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Learning to Manage Global Environmental Risks

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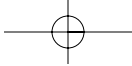
Clark C. Gibson, Margaret A. McKean, and Elinor Ostrom, editors

*Learning to Manage Global Environmental Risks, Volume 1: A Comparative History of
Social Responses to Climate Change, Ozone Depletion, and Acid Rain*

The Social Learning Group

*Learning to Manage Global Environmental Risks, Volume 2: A Functional Analysis of
Social Responses to Climate Change, Ozone Depletion, and Acid Rain*

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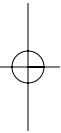
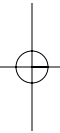


Learning to Manage Global Environmental Risks

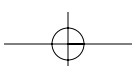
Volume 1

A Comparative History of Social Responses to
Climate Change, Ozone Depletion, and Acid Rain

The Social Learning Group



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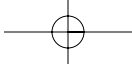
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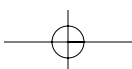
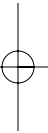
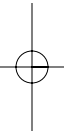
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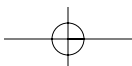
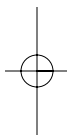
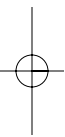
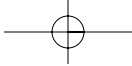
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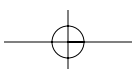
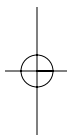
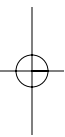
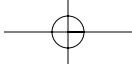
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(Superscripts refer to institutional affiliations listed on the right)

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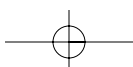
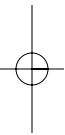
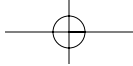
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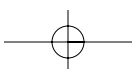
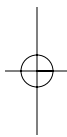
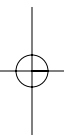
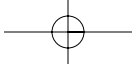


Series Foreword

As our understanding of environmental threats deepens and broadens, it is increasingly clear that many environmental issues cannot be understood, analyzed, or acted on simply. The multifaceted relationships between human beings, social and political institutions, and the physical environment in which they are situated extend across disciplines as well as geopolitical confines and cannot be analyzed or resolved in isolation.

This series addresses the increasingly complex questions of how societies come to understand, confront, and cope with both the sources and the manifestations of present and potential environmental threats. Works in the series may focus on matters political, scientific, technical, social, or economic. What they share is their attention to the intertwined roles of politics, science, and technology in recognizing, framing, analyzing, and managing environment-related contemporary issues and their relevance to the increasingly difficult problems of identifying and forging environmentally sound public policy.

Peter M. Haas
Sheila Jasanoff
Gene Rochlin



Foreword

More than a hundred years have gone by since an awareness of human-induced changes of the environment emerged. Air pollution became a political issue when industrial development and uninhibited emissions of smoke and gases in the United Kingdom caused serious social problems. Legislation became necessary in order to protect people's health and living conditions. The first law to prevent damage was passed by the British Parliament in the 1870s. Nevertheless, the use of coal as the prime source of energy continued to increase, and pollution was by no means eliminated. The solution of industrialists was of course to increase the height of chimneys and to spread the pollution over greater distances. Studies of turbulence and mixing in the lowest layers of the atmosphere became a profession of its own of obvious practical importance. The environmental problem of local pollution had been recognized, and means for solving it were developed, but the full scope of the issue was not yet understood. It took until the early 1950s before regional problems were gradually brought into focus. The seriousness of the issue was recognized early in the Los Angeles area, where special meteorological and climatic features of the region were of central importance, as well as in the industrialized parts of Britain and Western Europe. Some may still remember the disastrous smog that hit the London area in December 1954. Still, progress in mitigating and preventing serious incidents of this kind was slow. Damaging emissions often could not be seen far away from the source area and, after all, the incidents were temporary.

Similarly, people were generally unaware of the risk of emissions from nuclear plants. The accident at Windscale in England in October 1957 changed the public attitude drastically. Radioactive iodine originating from the accident was discovered far from the source over the European continent. The invisible radioactive threat became a reality, and the safety problems for the nuclear industry a political issue. Still the regional pollution due to everyday human activities was in general not thought about much.

In the mid-1950s C. G. Rossby recognized the importance of the natural large-scale dispersion by the winds of key chemical trace components of the air. A network of observational sites was established in northwest Europe to determine the chemical composition of the air and precipitation. It was soon shown that the long-distance transport of nutrients was of basic ecological significance. Nitrogen compounds emitted from agricultural activities in Denmark were of some importance for the farmers in southern Sweden. Similarly, it was realized that boreal forests to some extent depend on the supply of airborne nutrients in addition to what nature provides by chemical weathering of the bedrock. This network of observations also provided the data that later were used to study the regional dispersion of sulfur pollution, which led to the discovery of the acidification of precipitation and fresh water systems. The conclusion was obvious: The atmosphere must not be treated as an unlimited wastebasket for human activities. Regional pollution emerged as an important issue for the future. This development was largely science-driven. The pollution could not be seen, and the dangers remained abstract to the general public for a long time. Matters changed when fishing in the lakes of Scandinavia deteriorated and when the forests in central Europe were damaged in obvious ways.

At about the same time, another global environmental issue emerged, again not visible to the general public, and its appearance on the political agenda was therefore completely

science-driven: The ozone layer might be damaged because of the emissions of chlorofluorocarbons (CFCs). In this case there were not even data that could validate the theoretical deductions by scientists, but if true it meant a serious threat to life on earth. It was difficult to reach agreements on whether protective actions should be taken now or later. Some modest measures were agreed on, and negotiations for a convention on the protection of the ozone began. Progress was slow, and an agreement of a framework convention, however with no legally binding commitments, was not settled until 1985. The public awareness of the issue was slight. Merely a year later the ozone hole over the Antarctica was discovered. Scientists were able to explain the reason for its temporary appearance, and observations were now available that could validate the theory. Major reductions of the emissions of CFCs were called for, and an agreement was reached within a year. The issue still remained a mystery for most people, except in a few countries in the Southern Hemisphere, where there was a need for protective measures.

A possible global human-induced change of the environment—that is, the composition of atmosphere—already had been recognized implicitly by Svante Arrhenius in 1895, when he showed that changes of the concentration of atmospheric carbon dioxide might change the climate of the earth. The prime aim of his analysis was, however, to explain the last glaciation that had been discovered a few decades earlier, not to warn about human-induced climate change.

A possible human-induced climate change was not generally recognized outside the scientific community for many years. C. D. Keeling was the first to demonstrate clearly that the atmospheric concentration of carbon dioxide was increasing by about 0.5% per year and must have increased significantly (about 10%) above the preindustrial level. It remained, however, exclusively a scientific issue until the middle of the 1970s. At that time—that is, eighty years after Arrhenius's original analysis—Syukuro Manabe showed convincingly that Arrhenius was largely right. From then on, the threat of a possible human-induced global climate change, "global warming," gradually received more attention, first in scientific circles and then also in the political realm.

Global warming is undoubtedly the most complex environmental threat that we have been confronted with so far. Observations now provide considerable evidence that human-induced climatic change is occurring. Although more detailed scientific analyses of what happens now and may happen in the future are needed, the real challenge now is rather to try to understand better how countries and people will respond. How will different segments of society with different interests react? What will be the road from recognition of the issue to concerted action? How can controversies between developed and developing countries and between rich and poor be prevented? What key technical developments will be needed? Which institutions, nationally and internationally, will be required to manage their development without imposing unduly on people and the global market?

The present book does not provide answers to these questions. But it does contribute to a better understanding of the long-term development of efforts to manage interactions between society and the environment. The study looks in depth at the three issues discussed above—acid rain, stratospheric ozone depletion, and climatic change—and traces the evolution of efforts to deal with these issues over the period extending from the International Geophysical Year in 1957 to the United Nations Conference on Environment and Development in Rio in 1992. By taking this long-term perspective and by looking at developments in a range of countries as well as in international institutions, the study is able to illustrate the basis on which current efforts to respond to global environmental change can build. An important contribution of the study is the inclusion of a wide range of actors, rather than just focusing on scientists and legislators. The book itself is an important contribution to social learning about the management of global environmental risks.

Bert Bolin
Stockholm

Preface

This book emerged from the growing recognition during the late 1980s of the need for better understanding of how human societies might perceive, evaluate, and respond to global environmental change. As participants in a number of early attempts to articulate those needs and the research that would be necessary to meet them, we were particularly struck by three shortcomings of existing work. First, although experts, advocates, and political leaders in different parts of the world clearly encountered global environmental change in very different ways, most of our understanding reflected the perspectives of a very narrow range of countries and groups. Second, although society's response to global environmental change was clearly a long-term process unfolding over decades, most of our understanding focused on key discoveries and decisions and paid little attention to the historical connections among them. Third, although most debates on how to improve social response were replete with analogies and lesson drawing, there was little critical discussion of what might be appropriately learned from the experiences of other problems and places. The need to develop a long-term, comparative perspective on the evolution of social responses to global environmental risks—and of the role of learning in that evolution—therefore seemed evident.

The broad outline of the study reported here was developed by one of us, Bill Clark, with planning support from the Stockholm Environment Institute and the U.S. National Science Foundation. At an early stage, the project was taken under the wing of the Committee on the Human Dimensions of Global Environmental Change of the U.S. Social Science Research Council (SSRC). The project benefited substantially from the tough but constructive criticism of the remarkable group of scholars committed to promoting excellence in cross-disciplinary research that the SSRC had assembled. The development and implementation of the project as a truly international team effort, however, was made possible by the John D. and Catherine T. MacArthur Foundation. The Collaborative Studies Program that the Foundation began in 1990 was virtually unique at the time in providing opportunities for sustained multinational, interdisciplinary research teamwork on global environmental problems. We used the opportunity of Clark's stay as Jean Monnet Visiting Professor at the European University Institute in the spring of 1990 to bring together a team of coprincipal investigators for the purposes of developing a proposal to the MacArthur Foundation for a study on Social Learning in the Management of Global Environmental Risks. These individuals—the three of us plus Ida Koppen, Vassily Sokolov, and Brian Wynne—provided an initial core to the Social Learning Group that eventually grew into the collaborative network of scholars listed in the front of this volume. Shortly after notification by the MacArthur Foundation of favorable action on our proposal, the core group accepted an invitation by Dr. Peter de Janosi, director of the International Institute for Applied Systems Analysis (IIASA), to use the Institute's facilities for a retreat to develop detailed plans for implementing the project.

The basic design to emerge from the IIASA meeting was a project organized around teams recruited by the core group members. Each team ultimately consisted of senior scholars, junior faculty, and graduate students in various proportions. Each was selected to allow research on the history of social responses to global environmental risks in a specific

arena—initially Germany, the Netherlands, the United Kingdom, the Soviet Union, the United States, the European Community, and the family of international institutions. In particular, we decided to have each arena study develop a comparative analysis of the response of that arena to the three risks of acid rain, stratospheric ozone depletion, and climate change. In addition, a series of management functions were identified that would be addressed in each arena history through a common research protocol. The results would then be synthesized into cross-cutting “function” chapters for the final report, authored by groups consisting of contributors from the arena teams.

The substantive aspects and rationale of this design are described in chapter 1. Procedurally, the project adopted an iterative strategy to promote design and implementation of a truly comparable and comparative approach to research. The core element in this strategy was an annual summer study that brought all project participants together for a week of intensive discussions in plenary and smaller drafting group sessions. For the first iteration of the strategy during the spring and early summer of 1991, the draft research protocol developed by the core group at the initial IIASA meeting was applied by each arena team to the case of climate change. Our first summer study, held in 1991 at Bad Bleiberg in Austria, reviewed these results, revised the research protocol, recommended improvements in project management and direction, and planned a series of smaller meetings on cross-cutting topics for the following year. In an effort to expand the range of countries studied by the project, scholars familiar with the response to global environmental issues in Japan, Hungary, and Mexico were invited as observers to Bad Bleiberg and, based on their contributions there, were subsequently asked to join the group as full partners. Subsequent summer studies were held in 1992 at Canada’s Dunsmuir Lodge (focused on the ozone case), in 1993 at Germany’s Wuppertal Institute (focused on the acid rain case), and in 1994 again at Dunsmuir Lodge (focused on cross-case comparisons and further work on the climate change case). Within the broad structure provided by the annual projectwide summer studies, smaller and shorter meetings were held periodically to advance work on particular cross-cutting themes and chapters. From the earliest (pre-Internet) days of the project, an active electronic network was used to bind the group together between meetings.

In parallel with our largely internal cycle of summer studies and smaller technical meetings, we engaged in a continuing program of outreach to bring the insights of a larger community of scholars and practitioners to bear on the project’s evolution. As already noted, the SSRC organized an early critical review of the conceptual foundations of the study. A few outsiders were usually invited to our summer studies and provided valuable independent criticism—at least until they were coopted into the project as full-time participants. In May of 1993 we brought together at the European University Institute a small group of distinguished scholars who had written on various aspects of social learning—Emanuel Adler, Klaus Eder, and Sheila Jasanoff—and asked them to review the project’s preliminary findings and to advise us on potential orientations and audiences for what has become the present book. A presentation to Canadian government officials after the 1994 summer study provided valuable feedback on some of our emerging conclusions about the practical implications of our study for risk management. The synthesis chapters were initially presented in draft form at the First Open Meeting of the Human Dimensions of Global Environmental Change Research Community at Duke University in 1995. An even broader audience was addressed through a panel presentation organized at the annual meeting of the American Association for the Advancement of Science in 1996.

Taken together, our joint activities at these internal and external project meetings forged the Social Learning Group—a multidisciplinary, multinational collaborative team that, though replete with differences of opinion, perspectives, and research styles, nonetheless developed a shared set of concepts, data, methods, and commitment to the larger project. More prosaically, the meetings produced continuing refinements of the research protocol and project design, began drafting and reviewing the cross-cutting studies of management

functions, and added an arena study on Canada to the overall project. By the end of the 1994 summer study we had reached decisions on a table of contents for the project's final report, adopted length targets and editorial guidelines for the written material, negotiated responsibilities for completing those chapters, decided how credit would be allocated to contributors, and designated an editorial board consisting of the three of us plus Nancy Dickson to shepherd the final report to publication. Over the next two years, first drafts of most of the chapters included in this volume were completed, subjected to internal review, and revised extensively. The editors met again at IIASA in the summer of 1995 to review progress and—in light of the research results then emerging—to prepare a substantially revised outline of three synthesis chapters to pull results of the study together. This outline was circulated to other Group members for suggestions, with drafting of the revised synthesis chapters beginning in early 1996.

Any project as wideranging and multifaceted as that undertaken here faces enormous challenges of quality control. The basic housekeeping of fact checking, sequence verification, and secondary sources confirmation have been daunting—all the more so given the absence of consolidated archives for the relevant documents and the long historical time span and multiple languages involved in the study. Well aware from our initial research of the high proportion of elementary factual errors in the literature dealing with the history of global environmental change, the Group imposed on itself early on an especially rigorous program of peer review. For each of the core arena and function chapters, this has meant not only critical reading by a cross-section of project members and editors but also an external blind review by at least three external reviewers. These reviewers were selected by the editors in consultation with Group members for their familiarity with both the factual and conceptual aspects of the chapter. Care was taken that the reviewers selected for each chapter represented a wide range of national and disciplinary backgrounds. The reviews were blind in that only the editors, not the authors, were aware of the reviewers' identities. Beginning in the summer of 1996, most chapters had passed internal review and were ready for this external process. Reviewers were given a set of specific questions to answer and asked to reply in writing. They did—often at great length. The editorial board returned reviews to the chapter authors and monitored revisions to make sure that reviewers' concerns were addressed. Many of these revisions were relatively minor matters of fact, attribution, and emphasis. Several, however—especially in the function chapters—constituted major rewriting of the material. Revisions to reflect outside review were carried out through 1997. Final work on the synthesis chapters to incorporate those revisions was completed the following year. Along the way, results were critiqued by participants at the 1997 Bologna Summer School in Environmental Policy, participants in the 1998 meeting of the European Forum on Integrated Environmental Assessment, and members of a panel on Learning and Belief Change among Policy Elites held at the 1998 Annual Meeting of the American Political Science Association.

The final product that emerged from the Group project in the form of this book is a uniquely collaborative endeavor. The question of authorship therefore merits special comment. One of the toughest challenges in running any collaborative project is to balance the individual scholar's need for individual credit, the project's interest in getting collaborators to share their ideas and criticism with one another, and the practical requirement that someone have incentive and authority to focus and complete a multicontributor work. This challenge is particularly acute in projects such as this one that involve collaborators ranging from senior professors to junior graduate students. But to the extent that it cannot be satisfactorily resolved, collaborative research will remain the exception rather than the rule. This project took very seriously the need for collaboration and the challenges of devising appropriate incentives and credits to promote it.

We concluded, reasonably amicably, as follows. The chapters in this book grew out of multiple working group meetings by our arena teams and at our summer studies and other

meetings. Each has drawn on the primary research memos and draft text of many individuals. In the end, however, one or a few individuals have taken responsibility for giving the chapter its present form. These individuals are listed as the lead author(s) on each chapter. In most cases, they share credit “with” a second group of authors who contributed to the conceptual content, but not the specific language, of the chapter. Finally, most chapters list in their first endnote a series of acknowledgments to others who contributed primary research or criticism on which the chapter is built but who did not shape the chapter in its present form. The resulting impression that many members of the Group contributed in multiple ways to multiple chapters is both intended and true. The book as a whole is presented and cataloged as a work of the corporate author the Social Learning Group in recognition of the collaborative character of not only the writing but the design and execution of the overall study. All of the contributors listed at the front of this volume are members of the Group and thus authors of the book. Finally, the designation of editors for the book as a whole reflects the Group’s recognition of the extra effort needed from a few people in drawing the physical book together and ensuring consistency throughout.

A gratifyingly large number of people and institutions have supported this project in a variety of ways. Core funding, as already noted, was provided by the John D. and Catherine T. MacArthur Foundation. Other major supporters of the project included the U.S. National Science Foundation, Canada’s University of Victoria, the Netherlands Energy Center, the IBM Foundation, the Canadian Atmospheric Environment Service, the German Ministry for Research and Technology, the European University Institute, the Stockholm Environment Institute, and Utrecht University. Additional support was provided by the German Research Society, the U.S. Social Science Research Council, the USSR (later Russian) Academy of Sciences, the U.S. Department of Energy, the U.S. National Institute for Global Environmental Change, the International Institute for Applied Systems Analysis, Germany’s Wuppertal Institute for Climate, Environment, and Energy, the Mobil Foundation, the U.K. Economic and Social Research Council, the Fulbright Foundation, and the Hungarian National Scientific Research Fund. Finally, the home institutions of the Group members, listed at the front of this volume, contributed more than most of them know to making the project possible.

For their contributions as participants in the external reviewer process, the project is indebted to Robert Boardman, Harvey Brooks, James Bruce, Tom Brydges, Lynton Caldwell, Peter Chester, Ellis Cowling, Peter Fabian, Tibor Farago, Carlos Gay, Anver Ghazi, George Golitsyn, Len Good, Loren Graham, Hartmut Grassl, Nigel Haigh, Maarten Hajer, Leen Hordijk, W.J. Kakebeeke, Yoichi Kaya, P.M. Kelly, Jeremy Leggett, Ronnie Lipschutz, Mike MacCracken, Gordon MacDonald, Margaret McKean, Erno Meszaros, Alan Miller, Mario Molina, William Moomaw, Tsuneyuki Morita, Friedemann Mueller, Stephen Mumme, Ted Munn, Hiroshi Ohta, Michael Oppenheimer, Tim O’Riordan, Ian Rowlands, Milton Russell, Roberto Sanchez, Peter Sand, Rolf Sartorius, Steve Schneider, Toni Schneider, Ian Simms, Udo Simonis, Rob Swart, Peter Thacher, Arild Underdal, Peter Usher, David Victor, Arpad von Lazar, Konrad von Moltke, Helmut Weidner, Gilbert White, Pieter Winsemius, George Zavarzin, and Charles Ziegler. Numerous other individuals contributed critical insights on individual chapters and are named in those chapters’ acknowledgments.

The production of a volume involving dozens of authors, several languages, numerous time zones, and a variety of word processing programs is a task that no personnel officer would allow in a job description. Fortunately, this project has been supported by a cast of the least flappable and most efficient, resourceful, and downright nice people we have ever had the pleasure of working with: Kristen Eddy, Nora O’Neil, Bonnie Robinson, Rebecca Storo, and Ingrid Teply-Baubinder. This is their product, too, and we are immensely grateful for their support and good cheer through the toils of bringing it to fruition.

The Social Learning Group itself was a unique collection of scholars. This collaboration has had its own decade-long social history—one marked by trials and errors, hurrying and waiting, job changes and promotions, and unprecedented changes in the worlds inhabited by our Russian and Hungarian colleagues. Through it all, the Group's inventiveness, energy, commitment to understanding one another, and willingness to subsume individual agendas within a common endeavor defined for us a new standard for international, interdisciplinary collaboration. That many Group members did this while they completed dissertations and as their families grew at rates far exceeding those at which the study progressed is all the more testimony to the remarkable cast of characters the project entrained. Finally, we must single out for special mention our coeditor of this volume, Nancy Dickson. She joined the Group as project manager at its first summer study and, surviving that baptism under fire, has been its chief cat herder ever since. But she did far more than the complex and often thankless tasks of designing and maintaining our communications, organizing our meetings, pushing our schedules, and supervising the production of this book. She also emerged as a resourceful and accomplished researcher in her own right, as indicated by her coauthorship of several of the chapters in this volume.

For what they have accomplished, and for the colleagues and friends they have become, we are grateful to Nancy and all the members of the Group in more ways than we will ever be able to express.

William C. Clark
Jill Jäger
Josee van Eijndhoven

