

The History of Germany's Response to Climate Change

JEANNINE CAVENDER AND
JILL JÄGER

ABSTRACT. *The Federal Republic of Germany committed itself in June 1990 to reduce its carbon dioxide emissions by 25 percent of the 1987 level by the year 2005, as a measure of slowing down the increase in the greenhouse effect. The issue of a human-caused climate change, however, did not surface in Germany for the first time just a few years ago. The potential threat was recognized a half a century ago. This article traces the history of the German climate change debate in the last 50 years and discusses the forces and events that shaped it. The way in which various societal actors—among them scientists, the government, industry, non-governmental organizations (NGOs) and the media—entered into and influenced the debate is also examined. Unfolding the history of the global warming debate in Germany reveals how the country's current policy stance evolved.*

Introduction

In June 1990, the German Cabinet agreed to take internationally unprecedented action to reduce its carbon dioxide (CO₂) emissions.¹ This policy is based on what has emerged as a distinctly German environmental strategy called the *Vorsorgeprinzip* (the precautionary principle), which demands that action to prevent environmental damage be taken even before scientific certainty is achieved.

Germany's decision to approach global warming with long-term considerations is surprising in light of its recent history: Until the last decade, Germany was Western Europe's greatest polluter.² Twenty years ago, only a few specialists in the country seriously considered that human activity could influence climate on a global scale. Today, German scientists and politicians alike are convinced of the need to avert a potentially catastrophic warming of the

mans as part of his research with the German Weather Service. He had been reading papers of an English scientist, George Callendar, who described the rising concentration of CO₂ in the earth's atmosphere. Thus the reverse of his research topic—the idea that *humans* could influence the climate—began to pervade his thinking.⁴

His study in this area, however, was limited under the Nazis. Because the government permitted research during this period only when it could be shown to serve the war effort, the small amount of research Flohn managed to undertake could be carried out only discreetly and in his spare time. On rare occasions, however, Flohn's views attracted an interested, if small, audience. In January of 1941, for example, he was asked to give a seminar at the University of Würzburg on the effects of human activity on the climate.⁵ There he presented a paper, "Tätigkeit des Menschen als Klimafaktor" (Human Activity as a Climate Factor).⁶ This was the first paper published in Germany on the subject. He later wrote numerous other papers concerning human-induced climate change, most of which did not receive a wide audience until years later.

Four decades elapsed before the federal government established a full-fledged research program that began to examine the effects of human activity on the climate. In the interim, climate change received little attention in Germany. One episode, however, proved to be an exception. In 1952, the United States began experiments with atomic bombs in the Marshall Islands and the West Pacific—creating concern among scientists around the world about the effects of these nuclear explosions on the climate. Research by an American scientist, Horace Byers, indicated that atomic bomb explosions had the potential to alter the weather. These findings prompted the German Federal Ministry of the Interior (BMI) to form a research commission on the "spreading of radioactivity." The commission turned to Flohn to set up a network of stations to measure radioactive particles in the atmosphere. Members of Parliament debated the issue within the German Bundestag as well.

At about this time, presumably by coincidence, weather anomalies helped spread the fear of anthropogenic climate change throughout the public. *Der Spiegel*, a popular weekly news magazine, published a multinational opinion poll conducted by the International Research Associates in 1958. The poll, which surveyed citizens of seven industrialized nations, indicated that a majority of the German population believed atomic bomb test explosions were changing the weather. Of all the nations polled, only Australia and England had a majority of people who believed that the test explosions were not affecting the weather.⁷

Whether detonations could alter the weather was quickly forgotten by Germany in the following years. The research in Germany that was instigated in response to atomic detonations contributed little to the debate about anthropogenic climate change. The debate itself did not receive significant attention until two decades later. Nevertheless, the events of the 1950s demonstrate that

mans as part of his research with the German Weather Service. He had been reading papers of an English scientist, George Callendar, who described the rising concentration of CO₂ in the earth's atmosphere. Thus the reverse of his research topic—the idea that *humans* could influence the climate—began to pervade his thinking.⁴

His study in this area, however, was limited under the Nazis. Because the government permitted research during this period only when it could be shown to serve the war effort, the small amount of research Flohn managed to undertake could be carried out only discreetly and in his spare time. On rare occasions, however, Flohn's views attracted an interested, if small, audience. In January of 1941, for example, he was asked to give a seminar at the University of Würzburg on the effects of human activity on the climate.⁵ There he presented a paper, "Tätigkeit des Menschen als Klimafaktor" (Human Activity as a Climate Factor).⁶ This was the first paper published in Germany on the subject. He later wrote numerous other papers concerning human-induced climate change, most of which did not receive a wide audience until years later.

Four decades elapsed before the federal government established a full-fledged research program that began to examine the effects of human activity on the climate. In the interim, climate change received little attention in Germany. One episode, however, proved to be an exception. In 1952, the United States began experiments with atomic bombs in the Marshall Islands and the West Pacific—creating concern among scientists around the world about the effects of these nuclear explosions on the climate. Research by an American scientist, Horace Byers, indicated that atomic bomb explosions had the potential to alter the weather. These findings prompted the German Federal Ministry of the Interior (BMI) to form a research commission on the "spreading of radioactivity." The commission turned to Flohn to set up a network of stations to measure radioactive particles in the atmosphere. Members of Parliament debated the issue within the German Bundestag as well.

At about this time, presumably by coincidence, weather anomalies helped spread the fear of anthropogenic climate change throughout the public. *Der Spiegel*, a popular weekly news magazine, published a multinational opinion poll conducted by the International Research Associates in 1958. The poll, which surveyed citizens of seven industrialized nations, indicated that a majority of the German population believed atomic bomb test explosions were changing the weather. Of all the nations polled, only Australia and England had a majority of people who believed that the test explosions were not affecting the weather.⁷

Whether detonations could alter the weather was quickly forgotten by Germany in the following years. The research in Germany that was instigated in response to atomic detonations contributed little to the debate about anthropogenic climate change. The debate itself did not receive significant attention until two decades later. Nevertheless, the events of the 1950s demonstrate that

fears within German society about the possibility of human-induced climate change surfaced long before the greenhouse effect became a household word.

Throughout the 1960s, there was little concern within Germany about a changing climate. The media occasionally presented warnings that fossil-fuel combustion could affect the global climate, but the research that generated these articles always came from the United States or elsewhere abroad.⁸ Until the mid-1970s, German scientists learned about the potential for anthropogenic climate change primarily from their interactions with the international scientific community.

International initiatives in climate studies also formed at this time, including the creation of a worldwide satellite network to gather climate data and the development of a monitoring system to observe increases in carbon dioxide. These initiatives began to draw broader interest in climate change within the German scientific community. Finally, at the beginning of the 1970s, German researchers demonstrated their concern and became more outspoken about the issues, bringing the Federal Republic into the developing international debate about human impact in the global climate.

Part II

1970–1980: Foundation for change

AN INCREASE IN CLIMATE RESEARCH. The number of scientists involved in climate research increased dramatically in the 1970s, as did the amount of funding allocated for such research. Hamburg and Mainz formed the nuclei for the expansion of climate studies in Germany.⁹ As climate research intensified in Germany, scientists organized a series of conferences about human impact on the climate, including the 1976 Dahlem Conference on Global Chemical Cycles and Their Alterations by Man (held in Berlin)¹⁰ and a meeting on the global carbon cycle in Hamburg sponsored by the Scientific Committee on Problems of the Environment (SCOPE) in the spring of 1977.¹¹

The media also paid more attention to climate change. Scientists began publishing articles on the greenhouse effect, arousing public awareness about the possibility of global warming.¹² A feature article in *Bild der Wissenschaft*, written by Hermann Flohn in 1975, presented a catastrophic scenario of a greenhouse world.¹³ A newspaper that same year quoted him as saying, "The climatologists are now playing the role of Cassandra before the fall of Troy: had they believed her, Troy would have been saved."¹⁴ Several years later, Wilfried Bach published the popular book, *Gefahr für unser Klima* (Our Threatened Climate), the first book of its kind to present to the public the threat of human-induced global warming and how it could be avoided.¹⁵

At the same time, however, scientists were debating whether the earth was warming or cooling.¹⁶ Although a consensus could not be reached about

whether palm trees or penguins would soon flourish in Germany, the notion of a climate catastrophe dominated both scenarios. Such debate within Germany mirrored the controversy within the international scientific community; the suspicion that humans could alter the climate was gaining potency.¹⁷

One episode in the mid-1970s regarding the intentional manipulation of the weather helped instill in the German people an understanding of how powerful humans had become in influencing the climate. Initial concern was precipitated by leaks to the press at the end of the Vietnam War that the United States had flown thousands of cloud-seeding sorties in an attempt to gain an advantage in fighting guerrilla warfare.¹⁸ Fears erupted in Europe about the possibility of "weather wars" between the United States and the Soviet Union, since both superpowers were developing technology to manipulate the weather.¹⁹ By the end of 1977, 21 nations signed the Geneva Treaty to Prohibit the Hostile Use of Weather Modification.²⁰

RISING ENVIRONMENTALISM AND THE BIRTH OF VORSORGE. Even before the Germans began to debate climate change seriously, important events were taking place in the environmental arena. In the 1960s, the German public became sensitized to environmental problems through the publication of popular books such as Rachel Carson's *Silent Spring*. To a certain extent the environmental movement in the United States was exported to Germany. In addition, some measures had already been taken at both the state and federal levels for nature protection, air quality, water quality, waste removal, and noise pollution. Nonetheless, environmental protection was not yet a separate item on the national political agenda.²¹

The change began in October of 1969 with a speech given to Parliament by Chancellor Willy Brandt. The speech mentioned the need to address environmental problems.²² Underlying this speech was the pressure the government felt to develop an environmental program before the 1972 Stockholm Conference on Humans and the Environment. By September 1971 the Cabinet had agreed to Germany's first Environment Program, which included basic declarations that have become part of the environmental policy of all parties, industrial organizations, and other social sectors. Based on three principles—Vorsorge (precautionary measures), Polluter Pays, and Industry-Government Cooperation—the program provided the philosophical underpinnings that have guided all subsequent environmental policies. Vorsorge has been the most important of these principles for the global warming debate. It declares that, in the face of an environmental threat, the risks of inaction are too great to delay preventive measures, even if scientific certainty has not yet been achieved. This declaration became pivotal in Germany's response to the greenhouse effect in the late 1980s.

THE ENTRANCE OF GLOBAL WARMING INTO ENERGY POLICY. The energy crises of 1973/1974 and 1978/1979 forced both of the major parties in Germany to back away from dependence on foreign oil.²³ One response of the government was to encourage greater reliance on domestic coal. A second

response was to support and subsidize the expansion of nuclear power throughout the decade.

Despite the demand for greater coal consumption at that time, the coal industry foresaw the potential implications the greenhouse effect could have on this demand and, consequently, began to confront the issue early. After reading publications of the late 1970s by Hermann Flohn about the effects of fossil-fuel combustion on the earth's temperature, Gunter Zimmermeyer, the environmental director of Germany's hard coal mining association, began to include consideration of the CO₂ question in his recommendations for Germany's energy policies. In a paper Zimmermeyer co-authored for the 1980 World Energy Conference in Munich, for example, he proposed a plan that would increase the use of domestic coal and nuclear power while reducing CO₂.²⁴

The nuclear energy industry, seeking to contribute a much larger share to Germany's energy supply despite burgeoning public opposition, began to broadcast its knowledge about the greenhouse effect. Since nuclear energy conversion does not involve the emission of greenhouse gases, the industry was able to use the greenhouse effect as an argument for greater use of nuclear power. Although used only as a secondary argument in the 1970s, by 1986 global warming was used as a major justification for the nuclear power industry's continued existence.²⁵

Bitter disputes about the future of German energy policy arose in Parliament in the 1970s, splintering the solidarity of the Social Democratic Party (SPD), which was in power at the time. Evidence of this intra-party friction appeared as early as 1975. The *Frankfurter Allgemeine Zeitung*, a widely read national newspaper, ran an article that year quoting members of the SPD as supporting nuclear power, ostensibly because fossil fuels were known to emit CO₂ and might cause global warming.²⁶ SPD politicians began to use this argument at the same time the anti-nuclear movement was taking to the streets to protest the government's policy of supporting nuclear expansion. In 1976 and 1977, the CDU also began to make the connection between energy policy and carbon dioxide emissions. During this time, the party invited scientists to discuss the role of CO₂ with regard to climate change. By the end of the 1970s, however, the government had only just begun to grasp the implications of the global warming debate on German energy policy.²⁷

It was not until the end of the decade, during preparations for the first World Climate Conference, that the government began to view climate change as more than a peripheral issue. The Federal Environment Agency had taken the lead as the first governmental body to research the issue,²⁸ yet its effort had little effect on national policy.²⁹ The government's first major initiative on the issue began in September of 1979 when the Federal Cabinet agreed to launch a nationally coordinated climate research program. This step was taken by the German government concurrently with the formation of a Europe-wide climate research program called the European Climate Action Plan.³⁰ Due to

a lag in interest after the World Climate Conference in 1979 and to squabbles among the different ministries about which one should coordinate the program, however, the German Climate Research Program was not actually implemented until 1984.³¹

Part III

1980–1990: From research to action

By the end of the 1980s, disparate forces generated by increasing scientific research on climate change, by the environmental movement, by the debate about energy policy, and by concern about stratospheric ozone depletion converged, forming a consensus within the political arena to address global warming. With the establishment in 1987 of the highly influential Enquete Commission's "Vorsorge zum Schutz der Erdatmosphäre" (Precautionary Measures for the Protection of the Earth's Atmosphere) and the ensuing ministerial decision to reduce carbon dioxide emissions by 25 percent, Germany demonstrated the seriousness with which it approached the issue.

The forces that culminated in this decision developed abroad, but they had distinct impacts within Germany once they took root there. First, evidence of a significant increase in global carbon dioxide emissions caused scientific concern to arise abroad. This concern gained momentum within Germany in the 1970s and especially in the 1980s as prominent German scientists like Wilfried Bach, Egon Degens, and Hartmut Graßl continued to bring their increasing knowledge about global warming to the press. The trend created pressure on the German government to address global warming. Establishment of a government-sponsored research program on climate change in 1984 manifested the country's growing readiness to confront the issue. It also showed the importance the scientific debate had gained within the government.

Second, environmentalism began to rise in Germany. The movement, which had its origin across the Atlantic, increased the potency of environmental issues within Germany's political arena. This phenomenon made it politically attractive by the 1980s for politicians to take on the issue of global warming. Germany's environmental movement received a dramatic boost in 1981, when scientists concluded that more than half of the country's trees were dead or dying. The unexpected crisis jolted the German people, whose culture and folklore grew out of rich forests like the Odenwald and the Schwarzwald. The shock left behind the growing suspicion that this time the country had waited too long before heeding warnings of environmental danger. Despite the dearth of scientific evidence, a consensus emerged rapidly within the media, the public, environmental groups, and the government; they all indicted air pollution as the primary cause of this phenomenon they called *Waldsterben* ("forest dieback").³² A dramatic scene depicting a forest choked by industrial

fumes appeared on the cover of *Der Spiegel* in 1982.³³ Waking up to find the alleged consequences of unchecked economic growth upon them, members of the SPD, led by Chancellor Helmut Schmidt—who was well known for his sympathy for industry—implemented a broad new environmental program in 1982. The legislation attempted to give teeth to the *Vorsorge* principle which, up to this point, had remained weak in its effect.

The government's swift action was followed by the entrance of the Green Party into the Bundestag in 1983. The Greens election came at the expense of votes for the major parties, particularly the SPD.³⁴ Electoral pressure compelled the established parties to re-orient their politics and advocate environmental legislation. Waldsterben and the Green Party's presence in Parliament reinforced the gradual trend toward *Vorsorge*, which had begun during the early stages of Germany's environmental movement. By the middle of the decade, the *Vorsorge* principle had become accepted well enough to provide the basis for Germany's decision to address global warming without waiting for scientific certainty.³⁵

Continued debate about Germany's energy policy created a third force that paved the way for the creation of a global warming policy. This debate stemmed from the international oil crises of the previous decade, but it ran a distinctive course within Germany. In 1980, Parliament established the Energy Enquete Commission to study possible pathways for future energy consumption. Although members of the commission never addressed the greenhouse effect, they debated at length the risks of continued dependence on oil, the environmental hazards of coal combustion, and the vehement public opposition to nuclear power.³⁶ Within all sectors of German society, the debate nurtured the belief, well-rooted in the depths of the world wars and the Arab oil embargoes, that energy should be treated as a scarce resource and used as efficiently as possible.

The CDU emerged from the Enquete Commission debates in continued support of its controversial position to increase the use of nuclear power. The global warming issue provided a means by which the CDU-led government could justify its support for nuclear expansion and appear environmentally conscious at the same time.

Using the climate change issue to justify nuclear power became increasingly important for the CDU throughout the decade, when the SPD was turning against it. In 1986, the government issued a report stating its intentions to expand nuclear capacity.³⁷ Heated debate ensued within the Bundestag with the greatest opposition coming from North Rhine-Westphalia, the country's biggest coal-producing state. The state's minister president, Johannes Rau, accused the CDU of using the carbon dioxide issue merely as a political argument for limiting coal production. The federal minister of the environment at that time, Walter Wallman, responded by reiterating the evidence for a coming climate catastrophe and the subsequent need to reduce dependence on fossil fuels.³⁸ Several states tried to halt the adoption of the energy policy

within the Bundesrat, but they were unsuccessful against the CDU majority. The government's energy policy was thus adopted, at least partially substantiated by the issue of the greenhouse effect. This provided the government with an incentive to legitimate the issue as a serious problem.

Finally, evidence of stratospheric ozone depletion began to heighten fears first in the United States but soon afterward in Germany. This provided a fourth impetus for the German government to address climate change in the 1980s. In the media, the issues were consistently juxtaposed, particularly after 1986, and they were often presented in ways that made it difficult to distinguish the issues of ozone depletion and climate catastrophe. Discussion within the Parliament about reducing production and emissions of chlorofluorocarbons (CFCs), chemicals that lead to the destruction of stratospheric ozone and also contribute to greenhouse warming, brought the two issues together within the political arena.³⁹ Once the German government began to take stratospheric ozone depletion seriously, not addressing the greenhouse effect became difficult as well. The presence of the Greens in Parliament made it even more difficult.⁴⁰

Against the backdrop of these internationally generated forces, several events in the mid-1980s punctuated the global warming debate in Germany and catalyzed a consensus for action. The first of these was the unexpected discovery of the ozone hole in 1985. Although negotiations to phase out CFC production were already underway, the discovery of the hole took everyone by surprise.⁴¹ In Germany, extensive media coverage and stepped-up political efforts to reduce CFC emissions fed directly into concerns about global warming. It seems likely that the sudden concern about the ozone issue created a sense of urgency for the need to address the greenhouse effect.

Second, the German Physical Society (DPG) report of January 1986 increased this sense of urgency. The report, which was written shortly after the 1985 international conference, in Villach, Austria, on global warming predicted an apocalyptic climate catastrophe due to fossil-fuel combustion and deforestation. The media devoured the report and it made an impact in the political arena as well.⁴² *Der Spiegel* ran an article, "Death in the Greenhouse,"⁴³ about the report. In April 1986, the same magazine published a cover story entitled "Climate Catastrophe," with a picture of the Cologne cathedral deluged by a rising ocean. The *Frankfurter Rundschau* (one of the country's best-known daily newspapers) reprinted the entire report of the DPG and warned that the earth could become uninhabitable.⁴⁴ The report provided stimuli for parliamentary discussion as well. Bundestag members of the SPD and the Green Party posed several formal questions about the report's conclusions—to which the government had to respond publicly.⁴⁵

Third, the nuclear accident at Chernobyl, which occurred in April 1986, ironically became a catalyst for action on global warming. By strongly fanning anti-nuclear sentiment, already kindled by the Three Mile Island incident and concern about the use of nuclear waste for atomic weapons, Chernobyl created

extreme difficulties for the atomic energy industry.⁴⁶ The industry, which had long used global warming as a peripheral argument to justify nuclear energy expansion, after Chernobyl tried to bring the warming issue to the center of political discussions. The industry's transparent goal was to promote nuclear energy on the basis that it could prevent a climate collapse; the recent publication of the DPG report made this task a simple one.

With the tremendous rise in public awareness about global warming and the mounting international pressure to combat stratospheric ozone depletion, the federal government began to initiate action for protection of the atmosphere. In a speech before the Bundestag in March 1987, Chancellor Helmut Kohl addressed the climate issue and called it the greatest of all the environmental problems.⁴⁷ Led by the Greens, who rushed to submit the first legislative proposal, all the parties initiated bills shortly after the speech to form a new Enquete Commission. This was composed of both scientists and members of Parliament, who would study the problems of the ozone layer and the greenhouse effect. The Enquete Commission, established in December of 1987, was appropriately titled "Vorsorge zum Schutz der Erdatmosphäre" (Precautionary Measures for Protection of the Earth's Atmosphere).

In examining the global warming problem, the commission held general hearings to inform—and receive positions from—industry representatives and environmental groups. In this way, it established a relatively rapid consensus among many sectors of society that the climate change problem must be addressed. As a result of its rare mix of scientists and politicians, the commission was able quickly and comprehensively to integrate scientific assessments into the political process. It consequently generated ambitious policy recommendations that cut across party lines and paved the way for the government's CO₂ policy. Although the first report of the Enquete Commission, issued in 1988, dealt mostly with ozone depletion, it also warned of the serious dangers posed by the greenhouse effect and concluded that preventive action must be taken.⁴⁸ The Bundestag unanimously approved the report, thereby officially endorsing the need to take substantial measures to reduce the greenhouse effect. This was in sharp contrast with governmental statements from most other industrialized nations about global warming. The commission's third report, released in May 1990, states that the rise in the global average temperature of 0.5 degrees C, as well as the sea level rise of 10 to 20 centimeters in the last 100 years, were most likely caused by the enhanced greenhouse effect, a result of human activity.⁴⁹ The statement reveals the relative certainty with which the commission attributes current warming trends to anthropogenic emissions. This contrasts with official statements of other industrialized nations, such as the United States, where there appears to be less consensus among scientists and government officials about the probable causes of recent warming trends.

Since the formation of the commission and the subsequent hearings, every significant industry in the country has been affected to some degree. Although

industries like coal mining and automobiles are skeptical about global warming predictions, all have agreed that at least some degree of action must be taken on the basis of *Vorsorge*.⁵⁰

In addition to harnessing the interest of industries in questions of climate change, the Enquete Commission also provided an impetus for environmental groups to get involved. The most active to have addressed the climate change issue are German Greenpeace; the *Deutsche Naturschutzring*, or the DNR (German Nature Protection Ring); and the *Bundesverband der Umwelt und Naturschutz Deutschland* (German Federation of Environment and Nature Protection), commonly called the BUND.

Oddly enough, these groups were the last sector of society publicly to acknowledge the problem of global warming, and did so only after the establishment of the Enquete commissions.⁵¹ Several factors may have contributed to their late entrance into the climate change debate.

First, German interest groups have traditionally been more involved in local environmental issues than in international ones. Second, they may have been waiting for greater scientific evidence or for a greater political consensus.⁵² Finally, there is some evidence to suggest that interest groups were afraid of pushing the issue of the greenhouse effect, since it appeared to provide support for nuclear power—which they were committed to abandon. Instead, most groups supported an increased use of coal in conjunction with the development of solar or other renewable energy sources; such proposals, however, generally meant an increase in CO₂ emissions.⁵³ Most groups focused attention on reducing total energy demand and on shifting energy use toward coal in conjunction with development of solar power. After fears about the greenhouse effect were legitimated by the government, however, environmental groups could no longer avoid taking the issue seriously.

The unification of environmental groups with other sectors of German society in recognizing global warming as an environmental threat contributed to a growing consensus to work towards prevention.⁵⁴ Environment Minister Klaus Töpfer's announcement to reduce Germany's CO₂ emissions made public the government's decision to act on this consensus. The decision was the culmination of a series of international forces and catalytic events that shaped Germany's unique debate on global warming.

Conclusion

Despite the long period the global warming debate has spanned in Germany, policy formation is only in its initial stages. The third report of the Enquete Commission in May 1990 proposed that Germany should set a goal of 30 percent reduction of CO₂ emissions by 2005 (from 1987 values). This number was based on estimates of reduction potentials. In June 1990, the Federal

Cabinet agreed on the 25 percent, having concluded that this was more feasible than using the entire potential identified by the Enquete Commission. An interministerial group was set up to investigate ways of achieving this goal.

During the preparation of the Climate Convention, which was signed by more than 150 nations at the UNCED conference in Rio de Janeiro in June 1992, Germany pushed strongly for industrialized countries to accept at least a goal of stabilizing CO₂ emissions. After the Rio conference, the German Government Ministry again reconfirmed its goal of reducing CO₂ emissions by 25 percent by 2005. It also acknowledged the importance of the reconfirmation at Rio of the European Community's goal of stabilizing of emissions by 2000, and described the German efforts to begin a "prompt start" process before the convention becomes legally binding.

The German case study reveals that the roots of environmental issues may begin long before they become popular themes in the media. In the case of global warming there was an extensive time lag between when the potential threat was recognized scientifically and when it was addressed politically. The course it followed in Germany depended heavily on energy politics, chance events, actions of particular individuals, the ebb and flow of the environmental movement, and an array of international pressures. Forces and factors external to the issue of climate change often influenced the debate. This has been true in the international debate on climate change as well, and should be understood by policy-makers who are involved in negotiations.

Notes

1. Nancy Wilson, ed., "Climate News Around the World," in *Climate Alert* 4, no. 3 (May 1991).
2. Although West Germany took strict measures to reduce a number of air pollutants during the 1970s and 1980s, Germany today still may be Europe's greatest CO₂ emitter. All references to Germany refer to West Germany up to the date of German unification in October 1990. East Germany certainly polluted heavily and ignored global warming longer than the West Germans. Therefore, taking East Germany into consideration further bolsters the argument that Germany was one of Western Europe's greatest polluters.
3. Deutscher Bundestag, "Fragen für den Monat August 1978 mit den dazu erteilten Antworten," 8. Wahlperiode, Drucksache 8/2105, Sept. 21, 1978.
4. Hermann Flohn, Institut für Meteorologie, Universität Bonn, personal communication, July 22, 1991.
5. See note 4.
6. Hermann Flohn, "Die Tätigkeit des Menschen als Klimafaktor," *Zeitschrift für Erdkunde* (September 1941): 13-22.
7. "Die Natur macht Sprünge," *Der Spiegel* (August 20, 1958).
8. A comprehensive count and analysis of articles on human-induced climate change for the weekly magazine *Der Spiegel* and the monthly journal *Bild der Wissenschaft* show that before the mid-1970s, all such articles were prompted by research conducted in the United States.

9. After strong advances made by a research group at the University of Hamburg in the early part of the decade, the Max Planck Institute for Meteorology was established in Hamburg in 1975. Professor Flohn was involved in creating the research agenda for the new institute. He suggested they study the physical processes of climate and the possibility of human impact on it. Klaus Hasselman, who has become a central figure in ocean-atmosphere modeling in predicting global warming, became the first director. A second center for climate research evolved in Mainz. In contrast to Hamburg, the research in Mainz focused on the chemical processes of climate. In the early 1960s Christian Junge became the director of the Max Planck Institute for Chemistry in Mainz. Junge was a meteorologist who had previously studied air pollution. He became increasingly involved in international climate research initiatives and spent a good deal of time in the United States.
10. Werner Stumm, *Global Chemical Cycles and Their Alterations by Man*, report of the Dahlem workshop held in Berlin, November 15–19, 1976 (Berlin: Abakon Verlagsgesellschaft, 1977).
11. Deutscher Bundestag, "Fragen für den Monat August 1978 mit den dazu erteilten Antworten," 8. Wahlperiode, Drucksache 8/2105, Sept. 21, 1978.
12. See, for example, articles published in *Bild der Wissenschaft* by Horst Dronia, "Verändern wir unser Klima?" March 1975; Hermann Flohn, "Regieanweisungen eines Wissenschaftlers: Energie und Klima im 21. Jahrhundert," November 1975, and "Gefährden Klima-Anomalien," December 1978; Egon Degens and Stephan Kempe, "Heizen wir unsere Erde auf?" August 1979; and Wendelin Klär, "Eiswüste oder Steppe," August 1979.
13. Hermann Flohn, "Regieanweisungen eines Wissenschaftlers: Energie und Klima im 21. Jahrhundert," in *Bild der Wissenschaft*, Heft 11, 12 Jg. (November 1975).
Information on the media in this section is taken primarily from an exhaustive survey of *Der Spiegel* and *Bild der Wissenschaft* from 1950 to the present. Brief studies of other periodicals and newspapers suggest no significant deviations from the trends revealed by these two magazines.
14. Rolf H. Simen, "Warmzeit durch Aufheizung der Erdatmosphäre?" *Frankfurter Rundschau* (April 26, 1975): 12.
15. Willfried Bach, *Gefahr für unser Klima: Wege aus der CO₂ Bedrohung durch sinnvollen Energieeinsatz* (Karlsruhe: C. F. Müller, 1981).
16. Wendelin Klär, "Eiswüste oder Steppe: Kommt das Eis Zurück?" *Bild der Wissenschaft* (August 1979); Hentrup Dieter, "Auf dem Weg in eine Kleine Eiszeit: Industrielle Aktivitäten des Menschen werden jedoch vermutlich eine Erwärmung bringen," *Frankfurter Rundschau* (December 27, 1977).
17. The possible effects of anthropogenic CO₂ emissions were discussed in Parliament in response to a question posed by the Social Democratic Party. Deutscher Bundestags, Drucksache 7/5482, *Stenographischer Bericht*, 257 Sitzung (Bonn, July 2, 1976).
18. "Vietnam: Wolken gemolken," *Der Spiegel* (July 10, 1972).
19. Deutscher Bundestag, "Unterrichtung durch die deutsche Delegation in der Interparlamentarischen Union über die Frühjahrstagung der IPU in Colombo vom 31. März bis 6. April 1975," Drucksache 7/3614 (December 5, 1975).
20. Deutscher Bundestag, "Entwurf eines Gesetzes zum Übereinkommen vom 18. Mai 1977 über das Verbot der militärischen oder einer sonstigen feindseligen Nutzung umweltverändernder Techniken," Drucksache 9/1952 (Bonn: Thende Druck KG, 1982).
21. Edda Müller, *Innenwelt der Umweltpolitik* (Opladen: Westdeutscher Verlag, 1986).

22. See note 21.
23. During this period, both the Social Democrats (SPD) and the Christian Democratic Union (CDU) promoted the expansion of nuclear energy as well as a greater use of coal. This consensual policy resulted in part from the fact that both parties had majority representation in states that thrived on the coal industry, and in part from the fact that the problems of dependence on foreign oil and gas crossed party lines.
24. H. Lieth, J. Seelinger, Gunter Zimmermeyer, "Die CO₂ Frage aus Geoökologischer und Energiwirtschaftlicher Sicht," 11. Weltenergiekonferenz, September 8-12, 1980, Munich, WEC 1980, Vol. 3.
25. Ludwig Traotmann-Popp, BUND Landesverband Bayern, personal communication, August 9, 1991.
26. "Energieverbrauch und Umweltschutz," *Frankfurter Allgemeine Zeitung* (June 23, 1975).
27. Klaus M. Meyer-Abich, "Das Kohlendioxidproblem als Scheinargument: In der Kernenergiekontroverse wird eine klimatologische Tatsache fälschlich als politische ausgegeben," *Süddeutsche Zeitung* (November 23, 1979).
28. Umweltbundesamt, "Klimawirkung von Luftverunreinigungen," *Jahresbericht 1978* (Bonn, 1979), p. 62.
29. Harmut Graßl, co-director of the Max Planck Institute for Meteorology in Hamburg, personal communication, July 18, 1991.
30. Deutscher Bundesrat, "Vorschlag für ein mehrjähriges Forschungsprogramm auf dem Gebiet der Klimatologie (indirekte Aktion, 1979-83), *EG-Dokument, R/2359/79*, Drucksache 458/78, October 6, 1978.
31. Wolf-Dieter Garber, Umweltbundesamt, Berlin, personal communication, July 15, 1991.
32. Peter J. Katzenstein, *Industry and Politics in West Germany* (Ithaca: Cornell University Press, 1989); and Günter Hill, Umweltabteilung, BDI, personal communication, July 25, 1991.
33. "Saurer Regen über Deutschland: Der Wald Stirbt," *Der Spiegel* (November 16, 1981).
34. Popularity of the Greens grew sharply from 1979 to 1985, and their party membership increased from 3,000 to 40,000 in that time (Peter Katzenstein, *Policy and Politics in West Germany* (Philadelphia: Temple University Press, 1987). Polls in 1979, however, showed that most of the voter support for the Greens came not from their own party but from former supporters of the SPD ("Die SPD hat kein Konzept," *Der Spiegel*, October 29, 1979; "Rot einfärben" *Der Spiegel*, November 12, 1979). This trend continued through the national election in 1983, and the Social Democrats recognized that they would need to incorporate environmental issues into their platform if they wanted a chance to regain power.
35. A report issued from the Interior Ministry in 1984 concerning the establishment of the National Climate Research Program stated that after the experiences with Waldsterben and dioxins, the government felt it necessary to follow the precautionary principle. Deutscher Bundestag, *Bundesbericht Forschung 1984*, Drucksache 10/1543, Bonn, 1984.
36. Rolf Bauerschmidt and Klaus Schmoelling, "Die Energie-Enquete des Deutschen Bundestages: Die 4 Pfade in die Zukunft," *Bild der Wissenschaft*, February 1981.
37. Deutscher Bundesrat, *Energiebericht der Bundesregierung*, Drucksache 423/86 (Bonn: Bonner Universitäts-Buchdruckerei) September 26, 1986.

38. Deutscher Bundestag, Plenarprotokoll 10/236 (Bonn: Bonner Universitäts-Buchdruckerei), September 26, 1986.
39. Deutscher Bundestag, Antrag, Einsetzung einer Enquete-Kommission, "Vorsorge zum Schutz der Erdatmosphäre," Drucksache 11/533, June 24, 1987.
40. The Greens' version of the Enquete Commission proposal emphasized the need to take substantive measures to combat global warming and warned against stalling action with research. The proposal from the Greens was partially incorporated into the final bill for the establishment of the Enquete Commission.
41. Richard Benedick, *Ozone Diplomacy: New Directions in Safeguarding the Planet*, (Cambridge: Harvard University Press), 1991.
42. Many meteorologists and other scientists were appalled at the DPG report's extreme predictions, sweeping conclusions, and general scientific inaccuracy. A year later, the DPG, together with the German Meteorological Society (DMG) rewrote the report, which was once again widely publicized. Clearly this had an effect in mobilizing public opinion and setting political wheels in motion.
43. "Tod im Treibhaus: Eine Abgaswolke bedroht die Welt," *Der Spiegel* (January 20, 1986).
44. "Dokumentation: Die Deutsche Physikalische Gesellschaft warnt vor einer Klimakatastrophe," *Frankfurter Rundschau* (September 19, 1986).
45. See, for example: Deutscher Bundestag, Plenarprotokoll 10/197, February 19, 1986; Drucksachen 10/5195, March 14, 1986 and 10/5409, April 25, 1986.
46. Michael T. Hatch, "Corporatism, Pluralism and Post-industrial Politics: Nuclear Energy Policy in West Germany," *West European Politics* 14 (January 1991): 87.
47. Deutscher Bundestag, *Stenographischer Bericht*, 4 Sitzung Plenarprotokoll 11/4 (Bonn: Bonner Universitäts-Buchdruckerei) March 18, 1987.
48. Two additional reports have since come out, providing policy options and strategies for reducing greenhouse gas emissions.
49. Deutscher Bundestag, *Dritter Bericht der Enquete-Kommission Vorsorge zum Schutz der Erdatmosphäre zum Thema Schutz der Erde*, Drucksache 11/8030, Sachgebiet 2129, May 5, 1990, p. 27.
50. Gunter Zimmermeyer of the Environmental Department of the German Hard Coal Mining Association argued that the consensus for action is only superficial. Many industries, he insisted, including the coal industry, are resisting policies for carbon dioxide reduction. (Personal communication, July 17, 1991).
51. According to Ludwig Traotmann-Popp, formerly a member of the federal BUND in Bonn, some members of the BUND took an interest in global warming in the early 1980s after reading scientific reports about the issues, particularly from Hermann Flohn. Internal seminars were even held on the issue at that time. Traotmann-Popp argued, however, that only after Chernobyl in 1986 were the BUND's concerns about global warming taken seriously by the public. This, he asserted, was the result of the atomic energy industry's tremendous attempt to save itself by convincing the public about the dangers of a climate catastrophe. (Personal communication, August 9, 1991).
52. According to Helmut Röscheisen of the Deutscher Naturschutzring, they were inspired to take action only after enough scientific evidence had accumulated to clearly identify the greenhouse effect as a serious threat. (Personal communication, July 26, 1991).
53. Traotmann-Popp, formerly of the federal BUND, argues that the organization's energy proposals, which had called for an increase in CO₂ emissions, were merely to bridge the gap before alternative energy sources had been developed and before energy saving strategies had been implemented. Traotmann-Popp indicated

that the BUND had indeed recognized as early as 1981 that CO₂ had to be reduced in the long term because of the greenhouse effect. (Personal communication, April 9, 1991).

54. Some argue that the consensus is only superficial. Many industries do not support the nation's global warming policy.

ACKNOWLEDGEMENTS. For funding: National Science Foundation and the John D. and Catherine T. MacArthur Foundation. For assistance: Prof. Fred Strebeigh (Yale University), Prof. William Clark (Harvard University), Prof. Hermann Flohn (Bonn University), Prof. Hartmut Graßl (Hamburg Max-Planck-Institute), Wolf-Dieter Garber (Umweltbundesamt in Berlin), Dr. Günther Hill (Federation of German Industry), Helmut Röscheisen (German Nature Protection Group), Dr. Ludwig Traotmann-Popp (BUND), Dr. Alfred Hoffmann (Siemens AG), Dr. Alfred Rest (Cologne University), Leif Alfredsson (Association of the Automobile Industry), Mark Levy (Princeton University), Dr. Michael Hatch and Nancy Dickson (Harvard University).