their core (Hays 1987; Morris 1988). America's encounter with acid rain, as its encounter with other issue areas, can thus be expected to be an inherently social phenomenon, incomprehensible from a perspective that includes governmental actors and actions alone.

Fourth, scientific and technical experts have historically enjoyed an especially privileged position in the formulation and legitimation of American public policy (Ezrahi 1990).[2] This comfortable relationship experienced its golden age in America during the quarter century following the Second World War. But by the time that global environmental risks began to come onto the national agenda in the late 1960s and 1970s, the gold had begun to tarnish. Doubts were increasingly voiced about both the efficacy and value-neutrality of science applied to social problems, even as science was increasingly called upon to support policymaking (Lindblom and Cohen 1979).[3] This meant that throughout most of America's historical engagement with the science-laden issues of acid rain, a national debate has been evolving on the proper role of scientific advice in the policy making process. We can expect that social responses to the acid rain issue have been shaped by that changing debate, and in turn have fueled it.

Beyond these enduring general characteristics of American politics and policy making, several specific historical developments have been particularly important in setting the stage for the country's encounter with the acid rain issue.

In the late 1950s a new, distinctive and vigorous environmental movement began to emerge in America (Morris 1988). In place of traditional conservation concerns, it increasingly reflected urban-based worries about public health and beautification. Its urban focus was soon "nationalized" through works such as Rachel Carson's *Silent Spring* (1962), that "made a very direct connection between amenity and health, and by so doing energized the environmental movement (Morris 1988)." This merging of concern for the natural environment with concern for the environment where people lived gave American environmentalism a central focus on what Samuel Hays has called issues of "beauty,

health, and permanence (Hays 1987)." A growing wave of public support for these issues crested in 1970, that saw the first Earth Day, the founding of both Greenpeace and the Environmental Protection Agency, and the signing of the National Environmental Policy Act. Atypically for public issues in America, this initial outpouring of concern has been sustained for more than two decades, spanning the period we study here (Dunlap 1992). The result has been a trend towards increasing participation, increasing public awareness, increasing regulation, increasing expense and increasing (though hardly uniform) protection of the nation's domestic environment.

Transboundary and global environmental problems received little attention in America during the heady debates surrounding the events of 1970, despite the haunting images of a precious and fragile earth produced through the Apollo Program. But two years later -- even as the country virtually ignored the Stockholm Conference on the Environment -- the publication of computer models purporting to show global *Limits to Growth* nudged America's environmental horizon firmly beyond its national borders (Meadows et al. 1972). This nascent global perspective was greatly amplified by the incorporation of environmental concerns in the many of the global energy assessments undertaken in the wake of the 1973 energy crisis. By 1980, the international dimension of America's environmental concerns had become sufficiently established to occupy a prominent role in the Carter Administration's monumental *Global 2000 Report* (US CEQ 1980).

Over the next decade global environmental risks emerged as mature issues of public policy in the United States. The pace of scientific discovery, public mobilization and government action all increased to unprecedented levels. By the time 1992 -- the year of the Rio Earth Summit -- had drawn to a close, the US had signed the Montreal Protocol for Protection of the Ozone Layer in 1987 and strongly supported subsequent amendments. Acid rain had finally been tackled in the Clean Air Act Amendments of 1990; an accord with Canada was signed in 1991. A decade of official government skepticism regarding the greenhouse effect had given way to grudging support for the climate convention signed at Rio. And the November 1992 elections had brought into the White House a Vice President whose best selling book *Earth in the Balance* identified the need to protect the global environment as one of the defining problems of the 21st Century (Gore 1992). Perhaps inevitably, public attention to global environmental risks declined and high politics turned elsewhere in the immediate post-Rio period. But the legacy of ideas, institutions, and interests left behind seemed almost certain to guarantee a continuing and significant American engagement with global environmental issues for years to come.

2.2 Issues and Actors in the Policy Debate on Acid Rain

Acid rain is perhaps the most difficult, complex transboundary environmental public policy issue that the United States has dealt with. Scientists, environmental groups, and the Canadian Government called for a control program, contending that sulfur dioxide, largely from utilities and factories in the Midwest, was causing acid rain and destroying aquatic life and damaging crops and forests. The Reagan Administration (1981-1988), utilities, and the United Mine Workers asserted that too little was known about acid rain to undertake a multimillion-dollar program to curb sulfur emissions. They disputed the science and called for more research to pinpoint cause and effect. They argued that even if power plants reduced emissions, there was no guarantee of a corresponding reduction in acid rain.

The debate over what policies to implement divided the nation along regional lines and produced a decade-long stalemate in Congress. The New England states, impacted by acid rain, wanted relief but did not want to pay for a control program because as consumers of electricity they already paid the additional costs of burning oil rather than coal. Critics of acid rain control programs argued that controls would lead to higher utility rates and would cost miners and other workers their jobs. One way of reducing emissions from their main source was to require coal-burning utilities to switch from

high-sulfur, Eastern coal to low-sulfur western-coal. This switch was strongly resisted by Eastern coal-mining states, that claimed they stood to lose as many as 300,000 jobs. The alternative was to require utilities to install scrubbers to remove sulfur from plant emissions. Their installation would have been costly, and would have required electricity rate hikes in many Midwestern states.

In 1989 President Bush supported acid rain legislation and a realignment of forces on Capitol Hill changed the stalemate. The 1990 Clean Air Act Amendments (CAAA) gave states the flexibility to reduce sulfur and nitrogen emissions in the least expensive way by allowing the use of market mechanisms, including trading of pollution rights.

2.2.1 Issue Pre-Emergence (to 1978)

In the United States interest in the problems associated with air pollutants dates back to the 19th century. As early as 1905 the nation's Supreme Court addressed the issue of responsibility for damages attributed to distant sources of sulphur fumes (Georgia 1907). Still, concern for the long-range transport of substances involved in environmental acidification and oxidant formation was a relatively recent phenomenon that can be traced to discussions held in the late 1960s among scientists from Scandinavia and the United States. Unlike the case of ozone depletion there were no "surprises" in the emergence of the science of acid rain. Rather, understanding of the phenomena and its impacts was incremental. The acid rain issue first appeared on the scientific agenda in the United States in 1971 following a series of lectures delivered at US universities by Svante Oden, a Swedish scientist (Cowling 1982).

Acid rain did not become a major problem in the US until after 1970. In the 1970s most power plants built tall stacks to help facilities meet the 1970 CAA National Ambient Air Quality Standards (NAAQS). The NAAQS required regions to meet ground level concentrations standards only, and allowed facilities to ignore the consequences of the longer range dispersion of the pollutants that were caught in the swifter airstreams at higher elevations.

In 1974 Cornell University scientist, Gene Likens, and colleague Charles Cogbill authored a major article providing pH isopleth maps that indicated that precipitation acidity in the eastern US had increased dramatically in just two decades (Cogbill 1974). They reported that rain in the eastern United States was 100 to 1,000 times more acidic than normal and that the probable cause was the large-scale and widespread emission of sulfur and nitrogen oxides from industry and electric power plants. This report spurred the media to begin reporting on acid rain as a North American problem.[4]

The link between tall stacks and long-range pollution was known and recognized by 1977, and the Clean Air Act Amendments of 1977 (PL 95-99) clarified that continuous control -- not dispersion -- should be the primary means of complying with standards. The Amendments provided for the prevention of significant air quality deterioration. Among other things, this legislation required that in so-called "non-attainment areas," emissions from new sources be "offset" by emission reductions from existing sources. The Environmental Protection Agency (EPA) was called upon to specify a minimum percentage reduction in sulfur dioxide emissions, based on the use of the best available control technology, that would produce the lowest achievable emission rate. Further, the legislation called for a percentage reduction in potential uncontrolled sulfur dioxide emissions through the installation of flue-bed gas desulfurization at coal-fired power plants. The politics of the day so crafted this legislation that it would in fact promote the coal industry's use of high sulfur coal even where emissions standards might have been met through the use of low sulfur coal. Limitations were also set on the height of smokestacks at such facilities. Significantly, the legislation was explicit on preventing interstate emissions that violated National Ambient Air Quality Standards, adding a process

by which a receptor state could challenge the State Implementation Plan provisions of another State. EPA was also required to promulgate new source performance standards for nitrogen and sulfur oxides.

With increased evidence of acidification in North America, there was political pressure both from within the United States and Canada to add the acid rain issue to their bilateral discussions. In 1977, Canadian Prime Minister Trudeau proposed the establishment of a joint Research Consultation Group on the Long Range Transport of Air Pollutants.

In 1978 Senator Edmund Muskie from Maine, an impacted state, called for the US and Canada to protect their shared environment. Through the 1978 Foreign Relations Re-Authorization Act (PL 95-426) the US Congress urged President Carter to begin negotiations with Canada to mitigate the impact of sulfur dioxide emissions from a Canadian (coal fired) power plant located in northern Minnesota.

2.2.2 Issue Emergence/Expansion (1979-1986)

In October 1979 the joint US-Canada Research Consultation Group issued its first report, identifying acid rain as the problem of greatest common concern at the present time (US-Canada RCS 1979). The report concluded that 50 percent of Canada's acid deposition originated in the midwestern part of the United States, while Canada was the source of only 15 percent of the United States' acid deposition.

During the Carter Administration (1977-1980) a debate took place on the impact of the 1977 Clean Air Act Amendments on coal production and usage. In 1980, Congress passed the Acid Precipitation Control Act that led to the establishment of the National Acid Precipitation Assessment Program (NAPAP). NAPAP was a ten-year research effort, chaired by the Interagency Task Force on Acid Precipitation. NAPAP conducted four assessments on acid rain: on current and future damages (NAPAP 1985); on alternative control and mitigation strategies (NAPAP 1987); and on scientific and policy issues (NAPAP 1989), and an integrated assessment in 1991 (NAPAP 1991). The cumulative budget for all ten years of NAPAP was $530 million -- almost six times the original estimate.

In 1980, the United States and Canada signed a Memorandum of Intent, in which the two countries were committed to work out an acid rain treaty. Through the Memorandum both nations agreed to develop domestic air pollution control policies and to comply with these through vigorous enforcement of legislation (US-Canada MOI 1981). Negotiations for the further development of effective domestic control programs were scheduled to begin in June 1981. (Secretary of State Muskie was the US representative who signed the MOI.)

Progress stalled, however, when Ronald Reagan became President. Throughout his administration (1981-1988) there was considerable opposition to taking action to control acid rain. The political debate about acid rain was most intense during the mid-1980s. The general climate was one of hostility toward regulatory fixes. The Reagan Administration, unconvinced of the gravity of the problem, continually argued that further research was necessary before it could sanction taking any action. Each of the three successive EPA administrators serving under the Reagan Administration stated that there was no scientific consensus to justify the institution of an emissions abatement program (Gorsuch 1982:285; Ruckelshaus 1984:16; Thomas 1986:91). 1983 was a turning point. The collective activities of politicians, environmental groups, industry lobbyists, government officials in environmental agencies, and the Canadian government raised the prominence of acid rain.

Congress

Congress in fact became the focal point of the acid rain debate during the 1980s. Over 200 days of hearings were held between 1980 and 1989 at which nearly a thousand witnesses testified on the acid rain issue (Dickson and Clark, forthcoming). The most divisive issue associated with the acid rain debate in the mid-1980s was the so called "intra-national equity problem." At issue here was whether to target emission controls to one area, the Ohio River basin in the mid-west, so as to solve the impact problems experienced in the northeast and to distribute these costs over the country. While the major sources of sulfur dioxide emissions were located in the midwest, the major recipients of the acid rain were in the northeast. The midwestern industries that would have been financially challenged by the adoption of control strategies included the electric utilities, the coal industry, and automobile manufacturers. Sport fishing and tourism in the Northeast were the primary industries most detrimentally affected by the deposition of these emissions.

The first Congressional goal to directly manage the risk of acid rain was articulated in 1981. Senators George Mitchell (a Democrat from Maine) and Robert T. Stafford (a Republican from Vermont) proposed the first legislation that called for a goal of reducing sulfur dioxide emissions by 10 million tons, that represented a 40 percent reduction from 1980 levels, and proposed a goal of capping emissions at 1981 levels. Interest in the issue increased in 1983 when Representative Henry Waxman of California and Gerry Sikorski of Minnesota, both Democrats, introduced the National Acid Deposition Control Act. The bill supported a cost-sharing plan and would have required that the 50 biggest emitters, primarily coal fired utilities, install scrubbers. The bill proposed to pay for this by charging a kilowatt hour tax on all consumers of electricity in the US. Sulfur dioxide emissions would have been cut by seven million tons a year while allowing the utilities to continue burning high-sulfur Eastern coal, protecting mining jobs. The legislation also called for removing four million tons of nitrogen oxide a year through controls on new power plant and trucks, and another three million tons a year of sulfur dioxide in a complex formula. This bill received a great deal of attention, but was never passed.

Two Democrats were repeatedly portrayed as the main obstacles to taking action: Senate majority leader, Robert Byrd of West Virginia, and chairman of the House Energy and Commerce Committee, Representative John Dingell of Michigan. Senator Byrd blocked legislation to protect his state's mining industry, a major producer of high-sulfur coal. Dingell fought legislation because its tougher regulations on exhaust emissions would impose new costs on Michigan's auto industry.

Scientific Community

The position of the scientific community was somewhat less confrontational. By 1981, the scientific community had gathered sufficient data to suggest a cause-and-effect relationship between acidifying emissions and ecosystem impacts. A report of the National Academy of Sciences at the time concluded that "only the control of emissions of sulfur and nitrogen oxides can significantly reduce the rate of deterioration of sensitive freshwater ecosystems... this would mean a reduction of 50 percent in deposited hydrogen ions (NAS 1981)." This was subsequently misinterpreted as calling for a 50 percent reduction in sulfur emissions. A 1983 National Academy of Science report found that there was a linear relation between the amount of emissions and the amount of acid rain deposited. Furthermore, a national survey of more than one thousand United States acid rain researchers conducted during the mid-1980s revealed that 80 percent of the respondents were in favor of immediate and decisive steps to curtail sulfur emissions (Kahan 1986:158-159).

The Executive Branch

In 1983, an expert panel of nine scientists commissioned by President Reagan's Office of Science and Technology Policy to conduct a peer review of the work of the US-Canadian Research Consultation

Group, warned that "Recommendations for inaction pending collection of all desirable data entail even greater risk of (irreversible) damage" to the environment, agriculture, and perhaps, public health. The panel clearly concluded that reducing sulfur emissions would reduce acid rain. This was contrary to the Reagan Administration's position that more research was needed before an expensive control program was adopted to curb the pollution from coal-fired power plants and other sources of acid rain. The report was the first recommendation by an official Government panel calling for action and not just more study to deal with acid rain.

A few months later the EPA proposed a plan aimed at alleviating acid rain in the Adirondack Mountains in New York State and in New England, where effects were heaviest. The proposed program would have required polluters to reduce sulfur emissions by 4-5 million tons annually. When William Ruckelshaus, EPA Administrator, put the proposal before the Reagan Cabinet Council on Natural Resources and the Environment in September 1983, it was criticized by representatives of the Energy Department and the Office of Management and Budget as premature and too costly. The proposal would have required the reduction of sulfur emissions by about 50 percent in Ohio and West Virginia, by about 30 percent in Pennsylvania, and by about 15 percent in New York, with smaller reductions in Vermont and New Hampshire.

The issue of acid rain figured prominently in the 1984 Presidential election campaign. For example, acid rain was a serious local concern to citizens of New Hampshire because of their vulnerability to lake and forest damage. The National Clean Air Coalition, an environmental advocacy group, brought the issue to the foreground of the New Hampshire presidential primary election by sponsoring citizen hearings on the issue. As a result the major democratic presidential candidates were forced to stake out a position on acid rain. Presidential Reagan was openly criticized for taking no action on the issue, while all other candidates announced their pro-active stance. From the mid 1980s to the end of this decade, a policy stance on acid rain was a key criterion for judging the responsiveness of the Administration to environmental concerns.

Relations with Canada

United States government negotiations with the Canadian government were renewed following the 1985 Shamrock Summit between US President Reagan and Canadian Prime Minister Mulroney at which special envoys were appointed on acid rain (US OWHPS 1985). Drew Lewis, the Reagan appointed special envoy on acid rain, supported emission abatement after studying the issue and meeting extensively with his Canadian counterpart. Lewis' publicly stated support for stricter abatement measures played a pivotal role in altering the Administration's policy stance. Released in 1986, the Envoys' Report recommended a five year program costing five billion dollars to develop clean coal technologies (US OWHPS 1987). While the effectiveness and public policy merits of the Clean Coal Initiative may have been questionable, the event was politically prudent from the United States perspective as it gave the Reagan Administration more time to explore other options and helped Prime Minister Mulroney to remain in office and to work with the United States on other issues of serious concern. In April 1987, President Reagan announced that he would negotiate a bilateral accord with Canada on the issue of acid rain.

To add to the fray, in 1987 the NAPAP released its Interim Report (NAPAP 1987). In its Executive Summary, NAPAP concluded that there was no conclusive scientific evidence on the relationship of acid rain and severe ecosystem damage to warrant implementing a policy of stricter pollution abatement. Scientists from both countries as well as Canadian government officials strongly criticized the report, particularly the Executive Summary that they argued had not been given the requisite peer review and reflected political rather than scientific findings (Canadian Federal 1989; Cowling 1992; Mahoney 1990; Perhac 1990; 1991a; 1991 b; 1992; Russell 1992). The Interim Report served as a symbol of the Reagan Administration's position on the acid rain issue.

States
State government officials also played an important role in generating federal interest in efforts to combat acid rain through law suits, lobbying efforts, publicity campaigns, and with legislation, and monitoring efforts. Officials of the affected northeastern states argued that acid rain damage would result in massive job losses for the tourist industry and financial losses for the sport fishing industry in this area. In 1981 New York State, Maine, Minnesota, Rhode Island, Vermont, and three environmental NGOs filed a petition with the EPA, claiming that within their state boundaries they had experienced violations of the National Ambient Air Quality Standards as a result of sulfur dioxide emissions from midwestern states. In 1984, through the efforts of New York governor Mario Cuomo, several northeastern states jointly sued the EPA for not requiring midwestern states to change their State Implementation Plans. By 1983, six northeastern states had succeeded in getting the National Governors' Association to set up a task force on acid deposition to study the situation and report on the findings. In 1984 New York State was the first state to pass legislation to limit acid rain. Its law called for a 12 percent reduction of sulfur dioxide emissions by 1988 and 30 percent by 1991.

Several States also supported coordinated research with groups in several Canadian provinces. For example, there were agreements for joint work between groups in New Hampshire and Quebec, New York and Quebec (1986), and Washington State and British Columbia (1986). This was followed by an agreement in 1988 between northeastern state Governors and the Canadian Prime Minister.

Industry
Industry argued against control programs based on financial hardship -- indicating that the imposition of additional regulations would mean the loss of thousands of coal mining jobs and huge consumer price increases for electricity. Various alliances were formed to lobby efforts to implement control programs. The Alliance for Balanced Environmental Solutions was a utility group. Its goals were to "educate" the public about acid rain and to forestall legislation aimed at requiring utilities to install expensive pollution control equipment in their power plants. Similarly, the Alliance for Saving Energy was essentially a utility group. The Clean Coal Technology Group promoted clean coal technology. The Alliance for Clean Energy was comprised of low sulfur coal producers and transporters, primarily railroads, some utilities, and some consumer related groups. Their message was let the polluters pay, and let the utilities choose what the best compliance method is. They were opposed to a nationwide tax.

2.2.3 Issue Post Emergence (1988-1993)

New domestic political power configurations emerged in 1988. The Congressional stalemate began to break up as the arrangement of influential congressional committee positions shifted. Senate Majority Leader Byrd from West Virginia, a high-sulfur coal producing state, had opposed any acid rain legislation. When he stepped down as majority leader in 1988, George Mitchell from Maine, an impacted state, replaced him. Mitchell had proposed acid rain control legislation for ten years as a member of the Senate Environment and Public Works Committee. The new Speaker of the House of Representatives, Democrat James Wright, also gave top priority to the passage of Clean Air Act legislation.

Presidential candidate George Bush learned from the 1984 Presidential campaign and thus promised to take action on acid rain. In June 1989, President Bush announced that he would support legislation to implement a ten million ton sulfur dioxide reduction goal. This target was to be achieved by allowing utility companies to buy and sell trading allowances for sulfur dioxide emissions. President Bush's endorsement of a market-based emissions reduction scheme won praise from both sides of the debate (Rosewicz 1993; Shabecoff 1993).

In October 1990, Congress formally passed landmark acid rain legislation as amendments to the Clean Air Act. Seemingly the half billion dollar NAPAP assessment did not play a key role in the policy process.[5] The proposed rules were welcomed by environmental groups and industry as a signal that innovation and consultation, rather than obstruction and confrontation, can guide the development of costly new environmental rules (draft rules were issued in October 1991). The final rules were issued in October 1992 after an extended period of public comment. The regulations will eventually cut in half permissible emissions of sulfur dioxide. The rule will take until the year 2010 to reach its goal. The regulations only entered into force in 1995 and the main effect will not be felt until 2000.

Once the 1990 CAAA were passed, President Bush renewed bilateral negotiations with Canada. In March 1991 he signed the US-Canada Agreement on Air Quality, that essentially affirmed the United States' commitment to the CAAA (USCAQA 1992). The Agreement also established a bilateral Air Quality Committee required to produce progress reports every two years. Every five years the two countries will evaluate the success of the agreement. While the Agreement was not a formal treaty, it represented an important symbolic gesture.

Environmentalists praised President Bush for making good on his campaign promise. Canadian officials felt they had achieved their aims. Industry was generally satisfied. By 1992, despite the lack of much in the way of actual emissions reduction and a lingering uncertainty within scientific circles as to the severity of the acid rain problem, the issue had retreated from public view.

2.3 The Print Media and Environmental Reporting

Environmental reporting emerged as a serious and sustained activity in America over the period of our study. Major media sources began creating environmental columns and beats in the 1960s.[6] *Environment* magazine was first published in 1969. Reporting of environmental problems grew in depth and scope during the 1970s. The mainstream press increased environmental coverage as environmental groups began publishing membership magazines.[7] During the 1980s, the media tended to concentrate on environmental incidents rather than issues. The public heard about problems including toxic chemical disasters at Love Canal, Times Beach, and Bhopal; nuclear accidents at Three Mile Island and Chernobyl; the discovery of the ozone hole over Antarctica; and increased concern over global warming during the hot summer and drought of 1988. The increased media attention to these newer and more threatening problems coincided with Reagan's relaxing of environmental regulations. By the late 1980s the media's coverage of environmental issues began to reflect an awareness of greater potential global crisis at hand. As interest in environmental issues grew, more independent environmental magazines emerged.[8]

Environmental journalism continues to gain increased prominence today. The field is the fastest growing segment of journalism today (Lyman 1993). Membership in specialized organizations for environmental journalists are growing, such as the Society of Environmental Journalists (now 900 members) and the Environmental Reporting Forum, a joint program of the Radio and Television News Directors Foundation and the Media Institute memberships.

2.3.1 The Selected Newspaper: *The New York Times*

There were 1,657 daily newspapers in the United States in 1994, with a combined circulation of some 62.5 million (UN DPI 1994). There is no one single national newspaper, but rather several elite national newspapers that have broad nation-wide appeal. Only a few papers have sought national distribution, the most important of the dailies being the *New York Times*, whose national edition is transmitted by satellite for printing in eight locations throughout the country; *The Wall Street Journal*, published in four regional editions serves the interests of the business community primarily and has

the highest nation-wide circulation; the Boston-based *Christian Science Monitor*, published in three domestic editions plus an international edition; and the *USA Today* (Banks 1994).

The *Times* was selected for the content analysis because of its influential role in the business, science, and policy communities. Media executives, analysis, and consumers have consistently ranked the *Times* as the top newspaper in the United States in quality and comprehensiveness.[9] As of 1994, Timesmen had won 69 Pulitzer Prizes for journalistic excellence, more than any other newspaper (Dickman 1995). It has a total news staff of over 1,000. Its foreign coverage includes 32 full-time correspondents working out of 26 bureaus (Dickman 1995). It subscribes to four news services: Associated Press, Reuters, Dow Jones, and Bloomberg. 1992 daily circulation figures were over 1 million while the Sunday addition had a circulation of nearly 1.8 million.[10]

Over the period studied, the *Times* provided more depth and breadth of coverage of global environmental issues than any other national paper in the United States.[11] Under its slogan, "More than Just the News", the paper introduced a special insert section on "Science, Education, and Medicine" in 1978. The present "Science Tuesday" section has no equal in other daily newspapers. Phillip Shabecoff became the *Times*' first environmental reporter. He was assigned to the environment in 1976, but also covered health policy and consumer affairs. In 1981 the environment became a full-time beat.

3 CONTENT ANALYSIS OF PRESS COVERAGE OF ACID RAIN

3.1 Methodology

Our study identified 447 articles dealing with acid rain printed in the *Times* between 1972 and 1992. We searched the *Times* Index manually for the period 1972-1978. Dialog's National Newspaper Index, that covers the *Times* for the period 1979-1992, was searched electronically to identify articles on acid rain. The search identified articles with the words "acid rain" or "acid deposition" or "acid precipitation" in either titles or as descriptors. For the period before 1979, our manual search also included the term "air pollution", but articles so identified were then individually reviewed and only those referring specifically to acid rain were retained for analysis. Finally, we distinguished between "news" articles and other forms of coverage including reviews, letters to the editor, editorials, and columns. Unless otherwise noted, the analysis presented here is based on the 298 "news" articles on acid rain that this methodology identified in the *Times* over the period 1972-1992. In addition to these published articles, our findings reflect interviews with a number of reporters and press officers as well as scientists, government officials, and members of environmental and industrial organizations.

3.2 Issues in Perspective

3.2.1 Timing

Figure 1 shows the temporal distribution of *Times* articles on acid rain for the period 1972-1992. The distribution of all articles and news articles is essentially the same.

In other countries such as Sweden and Germany, the press had been instrumental in getting acid rain onto the public agenda. This was not the case in America. Here, the press played no significant role in launching acid rain as a public policy issue. Between 1972 and 1978 the *Times* printed only 14 articles on acid rain. These focused mainly on emerging scientific findings of researchers in the

United States. They also included comments on increased levels of acidification in the Northeast and Europe. During the same period, however, scientists had already convinced the President's Council on Environmental Quality to call for "a comprehensive national program to assess the acid rain problem (CEQ 1977:198)." Government regulators had begun to formulate emission reduction plans. And American diplomats, prodded from both domestic and foreign politicians, had opened acid rain discussions with Canada.

But if the press was a passive and relatively uninterested observer of acid rain's emergence onto the American agenda in the late 1970s, it was a full partner in the issue's rise to national prominence through the early 1980s. Figure 1 shows the *Times*' increasing attention to acid rain from 1979 to a peak in 1984, when it published articles on the subject at a rate substantially in excess of one per week. Congressional activity on acid rain rose dramatically over the same period, reflecting the symbiotic coupling between media attention and political attention that has been documented in other issue areas (Baumgartner and Jones 1993).

The acid rain issue, however received significantly more attention from the press than climate change, ozone depletion, or any other large scale environmental issue of the 1980s. The most important factor behind this unprecedented level of interest was almost certainly that acid rain became the a "litmus test" for the Reagan Administration's policy towards the environment. Shortly after coming to office in the "Reagan Revolution" of 1981, Reagan's administrators blocked implementation of scheduled emission reductions and broke off negotiations with the Canadians that had begun under the Carter Administration. The Canadian government, American NGOs, and some affected states were outraged. In response, they attacked the White House and EPA in the courts, the Congress and the media. This provided extraordinarily news-worthy material for the press. The resulting publicity made it all the more difficult for the Administration -- committed at its core to rolling back regulation -- to back down. The conflict escalated. Peak coverage in 1984 coincided with number of important elections in both the United States and Canada where the acid rain problem emerged as a central campaign issue.

Coverage dropped dramatically after 1984, such that by 1992 fewer *Times* articles appeared on acid rain than in any year since 1979. This decline did not reflect new observations, or new science: the National Acid Precipitation Assessment Program issued its final -- and unsurprising -- report only in 1991. Why, then, did the *Times* coverage of acid rain trail off through the late 1980s and early 1990s?

Journalists interviewed for this study offered several explanations. Barbara Rosewicz, environmental reporter for the *Wall Street Journal*, saw the initial decline in 1985 this way: "Editors just aren't interested in putting something they have already heard about on the front page (Rosewicz 1993)." In other words "Attention, having gone up, must come down".

William Stevens, who began covering the environment beat for the *Times* in 1991, provided a complementary explanation for the continuation of the downward trend in the later 1980s: "[O]ther more global, overarching issues have come to the fore, such as global warming, biodiversity loss, and ozone depletion." Stevens added that policymakers, in the midst of setting priorities, realized that "...these other issues were much more important" than acid rain (Stevens interview 1993).[12] We have shown elsewhere that both the *Times*' and the Congress' attention to these other global issues were indeed rising as their coverage of acid rain fell (Dickson and Clark, forthcoming).

According to former *Times* environmental reporter Philip Shabecoff, the *coup de grace* for acid rain in the media was passage of the 1990 CAAA. In the eyes of the public, this legislation meant that policymakers had "solved" the acid rain problem (Shabecoff 1993). In fact, passage of the 1990

CAAA and the subsequent agreement with Canada did essentially satisfy the demands of the actors in the 1980s' acid rain debates. No longer would Canadian officials, state governors or environmentalists -- all of whom had provided input to the drafting of the CAAA regulations -- feel compelled to attract media attention to their positions.

We would add only one additional observation to those above. Acid rain could have become a divisive issue in America's 1988 elections, thus garnering the surge of press attention it had received four years earlier. One reason it did not is almost certainly that political leaders wouldn't give it a second chance. Early in that election year, state governors Cuomo (New York) and Celeste (Ohio) who, though representing opposite sides of the domestic debate, announced that the time had come to break the regional deadlock, agreed to "a reasonable and imaginative effort to... solve the acid rain problem," and advanced a specific proposal to do so.[13] Shortly thereafter, candidate George Bush -- seeking to distance himself from the environmental record of the Reagan (and, of course, Bush) Administration -- declared that for acid rain "the time for study alone has passed."[14] After his election, Bush moved swiftly to back up his campaign rhetoric with a proposal for reducing sulfur dioxide and nitrous oxide emissions that eventually emerged in the Clean Air Act Amendments of 1990. With no presidential politics left in the acid rain issue, America's attention turned elsewhere. By 1992, the issue had returned to the esoteric world of science and law from which it had emerged a dozen years earlier. It disappeared from the public, and press, agenda.

3.2.2 Framing

Geographic Focus of Coverage

While reports by Scandinavia scientists placed the issue of acid rain on the international scientific agenda, *Times* coverage of the issue focused on North American concerns throughout the study period. The relevant data are summarized in Figure 2.

Beginning in the early 1980s, the acid rain issue increasingly became a political story in the United States. It was framed strongly in domestic terms relative to the intra-national (i.e., regional) equity issue. Simultaneously, it was framed in domestic and transboundary terms relative to the ongoing negotiations concerning an air quality accord between the US and Canada. In 1981, for example, the *Times* devoted more than 70 percent of its acid rain coverage to the domestic-transboundary issue, whereas a year earlier domestic concerns had occupied 90 percent of the paper's acid rain coverage. Still, domestic concerns regained their dominant position. During 1982-1985, of the 12 front page *Times* articles on acid rain, seven dealt with the domestic debate on the severity of the problem, four on the intra-national equity issue, and only one on the transboundary pollution aspects of the problem. By 1986, the transboundary focus displaced domestic concerns by only a slight margin; both front page articles on acid rain that year focused on the ongoing bilateral discussion. In 1987, the *Times* devoted equal attention to domestic and domestic-transboundary concerns, with the ongoing negotiations being the subject of five of the seven front page articles appearing that year. During the remainder of the 1980s, domestic political concerns dominated, as newly elected President Bush vowed to take action to reduce acid-rain related emissions. Thereafter, all front page articles on acid rain concentrated solely on domestic issues.

Most non-domestic coverage was from Canada. During the early-to mid-1980s, the Canadian capitol city of Ottawa served as the third major geographic source of acid rain articles (behind Washington, DC and New York). Acid rain in countries other than the US, Canada and -- to a lesser extent -- Mexico rarely appeared in the *Times*. Coverage of Mexican copper smelter emissions impacting the US appeared in three articles in 1985, 1986, and 1989. Even less mention was made of acid rain in Germany, UK, Norway, Sweden, the Soviet Union, Africa, and Poland. Germany was mentioned in

only two *Times* articles, one in 1983 on the death of the Black Forest and another in 1984 on European policy to address acid rain. A 1989 article referred to New England's use of the Swedish lake liming model to treat acidified lakes. An article on acid rain from the west affecting the Soviet Union appeared in 1984. Another 1989 article out of Germany covered acid rain's impact on West African rain forests. In general however, the *Times*' coverage focused on acid rain as primarily a regional, and secondarily a North American concern. Virtually no effort was made to connect American developments on acid rain to the problems encountered or solutions attempted on other continents.

Causes of Acid Rain

When the long range transport of acid rain emerged onto America's national political agenda in the late 1970s it was largely framed as a problem caused by electric utility plants. Within that frame was a strong focus on the sulfur dioxide emissions of coal burned in those plants. Transportation emissions of nitrous oxides never achieved a dominant position in the broader American debate on acid rain. This framing of the problem was grounded in the intense policy debate that had been underway in America throughout the 1970s over the role of coal in a national energy policy and, particularly, the prospects for burning coal in ways that would meet *local* standards for ambient air quality and emissions. Powerful interests had developed a stake over the sulfur dioxide but not nitrous oxide, portion of coal's emissions and carried their agendas forward into the acid rain debate. Coal producers and the electric utilities themselves became conspicuous participants in that debate, while transportation interests pursued a strategy of grateful invisibility.

This framing of the national political debate was reflected in, and amplified by, coverage of the *Times*. Figure 3 shows that the overwhelming majority (about 75 percent) of its articles dealing with the causes of acid rain placed the blame on emissions from power plants. In contrast, only about 20 percent discussed automotive transport. And less than 10 percent addressed smelter emissions, silvicultural mistakes and natural causes combined. It was smokestacks, not tailpipes, that the newspaper cartoonists drew in their portrayals of the problem.

Impacts of Acid Rain

In contrast to America's limited vision of acid rain's causes, its view of possible effects remained broad. The public health and welfare concerns that had dominated local air pollution discussions in the 1960s and 1970s were indeed relegated to secondary importance with the recognition that long range transport of acid rain could endanger remote ecosystems. But while in many countries the subsequent debate focussed on a single class of effects (e.g., freshwater systems in Canada and forests in Germany), American concern for ecosystem effects remained eclectic.[15] Though at a regional level specific effects often dominated the debate, no nationally significant constituency emerged around any particular effects area.

The *Times*' coverage of the primary impacts of acid rain reflected this diversity. As shown in Figure 4, throughout the period of intense media attention covered in this study, a third of the *Times*' articles dealing with acid rain effects mentioned damage to aquatic systems while about a quarter mentioned forest damage. Other damages, such as those to human health and material damage were mentioned in about a tenth of the articles.

The American debate on effects of acid rain nonetheless did coalesce around a single powerful image: not one of individual impacts but rather of the acidity of precipitation per se. Nowhere is this clearer than in the print media cartoons of the subject, where perhaps the commonest image was one of rain dissolving umbrellas.[16] For all the scientific controversy on the subject of acid rain's effects, a broad "common sense" consensus seemed to emerge early on that too much acidity falling from the sky was a bad idea, and that something should be done about it.

Options to Address Acid Rain

The earliest American legislation on air pollution had assigned government the task of recommending specific technologies for emission abatement. This preference for mandated technological solutions ran deep in EPA and many NGOs well into the 1980s. A technological bias for control of acid rain was also reenforced by the issue's inheritance of the "clean coal" constituencies that had grown up to protect eastern (high sulfur) coal interests during negotiations over control of local sulfur dioxide pollution in the late 1970s and embedded itself in the CAAA of 1977.

The strategic alternative to technology mandates was allowing industry flexibility in deciding how it would reduce emissions. Various forms of taxes were discussed in Congress in the early 1980s, but primarily in the context of spreading the cost of mandated solutions rather than providing incentives for emission reduction. The idea that finally came to dominate the debate over policy means was the incentives-based concept of "tradable emission permits." This approach, that allowed industry substantial flexibility in deciding how it would meet emissions targets within specified geographic regions or "bubbles," had been used by EPA for other pollution problems as early as 1974. It had surfaced in American acid rain debates by 1980, and was included in several unsuccessful efforts to legislate acid rain policy through the 1980s. The flexibility and potential cost savings inherent in the tradable permits approach was lauded by a wide array of industrial, Congressional and academic participants in the acid rain discussions including President Reagan himself. Nonetheless, the strength of vested interests assured that tradable permits and their associated "bubbles" would begin to displace technology mandates as the dominant frame for the policy debate on the control of acid rain only as the issue itself was resolved and sank from public view in the wake of the 1990 Clean Air Act Amendments.

Our quantitative analysis of the *Times*' coverage shows that the newspaper captured the main elements of America's policy debate on options for dealing with acid rain (see Figure 5). Over the entire period of our analysis, the paper focussed primarily on domestic rules (more than a third of its articles) and emissions technologies (more than a quarter). In particular, during the 1980s its major focus was on emissions standards for power plants, technologies to reduce emissions in power plants through the use of scrubbers, fuel switching to low sulfur coal and, to a lesser extent, lawsuits.[17] The policy discussion on financial incentives was also captured by the *Times*, including not only the triumph of incentive options in the 1990s, but also the unsuccessful bids to introduce such options throughout the 1980s. The *Times*, like the national policy debate in general, devoted almost no attention to technologies that might mitigate the impacts of acid rain.

Throughout the 1980s the *Times* articles carried on a consistent if low level discussion of options involving international law and negotiations. Peak interest in the *Times* occurred in 1981, where over 30 percent of the articles discussed the new US-Canada Memorandum of Intent to work out an acid rain treaty. Reporting on US-Canada talks concerning coordinated abatement strategies continued through the mid-1980s but, interestingly, disappeared as those talks finally came to fruition in the early 1990s.

3.2.3 Slant

One of our central tasks in this research was to assess what, if any, systematic bias or slant might be evident in press coverage of the acid rain issue. To accomplish this we looked for both "action" bias -- whether articles reflected a clear stance with regard to the need for action on acid rain -- and "actor" bias -- whether articles systematically portrayed some groups more favorably than others.

We found that the vast majority (more than 85 percent) of the "news" stories printed by the *Times* over our study period conveyed no action bias on the acid rain issue. In other words, they did not convey a position on whether the nation should or should not take action. Figure 6 shows that of the roughly 10 percent of the articles that were pro-active, almost all were published in the 1990s when a national consensus on action had already emerged. No significant number of articles were slanted towards the wait-and-see position advocated by the Reagan administration.

Our analysis also shows that news reports in the *Times* displayed no significant actor bias in their coverage of acid rain. No more than 5 percent of the articles were classified as portraying actor groups in other than a neutral light. As shown in Figure 7, within this small population of slanted articles, a pro-environmental bias was most common, followed by an anti-industry and anti-government bias. These negative biases were observed, however, in only 2 percent of the total news article pool. They also tended to be concentrated in the "tails" of the coverage period, when very few articles of any sort were being published.

In contrast to the remarkably neutral character of its news articles, the *Times* did not hesitate to publish strongly slanted opinions on its editorial and opinion pages. Further, the *Times* ran over a hundred letters-to-the editor, opinion-editorial (op-ed) columns, editorials, and reviews on acid rain during the study period. In the 19 editorials it published on acid rain from 1980-1988, the *Times* consistently critiqued President Reagan's anti-regulatory position, while praising the environmental leadership of officials from New York State and Canada. This was clearly a pro-action rather than anti-government stance, however. Two editorials in 1989 praised President Bush and the new EPA administrator William Reilly for their innovative market based plan to significantly reduce sulfur dioxide emissions that was included in the 1990 CAAA.

More than half of the op-ed pieces published by the *Times* advocated increased regulatory controls on sulfur emission, including two by a former senior editor of the *Times*. Roughly a quarter argued that more controls were not warranted by the available data.

The *Times* clearly treated letters to the editor more as news than as opinion: the selection of letters for publication was carefully balanced with regard to slant. Most letters were contributed by either environmental or industry organizations. The American Electric Power Services Corporation in Ohio had two letters published in 1980 that used scientific uncertainty about the causal relationship to support their position, as did the Consolidated Coal Co. in 1983. Energy Conversion Alternatives advocated coal washing (1982). The Clean Coal Coalition, the National Coal Association, and Edison Electric Institute all advocated the development of clean coal technologies. The Alliance for Clean Energy wrote in 1985 advocating the use of low-sulfur western coal. The majority of pro-regulatory pieces were written by representatives of environmental advocacy organizations in the early 1980s. These included letters from the Adirondack Council (1979 and 1980), the Natural Resources Defense Council (1981), The Environmental Defense Fund (1981, 1983), the National Audubon Society (1981, 1983), and the National Wildlife Foundation (1982, 1984).

In conclusion, the *Times* clearly separated news from opinion in its articles on acid rain, practicing impartial, objective reporting on its news pages, while projecting a distinct set of preferences on its editorial pages.

3.2.4 Sources

A number of studies have shown that American journalists are much more likely to rely on government officials than other sources for their news stories on environmental policy (American Opinion Research 1994; Scheer 1993). This is not a surprising finding, since many such stories are

written from the point of view of what the government is or is not doing. A recent national poll of 102 American environmental reporters asked which sources they used for most of their stories about the environment. Government officials, press releases or reports were cited most frequently (about 40 percent), followed by environmental activists groups, academics, and professional journals at about 20 percent each. Business or industry sources -- executives, press releases, and company and industry publications -- were cited as dominant sources by less than 5 percent of the reporters (American Opinion Research 1994).

Our study bears out these general findings for the specific case of the *Times* and acid rain. As shown in Figure 8, the *Times* consistently favored United States government sources over all other source types. Over the entire study period, US government officials -- primarily from the executive branch -- were important sources for more than half of the *Times*' acid rain news stories. Canadian government officials, nongovernmental environmental organizations and academics each were cited as sources in about 10 percent of the stories. Industry representatives were quoted in little more than 5 percent of the stories.

Government organizations appeared to have relied primarily on press releases, and on press conferences when a significant government report was released. US Government officials most frequently mentioned were Presidents Reagan and Bush, EPA Administrators,[18] US Senators Mitchell, Stafford, and Byrd, New York State Governor Mario Cuomo, and US Envoy to Canada Drew Lewis. Occasionally an agency representative wrote a letter to the editor.

Canadian government officials also captured a great deal of attention in the *Times*. Prime Minister Brian Mulroney was cited as a source more than any other individual except President Reagan. Canadian environmental ministers were frequently quoted as well.[19] An analysis of the news story datelines revealed one corollary of this strong showing: during the early- to mid-1980s, the Canadian capital city of Ottawa served as the third major geographic source of acid rain articles (after Washington, D.C. and New York). Canadian officials used their access to *Times* reporters to get their views heard in America and to exert pressure on the US government.

Canadians made strong efforts to educate the American public as well. The federal ministry Environment Canada decided to launch a large public information campaign in the US, that included disseminating press releases and literature on acid deposition, organizing speaking engagements by Canadian officials, and distributing "Stop Acid Rain!" buttons and bumper stickers. Beginning in 1979, the $500,000 per year public information campaign likely contributed to the significant rise in public awareness of the issue in the early 1980s. This seemed to touch a nerve with the Reagan administration, as the Justice Department in 1983 labeled two films produced by this effort as "propaganda" under the Foreign Agents Registration Act of 1938.

Environmental groups also developed press strategies. Many groups had staff with credible expertise on the acid rain issue. These experts were willing, indeed anxious, to talk to the press about the scientific complexities of the problem, but also about policy approaches for meeting environmental goals. They used the media to challenge Reagan's anti-regulatory position by holding press conferences to announce new scientific findings, by writing editorials, by calling on Congress to hold hearings on the issue, and by filing lawsuits against the EPA for failing to enforce its own regulatory mandate. They made themselves accessible to the press, readily providing interviews. Environmental groups spent more time "working the media" than business did, according to Barbara Rosewicz of the *Wall Street Journal*. "They are very vigilant about letting me know days in advance that something might come out, or calling me the day a report came out and saying there's somebody you can talk to if you want to, and they'll be available before your deadline, etc." (Rosewicz 1993). Many

environmental groups were far from doctrinaire in their approaches and were more than willing to talk to the press about measures consistent with the profit-making motives of industry. One frequently cited source was described by *Times* reporter Stevens as "good to quote because he is an atmospheric scientist; he's very articulate and willing to talk; and he unabashedly represents the environmentalist viewpoint (Stevens 1993)." Philip Shabecoff, a reporter for the *Times*, used a lot of information from Canadian environmental groups (Shabecoff 1993).

Business used a variety of tactics to get media coverage. For example, the Alliance for Clean Energy, a group of low sulfur coal producers and transporters, sought coverage in local and state newspapers where they aimed at getting a message across to a certain member of congress (Gibson Prowitt 1983). They choose communities that were important because of the position of committee members who were in leadership positions. They met with editorial boards of the papers, with the local Chambers of Commerce, and with opinion leaders to discuss the effects of acid rain legislation being considered in Federal legislation. Generally industry made itself much less available to the press. "With business, I would have to call them and sort of beg to find somebody to talk to...If they called me back, they'd get in the paper...If it's not to their advantage to talk, they won't, whereas the environmentalists will always talk" (Rosewicz 1993). At the national level, industry was well represented. Relative to other global environmental issues such as stratospheric ozone and climate change, the proportion of witnesses from industry testifying before Congress on acid rain is high (Dickson and Clark, forthcoming).

Scientists were most evident as sources during the early stages of the acid rain debate. In the 1970s, what little press coverage there was of acid rain treated it as a scientific issue. All but three of the 19 sources cited in *Times* news articles of that period were scientists. As acid rain emerged onto the political agenda in the early 1980s, however, reporters turned from citing scientists to using government officials as their favored sources. This finding is consistent with the results of other studies showing that the public first learns about environmental problems as science issues, before they become transformed into political stories (e.g., Dunwoody and Peters 1992; Lichter, Amundson and Lichter 1992; Friedman 1991). Most of the scientific information came from press releases and press conferences from the National Academy of Sciences when a report was released. The NAPAP office was not perceived as having had a strong media strategy. Scientist Gene Likens used Cornell University's News and Feature Service to gain attention to the acid rain issue in the early 1980s (Cornell University 1984). Volker Mohnen at the Atmospheric Sciences Research Center at the State University of New York at Albany had a letter to the editor published in 1983 criticizing Michael Oppenheimer of the EDF's coverage of the issue. William Nierenberg, Director of the Scripps Institute and chairman of the 1983 science panel reporting to the White House Office of Science and Technology Policy wrote a letter defending their expert report.

In the cases of ozone depletion and global warming, American reporters seized on one or a few key scientists and quoted them throughout the coverage period (Dickson and Clark, forthcoming). In the acid rain case, however, the press did not find a favorite scientist. *Times* reporter William Stevens explained this by arguing that the acid rain issue was too diffuse, with aspects relating to forests, aquatic systems, buildings, and monuments, for there to be one or more science "czars" as there were in the ozone case (Stevens 1993). Another *Times* reporter, Philip Shabecoff, stated that the likely candidates had "a position on acid rain early on. Because [of this] and because of the pressure I was getting from my editors, I hesitated to quote [them]". Environmental Defense Fund scientist Michael Oppenheimer, himself often quoted as an environmental expert in the acid rain case, suggested that personality was an important factor. Scientists who might have taken the lead with the press on acid rain, he argued, happened to be more shy and private than those who emerged as leaders in other global environmental issues (Oppenheimer 1993). There is almost certainly some truth in each of these statements, though none of them can be quite all of the answer to why the acid rain issue failed

to develop a scientist spokesperson. Work we report elsewhere shows, for example, that while some of the press's most quoted scientists on ozone depletion and climate change were in fact vocal personalities, others were not. And while some of them consciously cultivated a neutral position on the issues, others were whole-hearted advocates of action. Finally, though acid rain is certainly a highly complex and multidiciplinary problem, so is climate change (see Dickson and Clark, forthcoming).

4 CONCLUSION

Analysis of the coverage of the acid rain issue by the *Times* highlights a number of differences between the US and other countries in how the issue of acid rain was framed. The study shows that more than an international transboundary issue, the issue was seen as a domestic issue that was dominated by intra-national equity concerns. The US-Canada transboundary issue was secondary, and there was little attention given to the issue elsewhere.

The timing of attention given to the issue was similar to other countries. There are plausible "American" explanations for the timing of the *Times*' interest in acid rain. The problem was framed as a scientific one in the 1970s, there was sustained interest in the 1980s, with attention peaking in 1984, coincident with national elections. After 1988 attention decreased. The passage of the 1990 CAAA essentially satisfied the demands of major actor groups. No longer would Canadian officials, northeast State officials or environmentalists -- all of whom had provided input to the drafting of the regulations -- feel compelled to attract media interest in their position. These factors, though certainly relevant, cannot however be the full story. For other countries to which these "local" explanations do not apply, exhibited similar cycles of news attention at similar times.

The US framed the causes and impacts of acid rain differently from European nations. Because of the focus on regional concerns, coverage of options to address the problem concentrated on domestic standards and emissions technologies to deal with power plants. There was much less discussion of international rules, and concern over automobile emissions was nearly absent. Over time there was a definite shift to covering market mechanisms, particularly trading of pollution rights. US coverage also focused on the impacts on aquatic systems over forests consistently throughout the time period.

Like other nations, the US relied on government officials as news sources. However, the second most frequently cited source was the Canadian government, followed by environmental groups. The US may be different from other countries in that many environmental groups have people who have credible knowledge of the issue and who are willing to talk to the media about complicated scientific problems and who are thinking about approaches for meeting environmental goals that take into account the profit-making motives of industry.

In the final analysis, however, the overriding finding of this study is that the *Times* served its readers for twenty years as a reasonably accurate and unbiased mirror on the nation's debate over what to do about acid rain. The *Times* did not set or significantly alter the national agenda on acid rain. Rather, it provided an important amplifier for groups with interests in that agenda. It provided coverage of the views of different groups in rough proportion to their willingness and ability to provide news events and articulate interviews on the subject. It presented these views in a generally fair and unbiased light. In short, the *Times* performed a role very consistent with American notions that the role of the press is an open and participatory policy process.

Figure 1. Frequency of all articles and "news" only articles (excludes reviews, letters to the editor, editorials, and columns) in the *New York Times* scaled as a proportion of the number of articles in the year of maximum citations (1984 = 82 articles for all articles; 1984 = 47 articles for news articles), 1972-1992.

FIGURE 1
NEWSPAPER ATTENTION -- "ACID RAIN" -- UNITED STATES

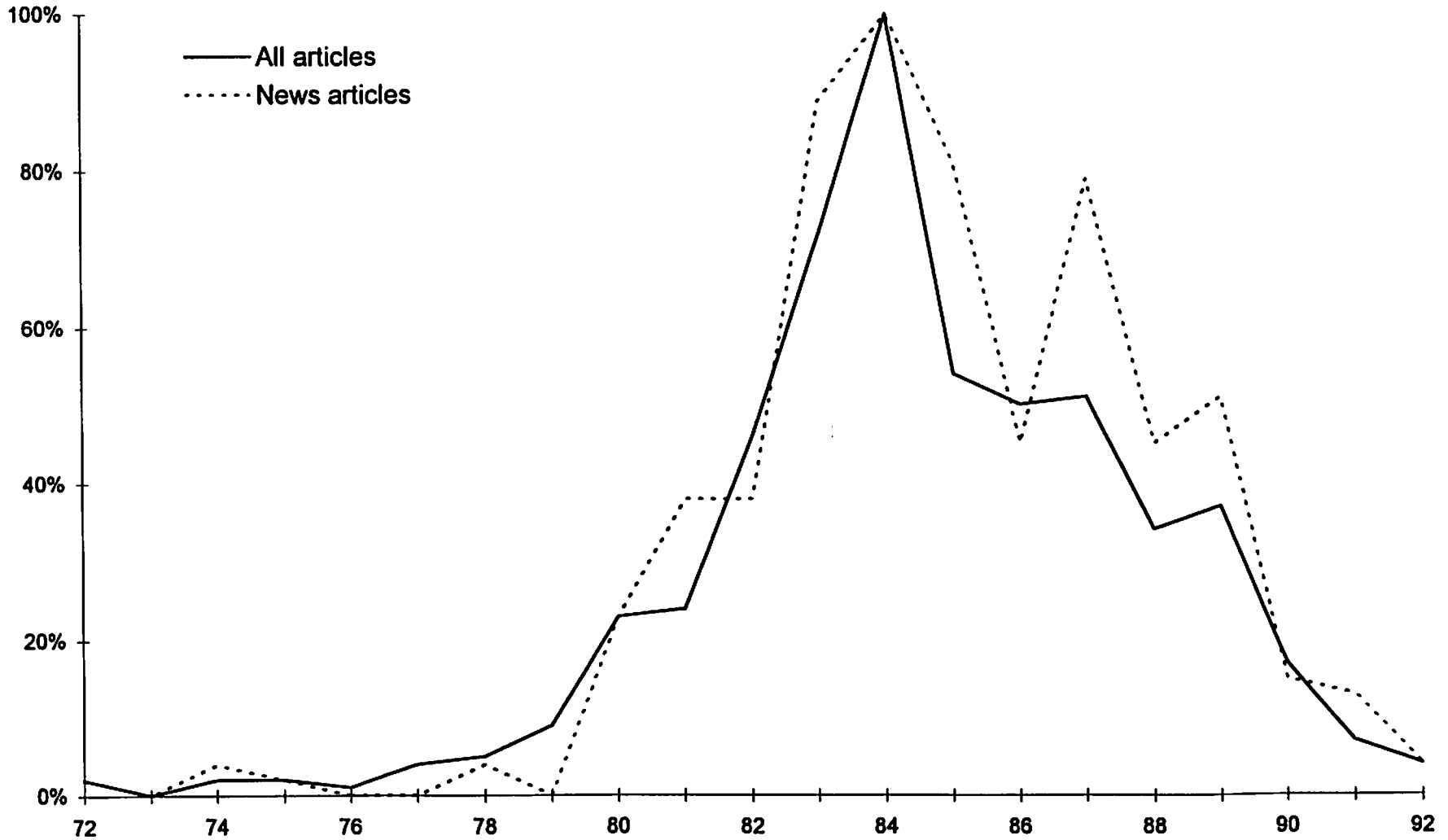


Figure 2. Percentage of *New York Times* articles in a given year belonging to each category, 1980-1992. Each article was assigned to only one of the following categories: purely a "domestic" scope; "domestic and transboundary" includes those articles that mention transboundary aspects but have a domestic focus; and "non-domestic" includes articles that have the transboundary aspect as the main focus or cover another country's problems. This analysis was performed on all "news" articles identified in Figure 1.

FIGURE 2
GEOGRAPHIC FOCUS – "ACID RAIN" – UNITED STATES

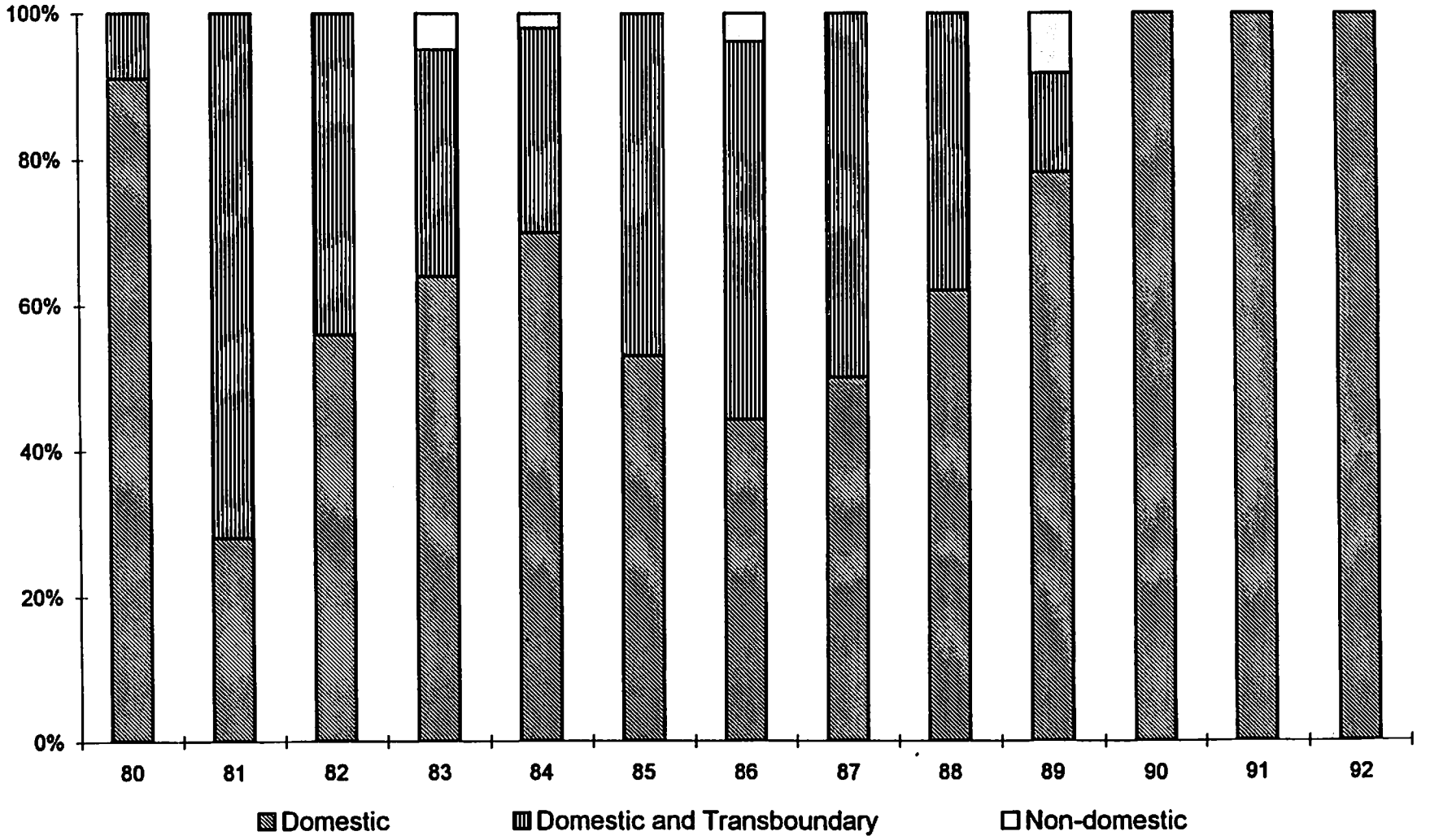


Figure 3. Percentage of all causes of "acid rain" mentioned in *New York Times* articles in a given year belonging to each category, 1980-1992. Each article may have more than one cause coded. This analysis was performed on all "news" articles identified in Figure 1.

FIGURE 3
CAUSES -- "ACID RAIN" -- UNITED STATES

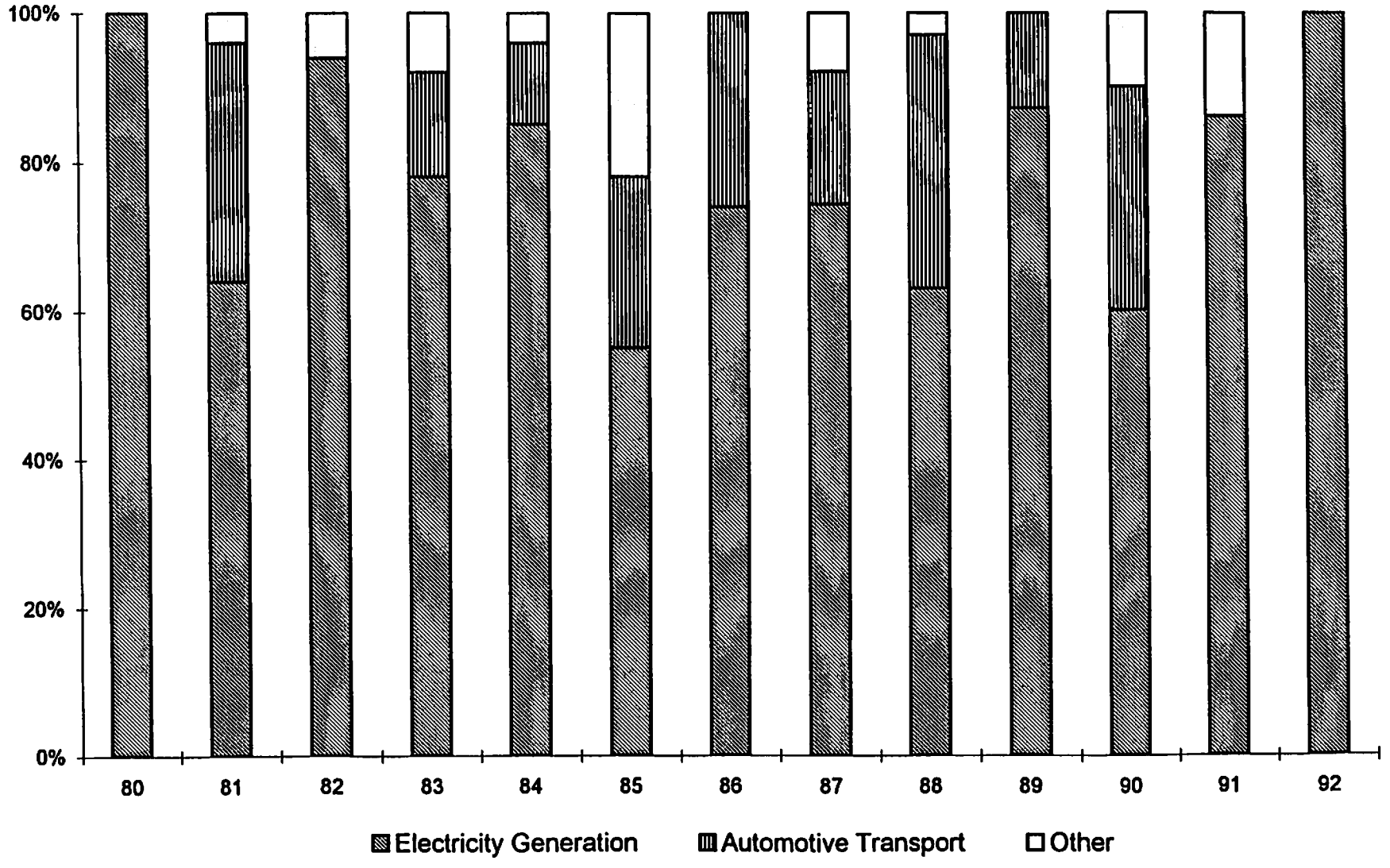


Figure 4. Percentage of all primary impacts of "acid rain" mentioned in *New York Times* articles in a given year belonging to each category, 1980-1992. Each article may have had more than one primary impact coded. Generic secondary effects, e.g., economic damage, are not included unless they are posed in terms of one of the listed primary impacts, e.g., the economic impact on forests is generally coded under forest impacts. In 1992, the two articles coded failed to mention impacts at all. This analysis was performed on all "news" articles identified in Figure 1.

FIGURE 4
PRIMARY IMPACTS -- "ACID RAIN" -- UNITED STATES

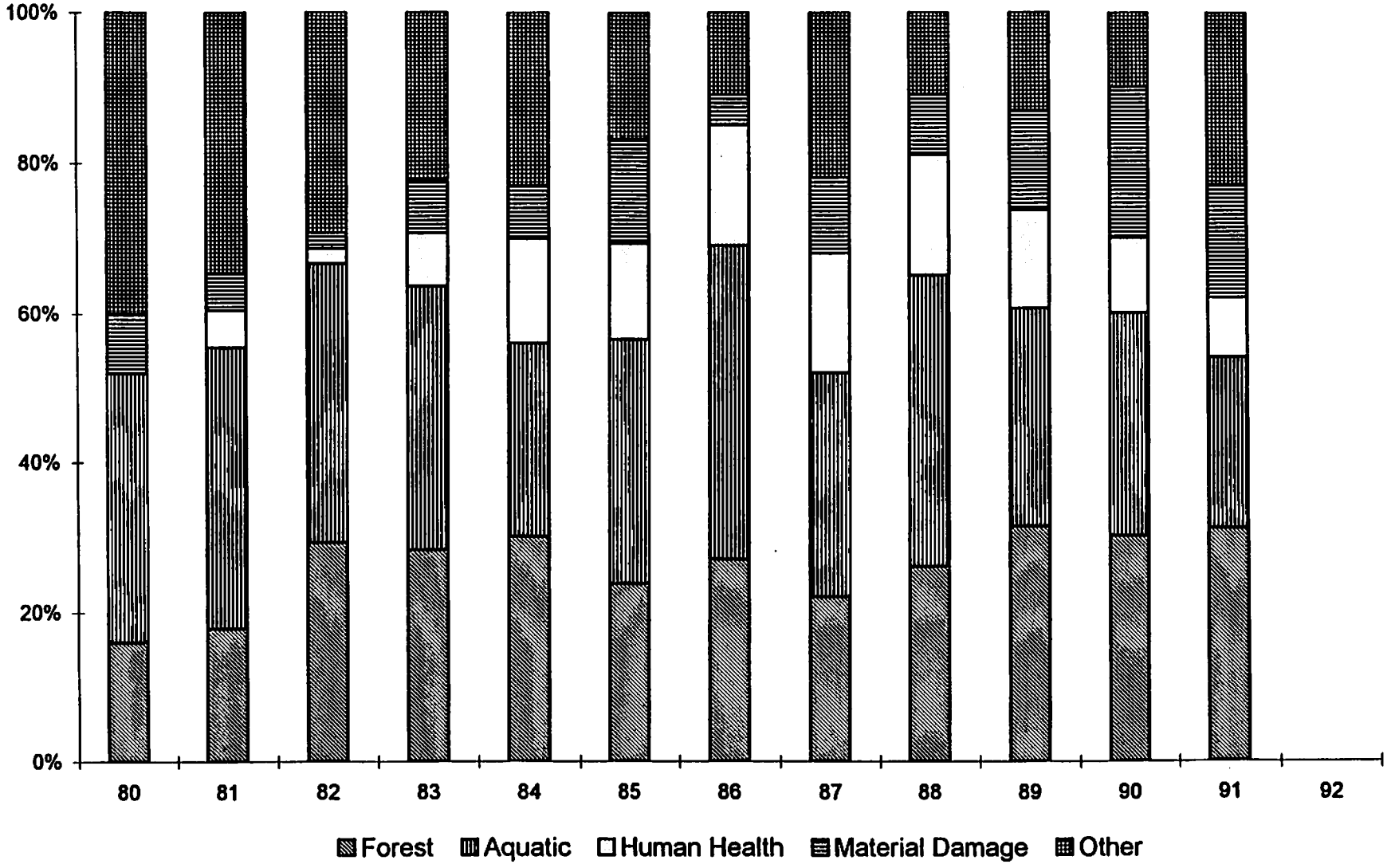


Figure 5. Percentage of all options to manage "acid rain" mentioned in *New York Times* articles in a given year belonging to each category, 1980-1992. Each article may have had more than one of the following option categories coded: "technology - emissions" includes technologies such as those that reduce emissions in power plants and autos, fuel switching, and renewable energies. "Technologies - impacts" are technologies designed to mitigate impacts such as liming, fertilizing, or breeding resistant species. "Rules - domestic" include emissions standards for power plants or autos, and lawsuits. "Rules - international" includes international or bilateral regulations or agreements. "Incentives" could include financial incentives and education. This analysis was performed on all "news" articles identified in Figure 1.

FIGURE 5
OPTIONS -- "ACID RAIN" -- UNITED STATES

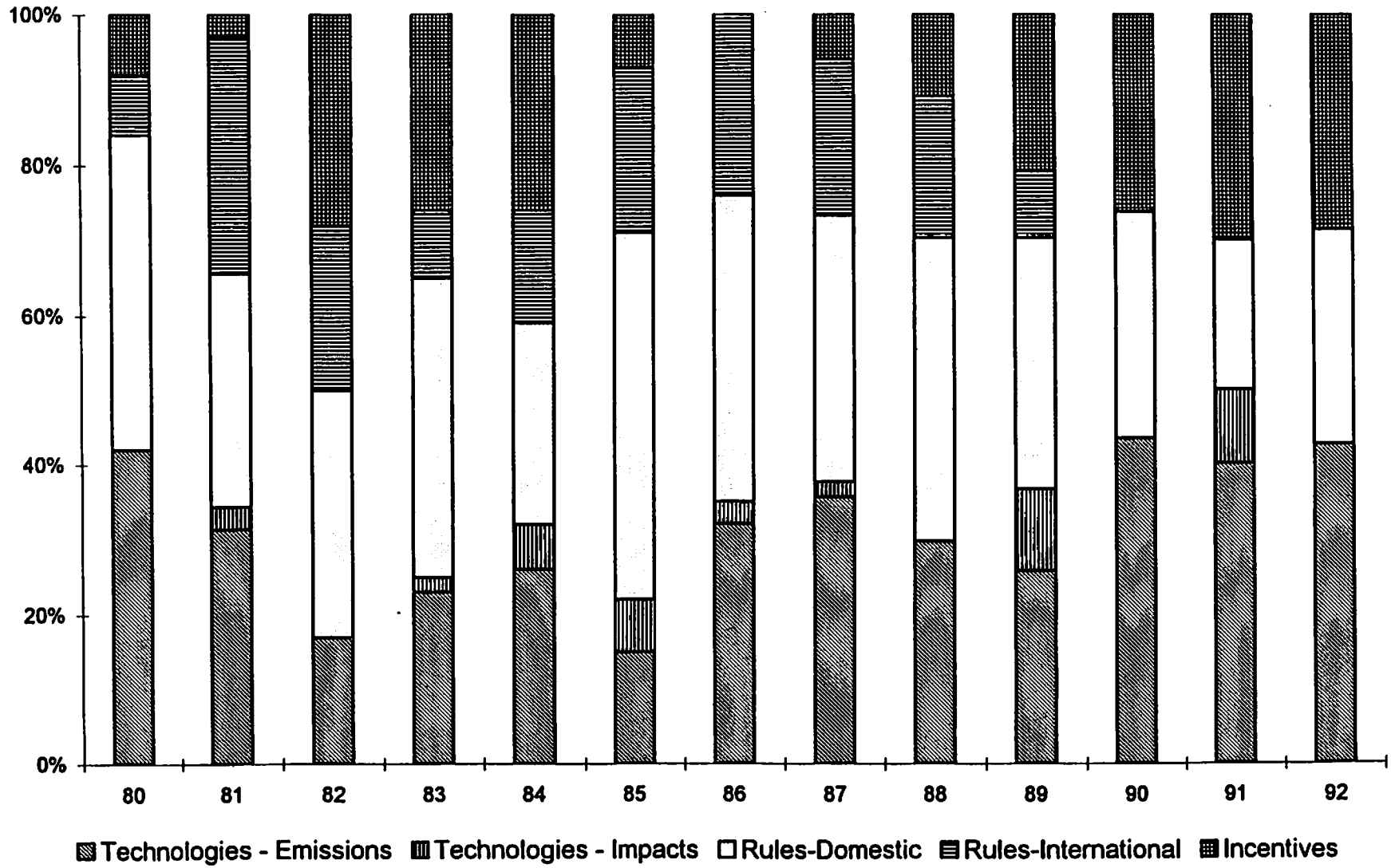


Figure 6. Percentage of *New York Times* articles on "acid rain" in a given year that were either for action or against action, 1980-1992. The percentage of articles coded as neutral is not shown. Each article was assigned to only one category. This analysis was performed on all "news" articles identified in Figure 1.

FIGURE 6
ACTION BIAS -- "ACID RAIN" -- UNITED STATES

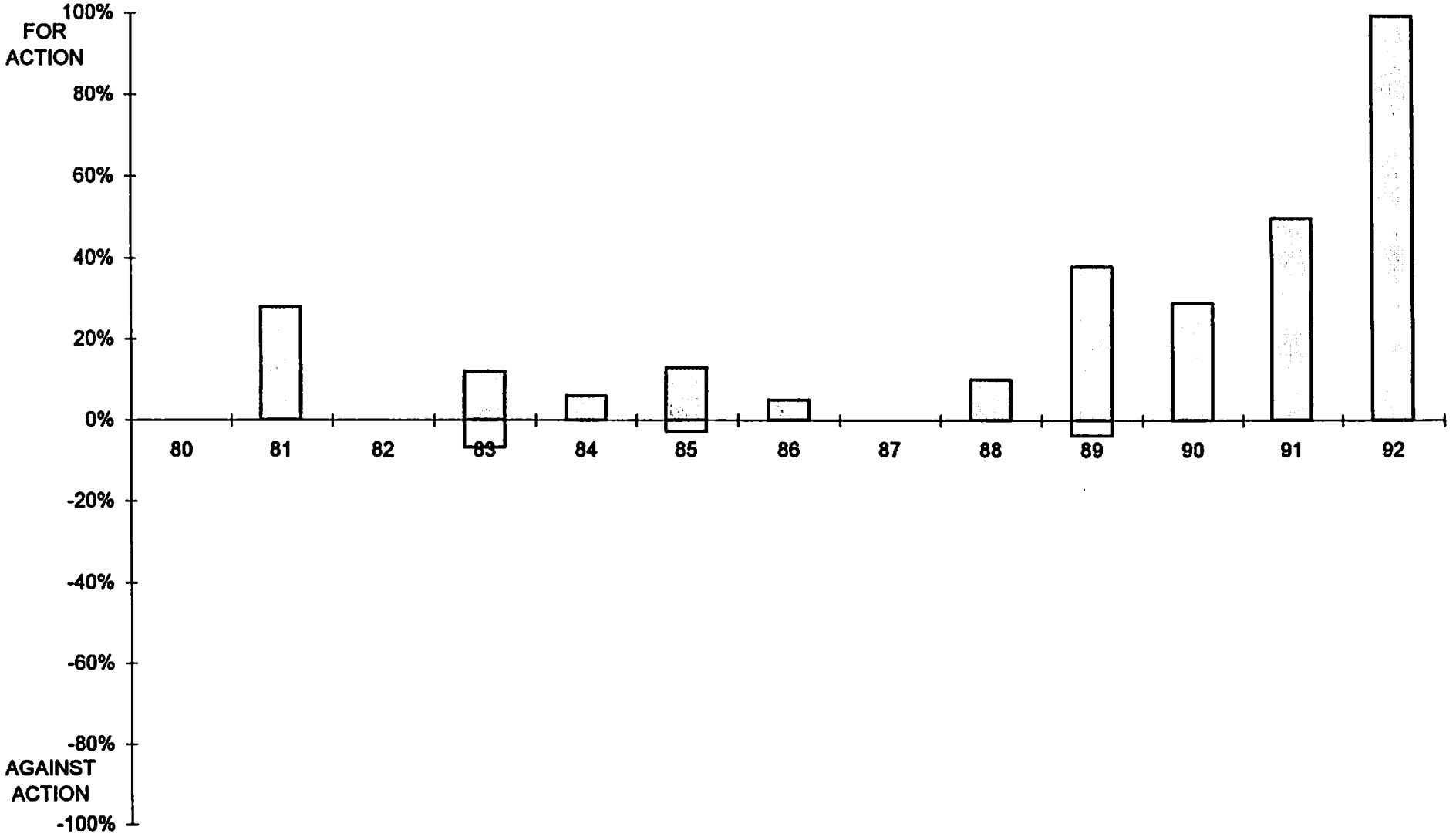


Figure 7. Percentage of *New York Times* articles in a given year that showed bias towards particular actors, 1980-1992. Positive bias portrayed an actor in a positive light; negative bias in a negative light. The percentage of articles coded as showing no bias is not shown here. Each article was assigned to only two categories, one indicating positive and, second negative bias. This analysis was performed on all "news" articles identified in Figure 1.

FIGURE 7
ACTOR BIAS -- "ACID RAIN" -- UNITED STATES

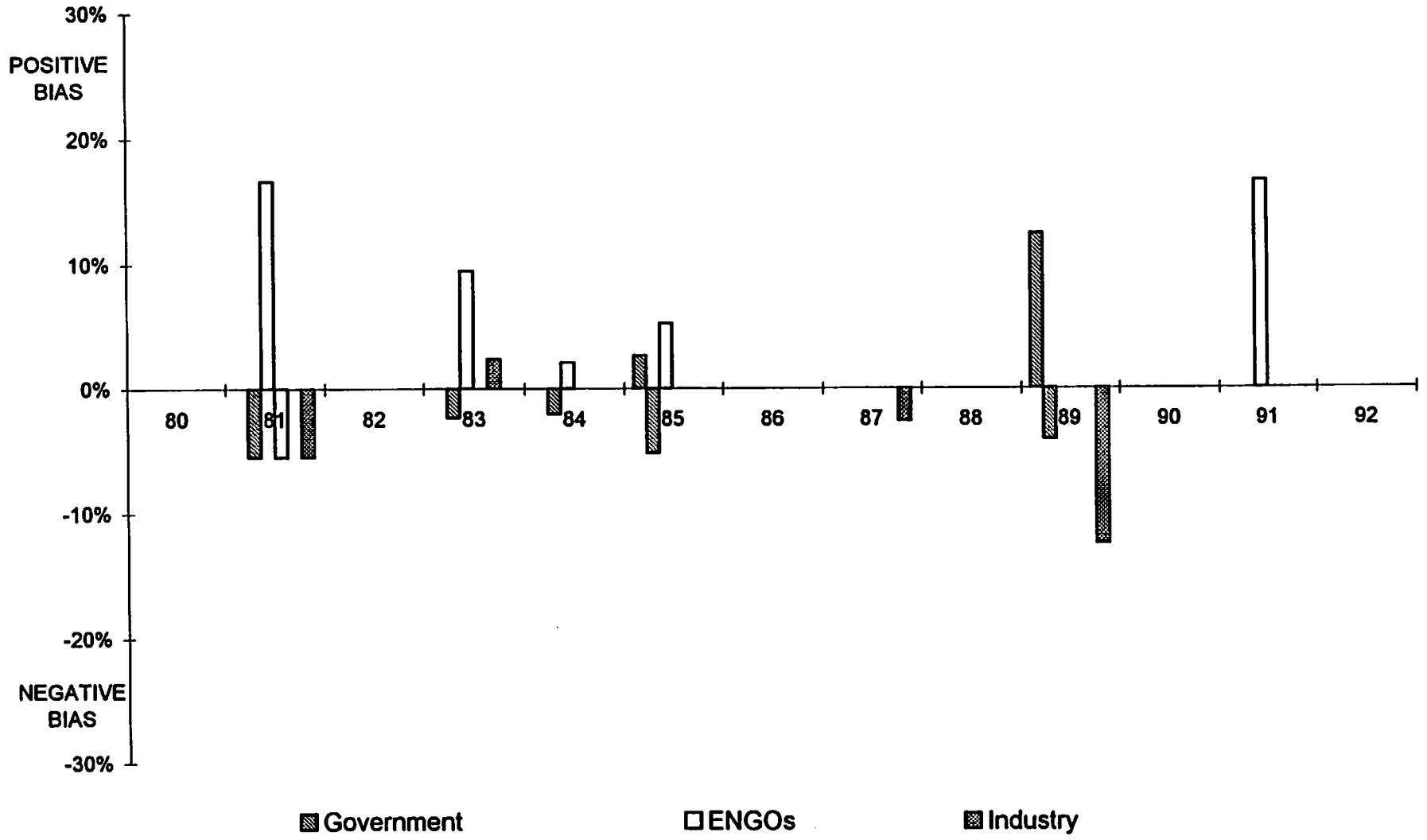
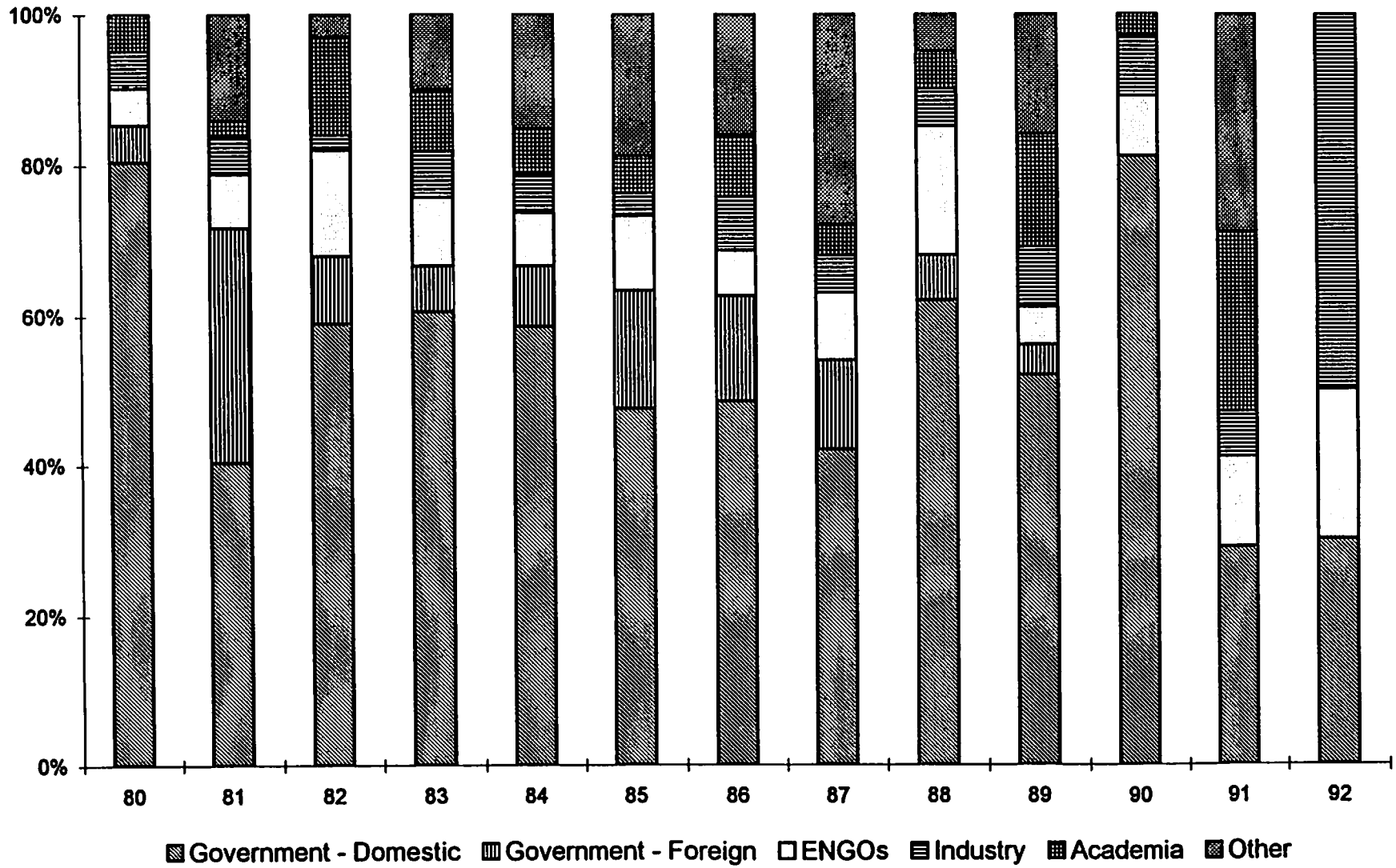


Figure 8. Percentage of news sources that dominated the framing and shaping of "acid rain" articles in the *New York Times*, 1980-1992. Each article may have more than one source category coded. "Government - domestic" includes executive, legislative, and judiciary actors. The "government - foreign" category includes executive and legislative actors from other countries, primarily Canada. "ENGO" includes environmental non-governmental organizations and environmentalists. "Industry" includes emitter and impacted industries. This analysis was performed on a sample of articles identified in Figure 1.

FIGURE 8
NEWS SOURCES -- "ACID RAIN" -- UNITED STATES



Endnotes

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2. The arguments advanced in this paragraph are explored in depth by Ezrahi (1990). The privileged position of science was based, at least in part, on a perceived symbiosis. Science would provide justifications for government action based on objective truth and demonstrable effectiveness rather than mere interests or the arbitrary exercise of power. Government, in turn, would support science as a social enterprise and scientists as valued advisors.

3. Long standing questions about the efficacy of science-based governance received renewed impetus from the perceived failures of the Great Society's social programs. And science's always tenuous claim to value-neutrality was devastatingly undermined by the central role America's "Best and Brightest" were seen to play in the conduct and justification of the Vietnam War.

4. See Rensberger, B. "Acid in rain found up sharply in east; smoke curb cited" in *The New York Times*, 15 June 1974, p. 1.

5. For one thing, the House of Representatives and the Senate passed their respective versions of the CAAA in spring 1990. It was not until June that the NAPAP findings were made publicly available. Moreover, the Integrated Assessment was not completed until September, with publication taking place only in spring 1991.

6. *Time* magazine created its Environment section in 1968. *Newsweek* followed shortly afterward.

7. Environmental organization magazines included *Environmental Action, Greenpeace*, and the Natural Resources Defense Council's *Amicus Journal*.

8. Independent environmental magazines included *Buzzworm, Garbage*, and *E Magazine*.

9. The rankings most often cited are the Edward L. Bernays poll of newspaper publishers, the Saturday Review poll of journalism educators, and *Time* magazine's selection.

10. 1992 circulation figures for the *New York Times* are 1,145,890 weekday mornings, and 1,735,706 Sunday (Banks, 1994).

11. The project, Social Learning in the Management of Global Environmental Risks, identified articles on climate change, ozone depletion, and acid rain in the *Los Angeles Times, New York Times, Wall Street Journal, and Washington Post*. It consistently found that over time the *New York Times* had the most comprehensive coverage of these issues.

12. Stevens refers here to EPA's 1987 *Unfinished Business* report, the first American governmental effort to formally rank environmental risks (US EPA, 1987). While global warming and stratospheric ozone depletion are easy enough to qualify according to the report's terms, acid rain is more difficult to

separate out as it is not categorized as a discrete problem area. Nevertheless, both stratospheric ozone depletion and acid rain are included in the most serious of four problem areas. In another section of *Unfinished Business*, researchers categorize environmental problems according to type of risk. As a cancer risk, ozone depletion is ranked seventh, while there is no risk from acid rain or global warming. As a non-cancer health risk, acid rain is ranked high, ozone depletion is ranked medium, and global warming is unranked. Regarding ecological risk, ozone depletion and global warming are considered the most serious while acid rain is on level three out of six. In the final of the four risk categories, welfare effects, all three problems are ranked in the high effects group with acid rain first, global warming fifth, and ozone depletion sixth. Furthermore, ozone depletion and global warming are both on the list of ten areas of relatively high risk but low EPA effort.

In the 1990 *Reducing Risk* report, a review of the *Unfinished Business* findings, EPA's Science Advisory Board (SAB) ranks global warming and ozone depletion as two of four relatively high risk problems under the category of ecology and welfare; acid deposition is ranked medium (US EPA SAB, 1990). None of the three problems were ranked as high risks in the category of human health effects.

13. They further stated that "if the folks in New York and Ohio can find a common ground, it may well serve as a guidepost for the rest of the nation." Their proposal called for a nationwide 10 million ton SO_2 reduction and a 3 million ton NO_x reduction.

14. Why it had passed was clearly for Bush a political rather than technical judgement. No new scientific or technological results had emerged, and the final report of the National Acid Precipitation Assessment Program was still two years away.

15. Particular constituencies and regions, of course, did focus on particular effects. From Trout Unlimited to the Yellowstone Valley Citizens Council to the Adirondack Mountain Club, over 40 groups reported on the effects of acid rain in Congressional hearings of the period. Within the government, the Forest Service maintained a continuing interest in forests, the Fish and Wildlife Service and Geological Survey on aquatic systems, the Department of Agriculture on crops, and -- above all -- EPA on effects in general.

16. The next most common image was probably one associated with calls for antacids -- i.e., used by humans to treat the symptoms of stomach acidity -- by clouds, fish, lakes and forests.

17. Lawsuits were implemented by environmental groups, industries, states and Canada, as was their right under the 1970 CAAA, but these were almost all in relation to the EPA's interpretation of the amendments or their failure to promulgate rules or enforce them.

18. EPA Administrators listed as sources included Douglas Costle (4), Anne Gorsuch (1), William Ruckelshaus (10), Lee Thomas (4), and William Reilly (3).

19. Source quotes of Canadian Environment Minister included John Frasier (3), Charles Caccia (5), and John Roberts (2).

References

Allen, Frank. Environmental Editor, Wall Street Journal. 1993. Personal Interview. Conducted by R. Ell. June 21. Cambridge, MA: Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University. Unpublished.

American Opinion Research, Inc. 1994. *The press and the environment: how journalists evaluate environmental reporting*. Conducted for the Foundation for American Communications. Princeton, NJ: American Opinion Research, Inc.

Banks, Arthur. 1993. *Political handbook of the world: 1993*. Binghamton, NY: CSA Publications.

Baumgartner, Frank and Bryan Jones. 1993. *Agendas and instability in American politics*. Chicago: University of Chicago Press.

Canadian Federal/Provincial Research and Monitoring Coordinating Committee (RMCC) for the National Acid Rain Research Program, Environment Canada. Winter 1989. A critique of the U.S. national acid precipitation assessment program's interim assessment report. *International Environmental Affairs* 1 (1): 57-64.

Carson, Rachel. 1962. *Silent spring*. Boston: Houghton-Mifflin.

Clancy, Noreen. Program Officer, National Acid Precipitation Assessment Program (NAPAP). 1993. Personal Interview. Conducted by R. Ell. June 24. Cambridge, MA: Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University. Unpublished.

Cornell University. 1984. Press Releases on Gene Likens' Research, 1974-1984. Cornell, Ithaca, NY. Unpublished.

Cowling, E.B. 1982. Acid precipitation in historical perspective. *Environmental Science & Technology* 16 (2): 110A-123A.

Cowling, E.B. 1992. The performance and legacy of NAPAP. *Ecological Applications* 2:111-116.

Detjen, James. Environmental Reporter, Philadelphia Enquirer, and President, Society of Environmental Journalists (SEJ). 1993. Personal Interview. Conducted by R. Ell. June 29. Cambridge, MA: Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University. Unpublished.

Dickson, Nancy M., and William C. Clark. Forthcoming. Uncivil science: America encounters global environmental risks. In *Learning to manage global environmental risks*, ed. William C. Clark et al. Cambridge: MIT Press.

Dickman, Eric. 1995. Telephone interview with Eric Dickman, New York Times Corporate Relations by Nancy Dickson, March 21, 1995.

Dunlap, Riley, and Angela Mertig, eds. 1992. *American environmentalism: the US environmental movement, 1970-1990*. NY: Taylor and Francis.

Dunwoody, S., and H.P. Peters. 1992. Mass media coverage of technological and environmental risks: a survey of research in the United States and Germany. In *Public understanding of science*, April.

Environmental Defense Fund (EDF). 1992. Press Releases, 1988-1992. EDF, New York, NY.

Ezrahi, Yaron. 1990. *The descent of Icarus*. Cambridge, MA: Harvard Univ. Press.

Friedman, S. 1991. Risk management: the public versus the technical experts. In *Risky business: communicating issues of science*, ed. L. Wilkins and P. Patterson. New York, NY: Greenwood Press.

Friedman, S. 1991. Two decades of the environmental beat. In *Media and the environment*, C. LaMay and E.E. Dennis. Washington, DC: Island Press.

Georgia v. Tennessee Copper Company. 1907.206 US 230.

Gore, Albert. 1992. *Earth in the balance: ecology and the human spirit*. Boston: Houghton-Mifflin.

Gorsuch, A. 1982. Testimony before Subcommittee on Health and the Environment. United States House of Representatives. February 10.

Hays, Samuel P. 1987. *Beauty, health and permanence: environmental politics in the United States, 1955-1985*. Cambridge, UK: Cambridge Univ. Press.

Heclo, Hugh. 1977. *A government of strangers*. Washington, DC: Brookings Institution.

Herz, J.C. 1993. Spray cans and the stratosphere: an analysis of fluorocarbon media coverage 1974-1976. Senior Honors Thesis, Department of Special Concentrations, Harvard University, Cambridge, MA.

Hicks, Craig. Media Relations Associate, National Research Council. 1993. Personal Interview. Conducted by R. Ell. July 23. Cambridge, MA: Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University. Unpublished.

Jerome, Fred. Executive VP, Scientists Institute for Public Information (SIPI). 1993. Personal Interview. Conducted by R. Ell. June 29. Cambridge, MA: Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University. Unpublished.

Kahan, A.M. 1986. *Acid rain: reign of controversy*. Golden, CO: Fulcrum, Inc.

Lichter, S.R., D. Amundson, and L.S. Lichter. 1992. *Media coverage of global warming, 1985-1991*. Washington, DC: The Center for Media and Public Affairs. Unpublished.

Lindblom, Charles E. 1980. *Policy making process*. Englewood Cliffs, NJ: Prentice Hall.

Lindblom, Charles E., and David K. Cohen. 1979. *Usable knowledge: social science and social problem solving*. New Haven: Yale University Press.

Lyman, Francesca. 1993. Prophets, mavericks, and mavens. In *Gale environmental almanac*, ed. Russ Hoyle. Detroit: Gale Publishers.

Mahoney, J. R. 1990. *Lessons learned from NAPAP: for consideration in planning and implementing other environmental assessments*. National Acid Precipitation Assessment Program, Washington, D.C. 5 pp.

Mahoney, J. R. 1990. *NAPAP - key results*. National Acid Precipitation Assessment Program, Washington, D.C. 16 pp.

Marcus, Alfred. 1980. The environmental protection agency. Pp. 267-303 in James Q. Wilson, ed. *The politics of regulation*. New York: Basic Books.

McMillan, Sondra. Marketing Officer, New York Times Company. 1994. Telephone Interview. Conducted by R.A. Scheer. December 5. Cambridge, MA: Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University. Unpublished.

Meadow, Donnela H., D. Meadows, E. Zahn, and P. Milling. 1972. *Limits to growth*. Washington, DC: Potomac Associates.

Morris, D.J.S. 1988. Help keep the peccadillo alive: American environmental politics. *Journal of American Studies* 22 (3): 447-455.

National Academy of Sciences (NAS). 1981. *Atmosphere-biosphere interactions: toward a better understanding of the ecological consequences of fossil fuel combustion*. Washington, DC: National Academy Press.

NAS. 1983. *Acid deposition: atmospheric processes in eastern North America*. Washington, DC: National Academy Press.

National Acid Precipitation Assessment Program (NAPAP). 1987. *Interim assessment: the causes and effects of acidic deposition*. Washington, DC: September, 1987.

NAPAP. 1989. *Assessment reports: state of science, state of technology, integrated assessment*. Washington, DC. January.

NAPAP. 1991. *1990 Integrated assessment report*. Washington, DC: NAPAP.

Oppenheimer, Michael. Senior Scientist, Environmental Defense Fund (EDF). 1993. Personal Interview. Conducted by R. Ell. June. Cambridge, MA: Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University. Unpublished.

Perhac, R.M. 1991a. Making credible science usable: lessons from CAA, NAPAP. *Power Engineering* 95 (9): 38-40.

Perhac, R. M. 1991b. Usable science: lessons from acid rain legislation, NAPAP. *Power Engineering* 95 (10): 26-29.

Perhac, R. M. 1992. *The acid rain experience: lessons for the future*. EPRI Report 0R-100431. Electric Power Research Institute, Palo Alto, California. 8pp.

Porter, Roger B., and Raymond Vernon. 1989. *Foreign economic policymaking in the United States*. Cambridge, MA: Center for Business and Government, John F. Kennedy School of Government, Harvard University.

Prowitt, Nancy Gibson. Industry Lobbyist. 1993. Personal Interview. Conducted by R. Ell. June. Cambridge, MA: Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University. Unpublished.

Rosewicz, Barbara. Environment and Energy Reporter, Wall Street Journal. 1993. Personal Interview. Conducted by R. Ell. July 23. Cambridge, MA: Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University. Unpublished.

Russell, M. 1992. Lessons from NAPAP. *Ecological Applications* 2:107-110.

Ryan, Dave. Press Officer, US Environmental Protection Agency (EPA). 1993. Personal Interview. Conducted by R. Ell. July 23. Cambridge, MA: Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University. Unpublished.

Ruckelshaus, W.D. 1984. Testimony before the Committee on Environment and Public Works. United States Senate. February 2.

Scheer, R.A. 1993. Reporters on the loose: assessing American newspaper coverage of the stratospheric ozone depletion issue, 1985-1987. Senior Honors Thesis, Department of Government, Harvard University, Cambridge, MA.

Schneider, K, G. Easterbrook, B. Rensberger, M. Fumento, E. Rubinstein, R. Bidinotto. 1993. Panel Discussion on Scientific Integrity in the Public Policy Process. Hosted by the Science and Environmental Policy Project, Arlington, VA.

Shabecoff, P. 1993. *A fierce green fire*. New York, NY: Hill and Wang.

Shabecoff, Philip. Environment Reporter, New York Times. 1993. Telephone Interview. Conducted by R.A. Scheer. February 22. Cambridge, MA: Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University. Unpublished.

Shabecoff, Philip. Environment Reporter, New York Times. 1993. Telephone Interview. Conducted by R.A. Scheer. February 25. Cambridge, MA: Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University. Unpublished.

Shabecoff, Philip. Environment Reporter, New York Times. 1993. Personal Interview. Conducted by R. Ell. July 15. Cambridge, MA: Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University. Unpublished.

Sheiman, Debbie. Press Officer, Natural Resources Defense Council (NRDC). 1993. Personal Interview. Conducted by R. Ell. July 23. Cambridge, MA: Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University. Unpublished.

Stevens, William K. Environment Reporter, New York Times. 1993. Personal Interview. Conducted by R. Ell. June 16. Cambridge, MA: Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University. Unpublished.

Thomas, L. 1986. Testimony before the Committee on Energy and Natural Resources. United States Senate. June 9-10.

United Nations Department of Public Information (UN DPI). 1994. *The world media handbook 1992-1994*. NY: UN DPI.

US-Canada Research Consultation Group. 1979. Joint statement on transboundary air quality by the Government of Canada and the Government of the United States of America, 26 July 1979. In *Final report--long range air pollution across national boundaries: recourses in law and policy, a US/Canada case study for the Congressional Office of Technology Assessment*. Washington, DC: OTA. Appendix I.

US-Canada MOI. 1981. Memorandum of Intent Between the Government of the United States of America and the Government of Canada Concerning Transboundary Air Pollution (MOI). March 1981. In *Common boundary/common problems*, American Bar Association: Appendix B.

US-Canadian Air Quality Agreement (USCAQA). 1992. Progress Report, March 1992.

US Council of Environmental Quality. 1980. *Global 2000 report to the President*. Washington, DC: US Government Printing Office.

US Environmental Protection Agency. Office of Policy Analysis. Office of Policy, Planning and Evaluation. 1987. *Unfinished business: a comparative assessment of environmental problems*. EPA/230/2-87/025a. Washington, D.C.: U.S. Environmental Protection Agency.

US Environmental Protection Agency, Science Advisory Board. 1990. *Reducing risk: setting priorities and strategies for environmental protection*. Washington, D.C.: EPA.

US Office of the White House Press Secretary (OWHPS). 1985. Remarks of the president and prime minister Brian Mulroney in Quebec City, Canada, announcing the appointment of special envoys on acid rain. March 17, 1985. Washington, D.C.: Executive Office of the President.

US OWHPS. 1987. *Statement on acid rain*. March 18, 1987. Washington, D.C.: Executive Office of the President.

Urquart, John. Ottawa Editor, Wall Street Journal. 1993. Personal Interview. Conducted by R. Ell. July 21. Cambridge, MA: Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University. Unpublished.

Vernon, Raymond, D.L. Spar, and G. Tobin. 1991. *Iron triangles and revolving doors: Case studies in U.S. foreign economic policymaking*. New York: Praeger.

Wine, Melanie. Media Department, Environmental Defense Fund. 1993. Personal Interview. Conducted by R. Ell. June. Cambridge, MA: Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University. Unpublished.