Climate fluctuations can trigger events that lead to mass migration, hunger and famine. Rather than attributing the blame to nature, the authors look at the underlying causes of social vulnerability, such as social processes and organization. Past and present susceptibility to destitution, hunger, and famine in the face of climate variability can teach us about the potential future consequences of climate change. By understanding why individuals, households, nations and regions are vulnerable, and how they have buffered themselves against climatic and environmental fluctuations, present and future vulnerability can be redressed. Through case studies from around the globe, the authors explore past experiences with climate variability, as well as the likely effects of, and the possible policy responses to, the types of climatic events that global warming might bring.

Climate Variability, Climate Change and Social Vulnerability in the Semi-arid Tropics

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Foreword

The threat of climate change has united scholars, practitioners, policy-makers and many publics to challenge the foundations of wasteful economic systems and, now over two years ago, to forge an unprecedented treaty: the Framework Convention on Climate Change. What is the contribution of the academic community to meet this challenge? Obviously, understanding of climate systems and their interactions with the biogeosphere brought the issue to the world's attention, garners the majority of funding, and, indeed, continues as an urgent need.

Yet, an equal contribution, in my view, is required from social scientists. The many disciplines are replete with frameworks (for example, political ecology, sustainable development, and risk assessment), concepts and methods (from structuration to contingent valuation and participatory rural appraisal), and prescriptions for action (such as community self-help and empowerment embodied in the slogan 'Think global, act local'). Across this diverse landscape, three foci should be prominent.

First, vulnerable populations and social equity must be firmly embedded in the science and politics of global change. Impact assessments, economic evaluations and international negotiations must be cognizant of the great disparities in livelihoods. Those who have contributed the most to climate change are able to bear the consequences more readily than those whose livelihoods are under threat at present and can least afford to either prevent climate change or survive potentially adverse consequences.

Second, the nuances of local vulnerability and capability must be clearly understood. In the near term, research on the human ecology of production, access to markets, and the politics of empowerment must be conducted at a local level. Regional and global patterns will only emerge from careful, consistent case studies of individuals, households and communities.

Third, local studies must be placed in the context of global change. Such transitions as from self-provisioning to mixed economies, from authoritarian to democratic government, from individual to collective responsibility imply a spatial connectedness that spans the world. At the same time, the dynamics of present resource use, social conditions, economic systems and political societies must be projected forward to match the time scale of climate change. Forecasting the evolution of vulnerable groups and regions remains one of the most perplexing issues in understanding the potential impacts of global change. For example, will famine continue to plague Africa in the next century? Will famine continue despite international agreements to end famine by the end of the 1990s and despite projections of economic growth such that developing countries in 2100 will be as rich then as the OECD countries are now?

This volume brings fresh insight to these issues. It firmly focuses attention on the conjuncture of the driving forces of global change, resource use in the climatically marginal semi-arid regions of Africa, Asia and Latin America, and the social geography of vulnerability. The commitment of the authors and editors provides a contribution to the literature on sustainable development and natural disasters. Furthermore, it looks beyond current approaches of climate change impact assessment toward fresh ways to identify vulnerable places, link the local and the global, and address the urgent needs of present vulnerable populations with the long-term need to enhance their capacity to respond to the effects of climate change. This latter objective should provide valuable insight for efforts to draft and adopt a protocol on adaptation for the Framework Convention on Climate Change.

It was a pleasure to have contributed to the International Conference on Impacts of Climatic Variations and Sustainable Development in Semi-Arid Regions in Fortaleza in 1992. It is an equal pleasure to recommend this book to a wide audience.

Thomas E. Downing
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Preface

It is with great satisfaction that we present this edited volume. It draws from the rich and timely presentations at the International Conference on Impacts of Climatic Variations and Sustainable Development in Semi-Arid Regions (ICID) held in Fortaleza, State of Ceará, Brazil, 27 January to 1 February 1992. ICID was a concerted effort on the part of social scientists, climatologists, policy analysts and policy makers to examine, find solutions for and bring attention to the common problems faced by the peoples of semi-arid lands – the most profound of which are associated with climatic phenomena. Conference participants were asked to examine the past consequences of and responses to climate variability, and given these past experiences, to reflect on the likely effects of and possible proactive policy responses to the types of climatic events that global warming might bring. Nations and peoples of the semi-arid regions of the world have had long histories of planning for, coping with, rebuilding after, and responding to variations inherent in their climates. The papers in this volume recount some of these histories and reflect on the future of the semi-arid lands of the least-developed countries.

ICID preceded the United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro in June 1992, in order to give voice at UNCED to the plight and needs of peoples of these semi-arid lands. The semi-arid regions of the world contain a large portion of the least-developed countries on earth. It is in these poorer semi-arid lands – the semi-arid tropics – where populations eke out their livings squeezed against a fluctuating and at times declining natural resource base. The ultimate need for development – throught entitlement and empowerment – to moderate the relation between people and their environment is manifest here. UNCED promised to address the problems of this very relationship between people and the land in the underdeveloped world. But, in the international arena of UNCED, world attention was focused on global-level or macro aspects of issues such as climate change, biodiversity and deforestation. Concerns about the living relation between local peoples and their natural resource base were overshadowed by these global concerns. The most underdeveloped regions, where the majority's livelihoods are caught between the limits of environment and development, were marginalized in the very context in which their concerns should have been center stage. ICID helped to bring these concerns back into the debate by introducing the conference declaration, the Declaration of Fortaleza (this volume), into the last preparatory session leading up to UNCED. But the real results of this effort will unfold in the years to come as Agenda 21 (UNCED's global plan of action) and other international environment agreements and institutions, such as the recent convention on desertification, take shape as policies on the ground. It is our hope that this volume can contribute to the debates that shape such policies.

The authors and editors of this volume are grateful to the sponsors, organizers and supporters of ICID. The Conference was convened by the government of Ceará and organized by Esquel Group Foundation Brazil (Fundação Grupo Esquel Brasil). Initial and generous support for this event was rendered by the Bank of the Northeast of Brazil and the Ceará Federation of Industries. Contributions were received from other Brazilian institutions, among them the National Science Council (CNPq), the Brazilian Agricultural Research Corporation (EMBRAPA) through its Research Center on the Semi-Arid Tropics (CPATSA), and the J. Macedo Group. An indication of the increasing awareness by the international community regarding the importance of semi-arid lands was the assistance received from sources outside Brazil. The Inter-American Development Bank (IDB), the Government of the Netherlands and the John D. and Catherine T. MacArthur Foundation were our most generous external financial supporters. Additional international support was received from the United Nations Environment Program (UNEP), the French Institute for Ultramarine Research (ORSTOM), and the World Bank. From its very beginning, ICID has received encouragement and guidance from Mr Maurice Strong, Secretary General of UNCED.

Special appreciation is due to the former Governor of the State of Ceará, Mr Ciro Gomes, and to the present Governor, Mr Tasso Jereissati. It was their belief that science,

international awareness, and political commitment must move together that made this event possible. Special thanks are due to Esquel Group Foundation for its continuous support and leadership role in ICID. Esquel Group Foundation USA, and the Esquel Group Foundation Brazil, are members of the eight country Grupo Esquel network that assisted ICID throughout its lengthy and laborious preparatory process. The Massachusetts Institute of Technology (MIT), through its Department of Urban Studies and Planning, provided us invaluable guidance and professional support.

The cooperation among the teams in Fortaleza, Brasilia, Cambridge and Washington in preparing this volume, as well as in convening and organizing ICID, is a vivid example of how civil society, the scientific community and government can cooperate across borders and disciplines to focus attention on problems that influence the destiny of us all.

A. R. M.
S. S. P.
J. C. R.

Abbreviations

BCE	Before the common era, referring to the time often called BC
BP	Before present, present is 1950
CFC	Chlorofluorocarbon: a gas known to destroy the earth's ozone layer
CILSS	Comité Inter-état pour la lutte Contre la Sacheresse au Sahel (Inter-State Committee for the Fight Against Drought in the Sahel)
ENSO	El Niño Southern Oscillation: a weather pattern that is an important determinant of global climatic patterns
FAO	Food and Agriculture Organization of the United Nations
GCM	General Circulation Model: models used by climatologists to forecast weather patterns
GHG	Greenhouse gases: gases that contribute to global warming by trapping the sun's heat in the earth's atmosphere
ICID	International Conference on Impacts of Climatic Variations and Sustainable Development in Semi-Arid Regions
ICRISAT	International Crops Research Institute for the Semi-arid Tropics
IGADD	Inter-Governmental Authority on Drought and Development, East Africa
IPCC	Inter-Governmental Panel on Climate Change of the United Nations
MNCs	Multi-National Corporations
NEB	Northeast Brazil
P/ETP	Precipitation to potential evapotranspiration ratio: a measure of aridity
PDSI	Palmer drought severity index
SDS	Sustainable development strategy
SUDENE	Superintendencia do Desenvolvimento do Nordeste (Northeast Brazil Development Agency)
UCAR	University Corporation for Atmospheric Research, USA
UNCDF	United Nations Capital Development Fund
UNCED	United Nations Conference on Environment and Development (June 1992, Rio de Janeiro)
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
WCED	World Commission on Environment and Development (Brundtland Commission)
WFP	World Food Program of the United Nations
WMO	World Meteorological Organization