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# The Social Contours of Risk

Volume II:  
Risk Analysis, Corporations & the Globalization of Risk



Jeanne X. Kasperson & Roger E. Kasperson

*Risk, Society and Policy Series*

The Social Contours of Risk:  
Volume II:

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Globalization of Risk



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The Social Contours of Risk:  
Volume II:

Risk Analysis, Corporations and the  
Globalization of Risk

*Jeanne X. Kasperson and Roger E. Kasperson, with contributors*

*with the assistance of  
Mimi Berberian and Lu Ann Pacenka*

 **Routledge**  
Taylor & Francis Group  
LONDON AND NEW YORK

**earthscan**  
from Routledge



First published by Earthscan in the UK and USA in 2005

For a full list of publications please contact:

Earthscan

2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN

605 Third Avenue, New York, NY 10017

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Typesetting by Mapset Ltd, Gateshead, UK

Cover design by Yvonne Booth

A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data

The social contours of risk / by Jeanne X. Kasperson and Roger E. Kasperson, with contributors, with the assistance of Mimi Berberian and Lu Ann Pacenka.

p. cm. – (Risk, society, and policy series)

Includes bibliographical references and index.

ISBN 1-84407-073-5 (v. 1 : pbk.) – ISBN 1-84407-072-7 (v. 1 : hardback) –

ISBN 1-84407-175-8 (v. 2 : pbk.) – ISBN 1-84407-176-6 (v. 2 : hardback)

1. Risk–Sociological aspects. 2. Environmental risk assessment. I. Kasperson,

Jeanne X. II. Kasperson, Roger E. III. Series.

HM1101.S635 2005

302'12–dc22

2005003307

ISBN 13: 978-1-84407-072-5 (set)

ISBN 13: 978-1-84407-175-3 (pbk)

ISBN 13: 978-1-84407-176-0 (hbk)

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# Acknowledgements

The intellectual debt of this book to colleagues, collaborators and friends over the past several decades is unusually large; in the 'Introduction and Overview' we try to note some of the more important of these. Beginning with graduate studies at the University of Chicago, Norton Ginsburg, Marvin Mikesell and Gilbert White were exemplary mentors. Our long professional collaboration and friendship with Robert Kates stimulated our interest in hazards research, led Jeanne to work on world hunger for ten years and enriched many of the studies reported on in this volume. Others at the George Perkins Marsh Institute at Clark University who have been important colleagues and collaborators over the years include Christoph Hohenemser, Rob Goble, Billie Turner, Patrick Derr, Dominic Golding, Sam Ratick, Halina Brown and Ortwin Renn. Outside of Clark, we have benefited greatly from our collaborators and friends Kirstin Dow, Paul Slovic, James Flynn, Bill Clark, Bert Bolin and Howard Kunreuther.

Mimi Berberian and Lu Ann Pacenka of the George Perkins Marsh Institute played central roles in the preparation of this book, and it would not have been possible without their generous effort and customary excellence in the multitude of tasks involved in the preparation of a volume for publication. Our good fortune to work with them over the past several decades is something we have valued greatly. Others who contributed significantly to the preparation of the book are Teresa Ogenstad and Erik Willis of the Stockholm Environment Institute.

The authors are also indebted to a variety of funding sources that supported the work in this volume over the years. We wish to note, in particular, the National Science Foundation, the Nevada Nuclear Waste Project (and particularly Joe Strolin), the United Nations University, the National Oceanic and Atmospheric Administration and the US Environmental Protection Agency. The George Perkins Marsh Institute of Clark University and the Stockholm Environment Institute supported the preparation of the book in a variety of ways and we acknowledge our appreciation to them.

Finally, we note the continuing support and joy we have received from our children, Demetri and Kyra.

*Roger E. Kasperson, on behalf of Jeanne X. Kasperson and Roger E. Kasperson*  
Stockholm, Sweden

1 June 2004

# Acronyms and Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
AE	architect-engineer
AIDS	acquired immune deficiency syndrome
AIR	<i>All India Reporter</i>
ALARA	as low as reasonable achievable
AOSIS	Alliance of Small Island States
ASARCO	American Smelting and Refining Company
ASSOCHAM	Associated Chambers of Commerce and Industry of India
BBC	British Broadcasting Corporation
BGH	bovine growth hormone
BRWM	Board on Radioactive Waste Management
BSE	bovine spongiform encephalopathy
BST	bovine somatotrophin
CAER	Community Awareness and Emergency Response
CEGB	Central Electricity Generating Board
CENTED	Center for Technology, Environment and Development
CEO	chief executive officer
CFC	chlorofluorocarbon
CIA	Central Intelligence Agency
CIIT	Chemical Industry Institute of Toxicology
CJD	Creutzfeldt-Jakob disease
CMA	Chemical Manufacturers Association
CPSC	Consumer Product Safety Commission
DAD	decide-announce-defend
DDT	dichlorodiphenyl-trichloroethane
DEA	data envelopment analysis
DFID	Department for International Development
DHHS	Department of Health and Human Services
DNA	deoxyribose nucleic acid
DOE	Department of Energy
EDB	ethylene dibromide
EIA	environmental impact assessment
EK-A	Energikommissionens Expertgrupp för Sakerhat och Miljö
ENSO	El Niño Southern Oscillation



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NACEC	North American Commission for Environmental Cooperation
NBC	National Broadcasting Company
NE NIGEC	Northeast Regional Center of the National Institutes for Global Environmental Change
NEPA	National Environmental Policy Act
NGO	non-governmental organization
NIMBY	not in my backyard
NIMTOF	not in my term of office
NNC	National Nuclear Corporation
NOAA	National Oceanographic and Atmospheric Administration
NORC	National Opinion Research Center
NRC	National Research Council
NRC	Nuclear Regulatory Commission
NSSS	nuclear steam system supplier
NWPA	Nuclear Waste Policy Act
OCRWM	Office of Civilian Radioactive Waste Management
OECD	Organisation for Economic Co-operation and Development
OFDA	Office of US Foreign Disaster Assistance
OMB	Office of Management and Budget
OPEC	Organization of Petroleum Exporting Countries
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
OTA	Office of Technology Assessment
PCB	polychlorinated biphenyl
PRA	probabilistic risk analysis
psi	pounds per square inch
PWR	pressurized-water reactor
RAINS	Regional Acidification INformation and Simulation
rem	roentgen equivalent in man
R.I.P.	rest in peace
SARA	Superfund Amendments and Reauthorization Act
SARF	social amplification of risk framework
SEI	Stockholm Environment Institute
SEK	Swedish krona
SFFI	Shriram Food and Fertilizer Industries (India)
SRA	Society for Risk Analysis
SSI	Swedish National Radiation Protection Institute
START	SysTem for Analysis, Research and Training
SUPRA	Scottish Universities Policy Research and Advice Network
TLV	threshold limit value
TMI	Three Mile Island
TRIS	flame retardant, chemical structure is (2, 3 dibromolpropyl) phosphate

TSCA	Toxic Substances Control Act
UCIL	Union Carbide of India Limited
UCS	Union of Concerned Scientists
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNDRO	United Nations Disaster Relief Organization
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations International Children Emergency Fund
UNISDR	United Nations International Strategy for Disaster Reduction
UNLV	University of Nevada, Las Vegas
USNUREG	United States Nuclear Regulatory Commission
USSR	Union of Soviet Socialist Republics
VDT	visual display terminal
WBGU	Wissenschaftlicher Beirat Globale Umweltveränderungen
WCED	World Commission on Environment and Development
WHO	World Health Organization
WICEM	World Industry Conference on Environmental Management
WIPP	Waste Isolation Pilot Plant
WTO	World Trade Organization





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# Introduction and Overview<sup>1</sup>

## HISTORY

Roger Kasperson and Jeanne Xanthakos met as first year students at Clark University in the autumn of 1955, beginning a college romance that resulted in their marriage in 1959 and what eventually also became a long scholarly collaboration. Loading their few personal belongings and a family cat, as it turned out, into a small U-Haul trailer, they set off for the University of Chicago, where Jeanne commenced graduate studies in English (receiving an MA in 1961), while also working in the University of Chicago Education Library and Roger began his graduate programme in the Geography Department (receiving his PhD in 1966). Geography at Chicago was a hotbed at that time, under the direction of Gilbert F. White, for the creation of a field of natural hazards research and cross-disciplinary research on environmental issues. While Roger was pursuing a programme focused on political geography, the tutelage of Marvin Mikesell, Norton S. Ginsburg and Gilbert White had an important lasting influence on his interest in human–nature studies, and introduced both Roger and Jeanne to a talented cadre of fellow graduate students (e.g. Robert Kates, Ian Burton and Tom Saarinen) who were pushing the boundaries of environmental geography. Meanwhile, Jeanne was also extending the library skills that eventually became a professional career track.

After stints at the Massachusetts State College at Bridgewater, the University of Connecticut and Michigan State University, where Jeanne held library and Roger teaching positions, and a brief stint at the University of Puerto Rico, where both served as researchers, Roger accepted a joint position in government and geography at Clark University and Jeanne spent the next six years at home with two young children. It was at Clark that both Roger and Jeanne developed professional interests in risk research.

## ENTRANCE TO RISK WORK

It all began with an educational innovation. In the early 1970s, many colleges and universities instituted a brief term – January term – between the two semesters during which innovative teaching and learning

experiences would occur. At Clark, this promised such inviting things as field research on environmental problems in Puerto Rico and the Virgin Islands (geographers know where to go during New England winters!). On this occasion, in 1972, Chris Hohenemser had challenged Robert Kates and Roger Kasperson to apply their natural hazards frameworks and thinking to 'a really complicated problem – the nuclear fuel cycle'. The result was an extremely rich dialogue between geographers and physicists that highlighted a host of risk issues and questions. When the Ford Foundation shortly thereafter in 1973 announced a new research initiative centred on important interdisciplinary problems, the Clark group applied, won one of the several grants awarded, and a new collaboration on technological risk that was to last for several decades was off the ground.

While the nuclear fuel cycle work led to an important publication interpreting 'The distrust of nuclear power' in *Science* (Hohenemser et al, 1977), it more importantly revealed the need for stronger theoretical and analytical underpinnings to the young field of risk analysis. During the late 1970s, as Jeanne was joining the Clark risk group as its bibliographer and librarian, we applied to the new risk programme in the National Science Foundation and secured several grants to work on foundational ideas and approaches to the study of risk.

Using a style of working based on an interdisciplinary team, bridging the natural and social sciences, that was to become a hallmark of Clark risk research, we undertook analyses treating the causal structure of risk, a framework for analysing risk management, a taxonomy of technological risk and a large number of case studies to which these analytical structures were applied. *Perilous Progress: Technology as Hazard* (Kates et al, 1985), with Jeanne as co-editor and both of us as contributors to many of the individual chapters, brought together these results. In the two volumes of this work, several chapters emerge from these foundational efforts of the late 1970s and early 1980s. We took, for example, the pervasive question of the time: how safe is safe enough? We argued (Chapter 1, this volume) that this is a normative question to which no simple answer suffices. What is 'acceptable' or 'tolerable' is, essentially, a decision problem in which broad considerations of risk, benefits, industrial structure, equity and technological development enter. Such problems are better treated from the standpoint of process than by such 'fixes' as '1 in 1 million risk' or 'best practicable technology'. With David Pijawka, we drew upon hazard frameworks to compare natural and technological hazards, especially the shifting patterns of risk apparent in both developed and developing societies, the greater difficulties that technological risks pose for management, and the potential role of the therapeutic community during risk emergencies (Chapter 2, this volume). This chapter also explored the possibility for using common analytical approaches in some depth.

From this basic work on technological risks, we identified a number of new research directions. One that resulted in sustained work involved the

intertwining of risk management with value and ethical questions, exploration of issues that were to continue to occupy our research attention to the current time and helped inform our later work, treated in detail in Volume I, on the social amplification of risk.

## RISK, ETHICS AND VALUES

Our work on nuclear risks brought home the realization that the most difficult risk problems are nearly always heavily value laden. This even involves the definition of risk, something about which people tend not to agree. Early in its history the Society of Risk Analysis sponsored an effort to reach a consensual definition of 'risk', and commissioned a committee for that purpose. After a year of work it was apparent that defining risk was essentially a political act and the committee gave up on its effort. Indeed, risk controversies suggest that it is often not the magnitude or probabilities of specific risks upon which interested parties disagree, but, more basically, what the risk of concern in the panoply of effects should be and what sign (positive or negative) should be associated with certain postulated changes.

Work on the nuclear fuel cycle highlighted the problem of nuclear waste, an issue largely underestimated and neglected in the US and elsewhere. Alvin Weinberg (1977) was not alone in designating this problem as the one in the nuclear fuel cycle that he had most underestimated. Our work suggested strongly the need to tackle the underlying problems of what we termed 'locus' and 'legacy': how the value problems involved in putting waste in someone's backyard or exporting the risks and burdens of management to future generations could be overcome. These questions stimulated what was to be a decade of work in a series of projects supported by a new National Science Foundation programme, Ethics and Values in Science and Technology (EVIST). Specifically, the 'locus and legacy' effort addressed the issue of how wastes could be equitably stored at one place for the benefit of a large and diffuse population at many other places, as well as how the burdens and risks of waste management could be equitably distributed over this generation, which has made the decisions and reaped most of the benefits, and future generations, which have had no voice in decisions and will bear the long-term burdens.

This early foray into risk and equity issues led in two directions. Firstly, together with the earlier work on the nuclear fuel cycle, we began an extended project on the complex of social, equity and risk questions contained in radioactive waste management. This resulted in a book on *Equity Issues in Radioactive Waste Management* (Kasperson, 1983a) in which we and others identified and assessed a number of equity problems, as well as explored alternative principles of social justice that could be brought to bear on them. One of us (R.E.K.) also during this period served two terms

on the National Research Council's Board on Radioactive Waste Management and chaired the panel that produced the report *Social and Economic Aspects of Radioactive Waste Disposal* (USNRC, 1984b). Eventually, we and others at Clark participated in a remarkable team of social scientists assembled by the state of Nevada to assess the social and economic impacts of the proposed Yucca Mountain nuclear waste repository (see Chapter 8, Volume I). Chapter 14 in Volume I summarizes the history of the nuclear waste adventure and the social and value issues that have pervaded the siting process. Specifically, it criticizes the 'tunnel vision' that has been apparent in the repository developmental effort and the focus of this vision on technical issues to the exclusion of the equity and trust issues that have driven societal concern in Nevada and elsewhere. Chapter 15 (Volume I) then generalizes these equity issues to a much broader array of siting undertakings, both in the US and other countries. The latter chapter assesses the underlying problems that have stalemated siting ventures in many countries, contrasts the major approaches that have evolved, and prescribes a series of innovations in process and substantive equity aimed at getting the process through 'roadblocks' and securing greater success in outcomes.

The second line of work involved uncovering new risk equity problems that needed consideration. While analysing the difference in radiation standards used for workers and publics, for example, we discovered that this was only one example of what we came to term the 'double standard' in risk protection, namely, that it was legally permissible to expose workers to much higher levels of risk than publics. 'What ethical systems supported such a position?' we asked. Chapter 12 in Volume I reports on the results of a National Science Foundation project that identified the moral arguments used to support differential protection and analyses and then tested the validity of each of these arguments and their assumptions. The chapter concludes that the assumptions supporting many of the propositions are flawed and based on incomplete or erroneous evidence, such as the view that workers are compensated for the higher risk and voluntarily undertake them, and argues that steps should be taken to narrow or eliminate the divergence in risk standards and to afford workers greater protection.

In the various case studies of different equity problems, it became apparent in this work that a framework for analysing equity issues was badly needed. As a result, in 1991, working with Kirstin Dow in the context of global environmental problems, we formulated such a framework (see Chapter 13, Volume I). It allows the treatment of a number of equity problems, including both geographical equity (the not-in-my-backyard, or NIMBY, issue) and temporal equity (fairness over current and future generations). Since it combines an empirical analysis of the 'facts' of existing or projected inequities with the ability to apply different normative principles to the distributions, analysts or decision

makers could use the framework, drawing upon their own definitions of social justice. Finally, the framework provides for application of different management systems for responding to the risk equity problems, including means for building greater procedural equity.

Finally, as part of a larger effort during the second half of the 1990s that concentrated on the most vulnerable peoples and places, we examined the global social justice problems that climate change may pose for international efforts to address global warming. In Chapter 16, Volume I, we argue that the current Kyoto process fails to treat the range of equity issues involved and, as a result, is unlikely to be successful until such questions are internalized. This includes not only differential past and future greenhouse gas emissions, but also the distribution of impacts that have already begun and the differing abilities to deal with such impacts. We set forth in this chapter principles of social justice that should be recognized and a 'resilience strategy' to supplement initiatives aimed at reducing emissions worldwide.

## **CORPORATIONS AS RISK MANAGERS**

The studies of risk management during the late 1970s and early 1980s had convinced us and others in the Clark group that those closest to the technologies and production processes were in the best position to be able to manage risks if only they could be trusted with the social mandate to protect the public and the environment. A study of the Bhopal accident, undertaken with B. Bowonder of the Administrative Staff College in Hyderabad, provided a dramatic and poignant case of how industrial management of risk can go wrong. The results of the post-mortem study of the accident are set forth in Chapter 5 of this volume. Bhopal revealed how essential management attention to both safety design and ongoing management systems and attention to risk 'vigilance' was, but how important safety culture, auditing and high-level management priority to risk were, as well. Furthermore, Bhopal suggested the need for public authorities to exercise monitoring and control over what happens in individual corporations and plants. In a follow-up assessment (see Chapter 8, this volume) some decades later with B. Bowonder, we assessed what had been learned from the accident and the extent to which India was better prepared in the future to deal with industrial risks and another possible Bhopal. As might be expected, the progress we saw was greatest at the level of policy and standards and weakest at the level of monitoring, implementation and enforcement.

Bhopal was not the only case of industrial disaster that drew our attention. Some years earlier the accident at the Three Mile Island nuclear plant in Pennsylvania had produced major concerns over the adequacy of emergency planning around nuclear plants in the US. With the aid of a grant from the public fund established in the aftermath of the Three Mile



Island plant accident, we broadly assessed the state of emergency planning for nuclear plants in the US, the major results of which appear in Chapter 6 in this volume. The review was not reassuring as to management plans for emergency response. The general approach was to try to ‘engineer’ local responses to accidents and, as much as possible, to use ‘command-and-control’ procedures built upon military models of communication and organization. In Chapter 6 of this volume we argue, by contrast, that emergency management designs should build upon the adaptive behaviour of people at risk and intentionally seek to create rich information environments that allow people to exercise informed judgements and adaptive behaviour as they select protective strategies. In short, the chapter is a call for a major overhaul of approaches to managing serious industrial accidents.

The Bhopal and Three Mile Island accidents, taken together with the many case studies of risk management appearing in *Perilous Progress*, pointed to the need for a deeper understanding of how corporations actually went about the task of managing risks. And so we initiated an effort during the mid 1980s to survey what was known about the corporate management of product and occupational risks. Chapter 4 in this volume, taken from *Corporate Management of Health and Safety Hazards: A Comparison of Current Practice* (Kasperson et al, 1988a), argues that corporate risk management is ‘terra incognita.’ Despite an extensive industrial trade literature and numerous exposés of particular failures, little was known systematically about the structures, practices and resources employed by corporations in their risk work. But the chapter does report on a number of findings emerging from case studies and the secondary literature: that corporations vary widely in the types and effectiveness of their risk management efforts, that a variety of exogenous and endogenous factors helped to explain the variance, and that much more systematic and in-depth research was needed to fill out the many empty spaces in our current knowledge. The analysis also called attention to what might be termed the ‘shadow’ regulatory system that exists in corporations of processes that assess risk, set standards, audit performance and seek to ensure implementation of decisions. But, again, research is needed to build upon the existing sketchy state of empirical understanding of what actually happens in corporations and how decisions are really made.

This general study of corporate risk management highlighted the role that corporate culture, sometimes termed ‘safety culture’, played in risk management. In a project focused on the risk and ethical issues involved in the transfer of technology and the location of plants by multinational corporations in developing countries, we undertook a case study of DuPont Corporation, a firm noted for having one of the most advanced corporate safety cultures, in its location of a new plant in Thailand. The study, reported in Chapter 7 of this volume, examined the literature on corporate culture and then analysed the extent to which corporate culture

considerations actually entered into the location and development of the DuPont plant and how conflicting objectives were negotiated and resolved. While the seriousness of replicating DuPont safety goals and performance in Thailand was quite apparent, the case also indicates the challenges arising from cross-cultural contexts and the ways in which corporate culture may interfere with other goals involved in technology transfer. This is an issue of considerable importance to sustainable development programmes globally.

## RISK COMMUNICATION AND PUBLIC PARTICIPATION

As the recognition of the limits to risk regulation grew during the 1980s, interest increased in the possibilities for managing risk through better communication of risks to the public and through greater involvement of publics in risk decisions. This impetus received considerable motive force through the support of Williams Ruckelshaus in his second term as administrator of the US Environmental Protection Agency, and his use of risk communication as a central ingredient in a regulatory decision involving the release of arsenic into the air by an American Smelting and Refining Company (ASARCO) smelter in Tacoma, Washington, in 1983. While the results of this process were ambiguous and controversial, risk communication became a central topic of management interest, not only in the EPA, but in private corporations and state environmental agencies as well. Risk communication rapidly became a dominant topic at annual meetings of the Society for Risk Analysis and the risk communication group became one of the society's largest specialty groups. In 1986, the EPA sponsored the first National Conference on Risk Communication, attended by 500 people. Later, in a searching overall assessment of literature and experience, the National Research Council published *Improving Risk Communication* (USNRC, 1989).

In this first generation of risk communication studies during the 1980s, the orientation was both simplistic and specific. Drawing from advertising and public relations, the risk communication task was conceived of as identifying 'target audiences', designing the 'right messages' and using the 'right channels'. Public relations people were viewed to be the relevant experts for the risk communication job and for the task of facilitating discourse about complex risks as being intrinsically, no different to selling soap. Engineering risk communication 'targets', 'channels' and 'messages' were the approach.

Predictably, these first generation efforts produced meagre encouraging results; by the end of the 1980s, the limits of risk communication programmes were becoming painfully evident. Obviously, risk communication, heretofore the domain of advertising and public relations firms, needed to be informed by psychometric and cultural studies of risk perception and, equally important, communication needed

to be integrated with empowering those at risk and with more democratic procedures in risk decision making.

A recognition also grew that the primary risk communication problem involved the failure of risk managers to listen to those who were bearing the risks and to act upon their feedback. So the decade of infatuation with risk communication as a 'fix' to the management problem ran its course and more sophisticated approaches began to evolve, essentially, the 'second generation' of risk studies.

The Clark group made several modest contributions to this evolution. First, with Ingar Palmlund, we proposed a framework for evaluating risk communication programmes (see Chapter 3, Volume I). This format argued that evaluation needed to begin as soon, or even before, the communication programme began. And it needed to be collaborative, so that publics participated in defining what the programme goals would be and what outcomes should be pursued. Properly designed, we argued, evaluation should be integrated with the substance and procedures of the communication programme, so that mid-course corrections could be undertaken to continue to develop the programme as it moved forward.

But we were also concerned that risk communication should be integrated more generally with efforts to empower publics and to enhance their participation in risk decision making. Much earlier, we had prepared a resource paper for the Association of American Geographers dealing with public participation and advocacy planning (Kasperson and Breitbart, 1974). We went back into the extensive literature that had developed during the 1970s and early 1980s to glean major propositions that were consensual findings from previous analyses and experience. Chapter 1 of Volume I provides the results of that foray, which were published in *Risk Analysis*.

Interestingly, as experience with risk communication grew during the second half of the 1980s and the 1990s, the appeal of risk communication as an answer to how the various problems of risk management might be resolved using non-regulatory approaches began to fade. The mixed success of risk communication experience contributed to this, as well as critiques of 'message engineering' from various precincts of the social sciences. And the pendulum swung to strategies aimed at what came to be termed 'stakeholder involvement,' which was increasingly seen both as a principal mechanism for informing risk managers of public concerns and values and as a means of winning the support of various participants in the process. And soon, through various federal and state agencies, stakeholder involvement had replaced risk communication as the required ingredient of any risk management effort and 'focus groups' had become the preferred tool. As with risk communication a decade earlier, little substantive engagement with the conflicting purposes and complexities in achieving effective public participation occurred, leading us to prepare a short cautionary statement on the euphoria for the 'stakeholder express',

provided in Chapter 5 of Volume I. Nonetheless, the uncritical embrace of stakeholder involvement continues at the time of writing, not only in the US and Europe, but in developing countries, as well, where it is supplemented by mandatory efforts at 'capacity building'.

It is still important, of course, to draw together what has been learned from a wide range of experience and scholarly analysis. We were asked in 1997 to take stock of the risk communication efforts over two decades as they bore upon industrial accidents and emergency planning. In Chapter 4, Volume I, we reviewed the various approaches to risk communication that had developed over time, pointing to the strengths and limits of each. We then proposed, drawing upon our social amplification research discussed in the following section, that an integrative approach needed to be taken for designing effective programmes. Using that as a base, we then proposed a series of practical guides or advice for corporate and government officials charged with developing and implementing risk communication with various publics.

## THE SOCIAL AMPLIFICATION OF RISK

By the mid 1980s, risk studies had gone through a period of rapid foment and development. The Society for Risk Analysis had been created and enjoyed rapid growth, a new risk and decision programme had been established in the National Science Foundation and the National Research Council had published an influential study, *Risk Assessment in the Federal Government: Managing the Process* that encouraged the use of risk analysis in support of regulatory decision making (USNRC, 1983). And yet, progress in conceptual approaches appeared limited due to the separation of natural and technological hazards, each of which had its own journals, professional societies and annual meetings; social and technical analyses of risks that proceeded largely independently from one another; and the preoccupation among social scientists with quarrels over which risk approach (the psychometric model, cultural theory or economic analysis) should be preferred. The risk field, in short, appeared hamstrung by fragmented thinking and the lack of overarching analysis.

It was also at this time (1986, to be exact) that we were drawn with other risk scholars into what would become a remarkable chapter in social science research. The state of Nevada was a candidate site for the development of a high-level nuclear waste repository and had decided to embark on a programme of social and economic studies to identify and assess what impacts the state might experience as a result of both the consideration process and then the development of the facility itself. The study team assembled boasted diverse experience and talents, and included such prominent risk scholars as Paul Slovic, Jim Flynn, Howard Kunreuther, Bill Freudenburg, Alvin Mushkatel and David Pijawka. But the state also assembled a remarkable technical review committee chaired

by Gilbert F. White that included the likes of the economist Allen Kneese, the sociologist Kai Erikson, and the anthropologist Roy Rappaport. The research group interacted intensely with these advisers over a decade of collaborative work, producing not only several hundred articles and technical reports, but breaking new ground on a number of risk issues and constructs.

One of these was the social amplification of risk framework. In 1986, as part of our review of risk analyses performed in support of the US Department of Energy's (DOE's) high-level radioactive waste management programme, we were pondering what effects small accidents in the transportation or operational system at the repository, or perhaps even significant mishaps in management without major radiation releases, might have on the programme. From past work, we recognized that such risk events would likely receive high levels of media attention and close public scrutiny. Paul Slovic (1987) was developing the concept of 'risk signals', risk events or occurrences that suggest to the public that the risk is more serious or difficult to manage than had been previously assumed. So we began a discussion with Paul Slovic and his colleagues at Decision Research about how we might analyse such issues, and together we started to try to describe, in schematic or simple conceptual form, what processes would be likely to emerge where things go wrong concerning risks that are widely feared. The team at Clark that worked intensively on this was made up of the Kaspersons, Rob Goble, Sam Ratick and Ortwin Renn. Alternative schematic frameworks flowed back and forth between Clark and Decision Research until the two groups reached agreement in the form of an article for *Risk Analysis*. This piece, provided as Chapter 6 of Volume I, stimulated lively debate from those who commented on it in the journal and also a vigorous exploration of the conceptual framework by not only the original authors, but many others over the next 15 years. Indeed, in terms of our own work, we subsequently wrote some 17 published articles or book chapters expanding on the framework and applying it to a broad array of risk issues and situations.

'The social amplification of risk' sought to produce an integrative framework that could be used to integrate both technical and social aspects of risk, but would also bring under one roof findings from a variety of theoretical and social science perspectives. The intention was to examine the major structures of society that enter into the processing of risk and risk events. This processing can be either proactive, in anticipation of risk events, or reactive to them. We define 'social stations' that are active in processing or augmenting the flow of 'risk signals' and interpreting their social meaning. The actions of these social stations may either dampen the flow of signals, as in risk *attenuation*, or amplify them, as in risk *amplification*. Both affect the rippling of consequences in time and space. Highly socially amplified risks have ripples that extend beyond the immediately affected persons or institutions, and may have large effects

upon distant actors. Highly attenuated risks, by contrast, typically have low visibility and concern, and impacts are restricted to those most directly affected.

The social amplification framework proved to be highly useful not only for the various studies conducted in the Nevada project on high-level radioactive waste management, but for other risk issues as well. In Chapter 7 of Volume I, for example, we ask the question: 'How is it, given all the ongoing attention to risks in the media and elsewhere, that certain risks pass unnoticed or unattended, growing in size until they have taken a serious toll?' Using notions from the social amplification framework, we explored the phenomena of 'hidden hazards' and found a variety of causes and explanations. Some hazards, such as what we term 'global elusive hazards', remain hidden because of the nature of the risks themselves. Elusive global hazards, such as acid rain and global warming, for example, have widely diffused effects that are difficult to pinpoint in particular times or places. Some risks, by contrast, are widely attenuated due to society's ideological structures, and so in the US occupational risks, for example, have often generated little concern. Other risks are concentrated among marginal peoples who have little access to political power or the media; therefore, hunger and famines often grow in severity and scope before they are 'discovered' by society's watchdogs or monitoring institutions. Meanwhile, socially amplified and value-threatening hazards, such as genetically modified foods, spark social clashes and conflicts while attenuated hazards generate yawns over the breakfast table.

Risk signals occupy an important place in social amplification thinking. But except for Paul Slovic's hypothesis that particular risk events have high signal value, little attention had been given to the types of signals that exist or the effects they might have. Therefore, working with Betty Jean Perkins, Ortwin Renn and Allen White, as recounted in Chapter 8 of Volume I, we undertook an analysis of the flow of risk signals related to the nuclear waste repository issue in the major newspaper of Las Vegas. This necessitated the development of methodology for identifying and analysing risk signals. We also created a taxonomy of risk signals for classifying the kinds of interpretation and inferences involved. The analysis of the flow of signals in the major Las Vegas newspaper pointed clearly to a major shift in the focus of the Nevada nuclear waste repository debate, from one initially centred on traditional risk and benefit issues, to one almost wholly preoccupied with equity, social trust and the use of political power. Risk signal analyses are a promising new approach to understanding the social contours of risk, but have yet to be fully developed by us or other social risk analysts.

Another aspect of risk emerging from the Nevada studies and one closely related to the social amplification of risk is the concept of stigma. In the nuclear waste context, the intense media coverage of repository-related risks and the social conflict surrounding the repository siting



process has a large potential to stigmatize places under consideration for repository sites (invariably termed as ‘dumps’) and, perhaps, the waste disposal technology itself. These issues are explored in depth in *Risk, Media and Stigma: Understanding Public Challenges to Modern Science and Technology* (Flynn et al, 2001). As part of their efforts on the stigma issue, we were asked to apply the social amplification framework to the development of stigma. This analysis, reported in Chapter 9 of Volume I, modified the social amplification framework to focus it directly on stigma evolution and effects. We give particular attention, drawing both on the stigma and amplification literatures, to how people, places or technologies come to be ‘marked’, how this marking, over time, changes the identity by which people view themselves and, finally, how identity changes in the perceptions of others. Clearly, social amplification of risks can constitute a powerful process in marking and identity changes. And stigma becomes not only a consequence and part of the ‘rippling’ of effects, but also a causal factor in future amplification processes.

During the late 1990s, the UK Health and Safety Executive became interested in the social amplification of risk framework and instituted a research programme on that theme. In 1999, with Nick Pidgeon and Paul Slovic, we convened a workshop in the UK that brought together researchers who had been working on social amplification concepts, themes and applications, and a series of papers was subsequently published in *The Social Amplification of Risk* (Pidgeon et al, 2003). For the workshop and volume, we joined with Pidgeon and Slovic in the stocktaking on social amplification work over the past 15 years, as reported in Chapter 11 of Volume I. This overview reviews the principal scholarly debates that have emerged around the social amplification framework, major findings from empirical research on the concepts, diverse applications that have been undertaken and unresolved issues that remain to be addressed. Sessions at the World Congress on Risk in 2003 showcased yet a new array of empirical and theoretical studies, indicating that the framework continues to be useful for a range of social studies of risk and policy applications.

## THE GLOBALIZATION OF RISK

Global environmental risk, we have noted elsewhere (Kasperson and Kasperson, 2001b), is the ultimate threat. What is at stake is the survival of the planet itself, and the life support systems it provides for humans and other species. At the same time, the risks are highly uncertain, and only partially knowable and manageable. The risk portfolios of individual countries and places are also becoming progressively more global in their sources. And so the increasing globalization of risk confronts humans with some of their most challenging and perplexing risk problems.

For some time our interests in global risks had been growing, as reflected in our writings with B. Bowonder (Chapters 5, 8 and 9 of this

volume), our international studies of comparative management of the nuclear fuel cycle (Chapter 3 of this volume) and the decade that one of us (J.X.K. spent at the World Hunger Program at Brown University during the 1980s and 1990s (see Newman, 1990). But two events – one international and one local – accelerated our attention to the global arena. The World Commission on Environment and Development (WCED, 1987) report clearly demarcated the need for concerted attention to changes in the basic biogeochemical cycles of the Earth and the threats that human activities posed for the long-term security and well-being of the planet. It also called for an international programme of risk research to build the necessary knowledge base. At about the same time, Clark University hosted a landmark international conference entitled ‘The Earth as Transformed by Human Action’ (Turner et al, 1990a) that documented and assessed human-driven changes in the planet over the last 300 years. At Clark, this led us to join forces with Bill Turner and his research group who were examining human transformation of the planet, particularly in terms of land use, land cover and agricultural systems.

The concrete result of this new collaboration was a major international project entitled Critical Environmental Zones, which was to occupy a decade of effort analysing nine high-risk regions of the world (the Olgallala aquifer, the Basin of Mexico, Amazonia, the North Sea, the Aral Sea, Ukambani in Kenya, the Ordos Plateau of China, the Middle Hills of Nepal, and the Sundaland area of Southeast Asia). The goals were unabashedly ambitious – to understand the principal human driving forces in each of these regions, the human and ecosystem vulnerabilities, and the patterns of human response that arose to deal with the risks and their effects. And, as with the social amplification work, we sought integrative frameworks crossing the natural and social sciences in each of the regions. The work was also avowedly collaborative in that scientists indigenous to the regions were involved in each of the regional assessments.

The project taught us a great deal, both about the challenges of integrative work and how comparative studies can actually be achieved when everyone has their own pet interests and differing theoretical perspectives. We particularly came to believe in the importance of process – the need to formulate team-oriented questions and formats, frequent project meetings where research designs and initial findings are presented and defended, and successive ‘approximations’ of what the emerging comparative findings are. Eventually, over the ten years of effort, a major comparative volume (Kasperson et al, 1995) and five regional books (see Chapter 11 of this volume) appeared. Although the regions had been selected because they were seriously environmentally threatened areas, the results were, nonetheless, sobering: each region had distinctive arrays of human driving forces; state policies and globalization processes were assuming increased importance; high vulnerability was apparent in many subgroups and marginal areas; and policy interventions aimed at

controlling driving forces and mitigating impacts and vulnerabilities were lagging seriously behind the pace of environmental degradation. So, while the Earth Summit in Johannesburg in 2002 could point to many good works and scattered successes in the first generation of sustainability work, *Regions at Risk* details that, however commendable these efforts, evidence abounds that we are losing ground. Chapter 11 in this volume details the major findings at some length.

As we worked on regional patterns of environmental change in different parts of the globe, vulnerability issues were assuming a growing prominence in our analyses. And, of course, our sustained work on equity issues had invariably involved questions of differential vulnerability to risk. During the mid 1990s, vulnerability research showed many of the same patterns and characteristics that the risk field as a whole had a decade earlier. Despite the fact that vulnerability is an integral part of the risk – threat is an interaction between stresses and perturbation and the degree of vulnerability that exists among receptor systems to them – the social science community researching the risk field had not given concerted attention to the assessment of vulnerability. Such attention as had occurred had come largely from analysts working on natural hazards and climate impacts; but they were heavily divided between the ecological and social science communities, while, in addition, the social scientists themselves were fragmented into competing ideological and theoretical camps. Indeed, a common view during the 1990s was that ‘social vulnerability’ was what really mattered, and thus linkages and interactions with ecosystems and ecosystem services could be left to others. Meanwhile, a variety of international efforts, such as those on the Intergovernmental Panel on Climate Change, the International Human Dimensions Programme, the emerging Millennium Ecosystem Assessment and agencies such as the United Nations Environment Programme and the United Nations Development Programme had identified vulnerability as a priority issue. Expectations were high for what vulnerability assessment could deliver. And so the time seemed right to convene some of the leaders in vulnerability research to take stock of the state of theory and research and to explore whether broad-based, more integrative approaches could be identified.

So, with support from the International Human Dimensions Programme and the Land Use, Land Cover Research Program, we convened a workshop at the Stockholm Environment Institute to assess research and practice in this field. The discussions indicated that, while many differences remained among competing approaches, it might indeed be possible to find a middle ground. Many agreed that a common conceptual framework, such as that presented by Clark and the Stockholm Environment Institute (Kasperson and Kasperson, 2001a, p16), was essential for greater cumulative progress in the field. But it was also apparent that two requirements, in particular, stood out: (1) whatever

framework emerged needed to treat the basic receptor as a social-ecological system as researchers in the Resilience Alliance had been doing (Berkes and Folke, 1998), and (2) that empirical applications and validation of any conceptual framework was a high priority.

Earlier we (along with George Clark and others) had been part of an effort to assess human vulnerability to severe storms along the northeast coast of the US (see Chapter 12 of this volume). This analysis sought to assess multiple dimensions of vulnerability in the coastal community of Revere, Massachusetts, and to integrate physical dimensions of risk with social vulnerabilities to them, drawing upon census data in particular for the latter. Data envelope analysis was then used to analyse the results and maps were prepared that captured the interactions between physical and social risk. Drawing upon that study and the workshop results, and collaborating with Bill Turner, Wen Hsieh and Andrew Schiller, we developed a lengthy analysis of the fundamental issues involved in vulnerability, with a particular focus upon creating a sound conceptual framework that captured the essential elements and dynamics of vulnerability (see Chapter 14 in this volume). This work also benefited greatly from interactions with a research team convened by Bill Clark at Harvard University and two intensive workshops held at Airlie House in the US that reviewed and contributed to our thinking in Chapter 14. Vulnerability analysis poses a major challenge in global change assessments and the need for sustained efforts on this in future research topics remains clear.

## HUSBAND–WIFE COLLABORATION

Over the past 25 years, as a husband and wife team, we have worked together on some 40–50 research projects, written or co-edited eight books and monographs, and co-authored some 50 articles, chapters and technical reports related to the subject of this book, *The Social Contours of Risk*. The question has been often posed to us – how do you work together so much and still manage to have dinner together every night? So some comment on this may be of interest to some of the readers of this volume.

Typically, we were both heavily involved, often along with other colleagues at Clark or elsewhere, in designing research projects. Since we almost invariably worked in a context of interdisciplinary collaborative research, we often sought to have something like a ‘mini-seminar’ to talk through a research issue with colleagues in order to determine what the central questions should be and how the research would be focused. Roger often played a role in helping to organize and structure these discussions; Jeanne was typically the expert on literature and bibliography and was always the meeting scribe. Jeanne also always sat quietly in a corner of the room, talking little but listening carefully and thus was always the best source as to who has said what and why (a precious skill; we know how good most men are at the listening function!).

As for collaboration in writing, we would always talk through what the central questions for a particular piece would be, what the argument was that would run through the work, and how it would be organized. We would then prepare an outline upon which we agreed. Roger would usually write the first draft. Jeanne would review the draft and then, armed with a host of questions and issues, discuss what she saw as the necessary revisions. After these had been talked through, Jeanne would write the revised version. Roger would review this, raise remaining issues, and Jeanne would subsequently write the final and polished draft for publication. Over time, we got quite good at this style of working and could be reasonably productive in our joint writing.

While we were both at the Stockholm Environment Institute, on leave from Clark in 2002, Jeanne died unexpectedly while this book was in process. The book is lovingly dedicated to her.

*Roger E. Kasperson  
Stockholm  
June 2004*

## NOTE

- 1 This 'Introduction and Overview', slightly modified, also appears in Volume I.

## Part 1

# **Risk and Society: Framing the Issues**



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