Introduction. Climate Variability, Climate Change and Vulnerability: Moving Forward by Looking Back

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> . . . Somos muitos Severinos
> iguais em tudo e na sina:
> a de abrandar estas pedras
> suando-se muito em cima,
> a de tentar despertar
> terra sempre mais extinta,
> a de querer arrancar
> algum roçado da cinza.
> Mas, para que me conheçam
> melhor Vossas Senhorias
> e melhor possam seguir
> a história de minha vida,
> passo a ser o Severino
> que em vossa presença emigra.
>
> João Cabral de Melo Neto, *Morte é Vida Severina*, 1966

Severina is a common name in the dry Northeast of Brazil – it is a name akin to the word for severity, reflecting rural life in these drylands. The experience of severe deprivation is widespread in the semi-arid tropics. Indeed, there are many Severinos living lives of constant vulnerability to hunger, famine, dislocation and material loss. Extreme climatic events, such as droughts, simply unveil this underlying chronic state. Such vulnerability is not caused by climate variability or climate change alone (Sen 1981; Watts 1983*a*). It is a result of the configuration of forces that shape the ability of farm and pastoral populations to produce, reproduce and develop. Climate extremes are an expected characteristic of semi-arid lands. Most populations know from local history the frequency and likely consequences of extreme climatic events. And most populations in highly variable or extreme climatic zones shape their livelihood systems to buffer against potential catastrophes. They prepare with the means at their disposal for these expected, yet unpredictable, threats. But why are some livelihood systems, some populations, some regions and some socioeconomic groups less able to prepare for or recover from natural extremes? What shapes their exposure to and ability to rebound from these expected events? What shapes their vulnerability in the face of climate variability and change?

This volume explores the relation between climate variability or climate change and the wellbeing of rural agricultural and pastoral populations in the semi-arid tropics. We focus on climate-related vulnerabilities because climatic events in these lands, particularly droughts, trigger frequent subsistence crises – sharply increasing crop failures, dislocation, hunger and famine. The cycle of drought also, through the dislocation process and impoverishment of some and through speculative profits and concentration by others, increases stratification and the social inequities that help shape chronic deprivation and vulnerability (Watts 1983*a*). This volume focuses on the semi-arid tropics – those semi-arid lands in the developing world – because it is here that the crisis is most acute and where the need for change is most immediate. While there is vulnerability to material loss in the temperate semi-arid lands – such as the southwest United States, no one starves when drought strikes. But drought of the same magnitude in the semi-arid tropics of Northeast Brazil or the Sahel is likely to result in hunger or famine, and would certainly result in widespread human misery. Indeed,

it is in the semi-arid tropics where drought and poverty collide. It is here that the processes of underdevelopment undermine the coping abilities and resilience of entire populations. This introduction focuses on how the contributing authors understand the causes of vulnerability, because it is through understanding these causes that the impacts associated with climate can ultimately be reduced.

The chapters of this volume were drawn from the more than 70 papers presented at the International Conference on the Impacts of Climate Variability and Sustainable Development in Semi-Arid Regions (see Preface). The papers were chosen for their broad historical perspectives on vulnerability and social response as well as for a wide geographical representation. The conference was an 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 dramatic 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 long histories of planning for, coping with, rebuilding after, and responding to variations inherent in their climates. The chapters in this volume recount some of these histories and reflect on the future of the semi-arid lands of the least-developed countries.

The stories in this volume follow different Severinos through different places and times – the Tlaltizapan region of Mexico, Machakos district of Kenya, Northwest China, Australia's Eyre Peninsula, Northeast Brazil and Amazonia, and the Midwest United States – to better know the various aspects of vulnerability and responses to it. These case studies address our questions by examining past experience so that we can respond now to reduce the vulnerability of current and future generations.

THE CAUSAL STRUCTURE OF VULNERABILITY

Climate impact analysis is a way of looking at the range of consequences of a given climatic event or change (Rosenzweig and Parry 1994; Rosenberg and Crosson 1992). For instance, drought, however defined, is associated with a number of outcomes. Impact assessments begin by mapping out direct physical consequences of a climatic event or change, such as: reduced crop yields; livestock losses; reservoir depletion; hydroelectric interruptions; drinking-water shortages or quality changes; dryland degradation; or forest dieback. These direct outcomes can then be traced to social consequences, such as: forced sales of household assets or land; further ecological losses such as soil erosion and deforestation from people trying to cope with the other losses by drawing more heavily on their remaining natural resources, speculative price rises driving food prices out of the range of the poorest households, dislocations resulting in out-migration to shanty towns and farther frontiers, destitution or servitude; disease outbreaks; hunger; or famine.

But it is misleading to designate these outcomes as 'impacts' of climate variability or change. This type of impact analysis implicitly attributes to nature causality that can be directly and more productively traced to social organization. 'Vulnerability' analysis (see Downing 1991, 1992; Ribot, Najam and Watson, this volume) provides a basis for tracing out social causality. Vulnerability analysis turns impact analysis on its head by examining the multiple causes of critical outcomes – dislocation, hunger, famine – rather than the multiple outcomes of a single event (Downing 1991, 1992). It traces outward from each instance of vulnerability the multiple physical, social and political-economic causal agents and processes. In doing so, it places climatic events among the social and political-economic relations and processes that shape the negative consequences with which we are concerned. By linking climate-associated 'impacts' (or outcomes) to causality, vulnerability analysis can also provide a sound basis for policy, since it is through responding to its causes that vulnerability can be redressed.

The methods for analysis of vulnerability – developed from the work of Amartya Sen (1981) – lay the groundwork for examining causality in a systematic way. Sen (1981, 1987), examining vulnerability to hunger and famine, begins at the household level with what he calls entitlements. A household's food entitlement consists of the food that the household can obtain through production, exchange, or extra-legal legitimate conventions such as reciprocal relations or kinship obligations (Drèze and Sen 1989). A household's assets, or endowment (cf. Drèze and Sen 1989), include investments in productive assets, stores of food or cash, and claims on other households, patrons, chiefs, government or on the international community that a household can make (Swift 1989:11). 'Assets create a buffer between production, exchange and consumption' (Swift 1989:11). They form the basis of a household's entitlements. In turn, assets depend on the ability of the household to produce a surplus that they can store, invest in productive capacity and markets, and in the maintenance of social relations (cf. Scott 1976; Berry 1993).

Vulnerability in this framework is the risk that the household's entitlements will fail to buffer against hunger, famine, dislocation or other losses. It is a relative measure of the household's proneness to crisis (Downing 1991).[1] The power

of this analytic framework is that from each instance of entitlement failure – i.e. each instance in which a household's production, investments, stores and claims are insufficient to sustain them – chains of causality can be traced out. From an understanding of causality, we can move toward policies to reduce the vulnerability which is located at the confluence of these causal chains (cf. Jessop 1990:13).

Through a household perspective on vulnerability, climatic and other environmental phenomena can be understood socially. By focusing on the household, Sen (1981), concerned with entitlement failure, and Blaikie (1985), concerned with environmental change, have replaced ecocentric models of natural hazards and environmental change with social models in which environmental fluctuations and changes – in climate, forests or soils – are located among the other material and social conditions shaping and shaped by household wellbeing (see Watts 1983*b*). By incorporating environment (including climate) into a social framework, the environment may appear to become marginalized – set as one among many factors affecting and affected by production, reproduction and development. But this does not diminish the importance of environmental variability and change. Indeed, it strengthens environmental arguments by making it clear how important, in degree and manner, the quality of natural resources is to social wellbeing. These household-based social models also illustrate how important it is that assets match or can cope with or vary with (as in buffer against) these environmental variations and changes so that the activities of production and reproduction on the land are not undermined by and do not undermine the natural resources on which they depend.[2]

Watts and Bohle (1993), extending Drèze and Sen's (1989) analysis of entitlements, argue that vulnerability is configured by the mutually constituted triad of entitlements, empowerment and political economy. Here, empowerment is the ability to shape the political economy that in turn shapes entitlements. Drèze and Sen (1989:263) have empirically observed the role of certain types of political enfranchisement in reducing vulnerability, particularly the role media can play in creating a legitimation crisis in liberal democracies. Watts and Bohle have situated Drèze and Sen's analysis in a broader theoretical framework, allowing for a more systematic analysis of the political economy of the production and reproduction of vulnerability. Their analysis illuminates the role of empowerment through enfranchisement in redressing the inequities ongoing political-economic processes produce.

The chapters in this volume, by examining the causes of vulnerability in their historical context, place vulnerability in its broader social and political-economic context. While they do not use the terminology of vulnerability (e.g. entitlements, enfranchisement, empowerment, capabilities), they show causal relations in the historical and contemporary production and reproduction of vulnerability at the level of the state, region, community and household. They show drought, floods, commodity price fluctuations and conflict as triggering crises, while locating the causes of vulnerability in the face of these events in the longer-term production of vulnerability through state policies, class relations, and demographic shifts. The chapters by O'Brien and Liverman, Wang'ati, Zhao, Glantz, Heathcote, and Bitoun, Guimarães and Araújo show how state policies – ranging from spatial and class inequalities in colonial and contemporary development, land-tenure and economic arrangements, to supports for the occupation of marginal lands – have played major roles in both security and vulnerability through their effects on resource access and population movements. They touch on the ways in which state development policies and processes have relegated some regions or classes to higher vulnerability while aiding others. In their cases, vulnerability has been shaped through the allocation of state funds and through the structuring of class-differentiated access to alternative income-generating opportunities and access to productive resources such as land, irrigation, credit, fertilizer and improved seed. O'Brien and Liverman, Glantz, and Heathcote also discuss the production of vulnerability through forces pushing and pulling people of particular classes down the rainfall gradient into more and more marginal lands, while Wang'ati cites population growth (in the absence of alternative employment opportunities – cf. Drèze and Sen 1989), in addition to population movements, as contributing to vulnerability. But, while state action and inaction, in addition to broader forces of differentiation and marginalization, may be responsible for producing much of the vulnerability faced by marginal populations, Ribot, Najam and Watson, Wang'ati, Zhao, Glantz, Heathcote, and Wilhite also argue that it is through state intervention that vulnerability can ultimately be reduced.

Taking crises that are often construed as impacts of climate extremes and tracing their causes, through vulnerability, to the social and political-economic system in which agricultural and pastoral households are located is a first step in moving toward durable policy responses. The chapters of this volume, outlined below, take a major step in the direction of linking climate-associated crises to social cause, and hence, potential response.

ORGANIZATION AND CONTENTS

The volume is divided into four parts. Part I is an overview, outlining the issues facing the populations of semi-arid lands. Part II consists of four country case studies examining the past responses to climate variability and potential conse-

quences of climate change. Part III includes three chapters with diverse objectives but all exploring the historical development – that is the causes – of climate-related vulnerabilities, or strategies for reducing the vulnerability to and impacts of extreme climatic events. Part IV contains the Declaration of Fortaleza, hammered out by the participants of the International Conference on the Impacts of Climate Variability and Sustainable Development in Semi-Arid Regions (ICID), and the working group summaries that served as a starting point for conference-wide discussions. The volume and the papers within it are outlined briefly below.

Part I is a synthesis chapter, 'Climate variation, vulnerability and sustainable development in the semi-arid tropics,' in which Jesse C. Ribot, Adil Najam and Gabrielle Watson tease out some overarching themes from the 76 papers and presentations at ICID. The authors focus on the relation between impacts and vulnerability and on the policy ramifications of vulnerability analysis. Impact assessment can indicate the types, distribution and magnitude of consequences of climatic events. It does not, however, automatically lead to relevant policy recommendations unless it is coupled with an analysis of the social causes of climate-related vulnerability. The object of vulnerability analysis is to bridge the gap between impact analysis and policy formulation by directing policy attention to the root causes of vulnerability rather than to its symptom – the negative outcomes, 'impacts', that follow triggering events such as droughts. This chapter also reviews and discusses definitions of drought, dryland degradation, desertification, climate variability and climate change, as well as the main problems involved in projecting climate change and its implications. In addition, the chapter sketches the main technical and institutional policy options that appear in the papers from the conference.

Part II, 'Climate variation, climate change and society,' consists of case studies of past responses to climate variability and potential consequences of climate change in Mexico, the countries of the African Sahel, China and Australia. In this section's first chapter 'Climate change and variability in Mexico,' Karen O'Brien and Diana Liverman discuss the increase in vulnerability to the consequences of drought under colonial rule, and its persistence in present agricultural arrangements. They examine the probable consequences of global warming with attention to the social underpinnings of climate-related vulnerability.

O'Brien and Liverman provide evidence linking past famines with drought, social unrest, speculative price rises, colonial economic and land-tenure arrangements, and the colonial political economy. They then show that current vulnerability is a function of the different agricultural practices associated with farm size – a relationship rooted in the colonial land-tenure system – hence linking vulnerability with political economy. They point out that the worst effects of drought have been observed in the rainfed agricultural areas cultivated by the poorest *ejidatarios* and *campesinos*, who have limited access to credit, irrigation, fertilizers and improved seeds. Hence, past and present vulnerability is closely linked with the political-economic circumstances faced by different classes of farmers in different geoclimatic regions, and small farmers tend to be the most vulnerable group.

O'Brien and Liverman's research also shows that drought-related crop losses have increased over the past four decades. This increase is only partly due to the mere extension of cultivated area, since the percentage of losses has also increased with time. The increased percentage probably reflects the expansion of agriculture onto more marginal land, since these losses have not been associated with any increase in the intensity of weather extremes. Thus, these increased losses probably reflect increased vulnerability for a particular class of small farmers on marginal lands (cf. Glantz, this volume; Heathcote, this volume).

The authors also compare the five most prominent climate change projections for Mexico and systematically examine their limitations and implications. They apply the climate model results to a more detailed study of the Tlaltizapan region, and find that 'in spite of differences between the climate model results, the general direction of changes in Mexican maize rainfed and irrigated yields with global warming is a decrease, whatever the model. Sensitivity analysis indicates that decreases in crop yields will be severe under global warming unless irrigation expands, fertilizer use increases, or new varieties are developed.' The ramifications are clear. If we expect the climate to warm and if we have reasonable confidence in the climate models, the 'unless' must be taken seriously. But, even without climate change, as the authors demonstrate through historical analysis, implementing such measures to reduce vulnerability is already needed.

Fredrick J. Wang'ati's chapter, 'The impact of climate variation and sustainable development in the Sudano-Sahelian Region,' examines past climate-related trends and experiences, the evolution of socioeconomic indicators in the region, and proposes a strategy to increase ecological sustainability and reduce subsistence vulnerability through locally based organization and innovation. In the Sudano-Sahelian region, the dry and highly variable climate is a major factor shaping ecological and socioeconomic processes. Wang'ati locates the causes of climate-related vulnerability in population growth, reduced mobility of pastoral groups, international conflict and changes in land-tenure regimes. He also cites inadequate traditional technologies, a low level of economic development and the lack of alterna-

tive income-generating opportunities as contributing factors. These factors have conspired to push permanent settlements onto previously only intermittently used marginal land.

According to Wang'ati the trends in Kenya's 'key variables' show that rainfall is declining, forest resources, food production and economic indicators are on the decline, and import dependence is increasing. But in the midst of these ominous macro trends, Wang'ati examines the very successful case of development in Machakos district of Kenya. Local-level analysis reveals that productivity and ecological management have evolved favorably over the past 60 years. In Machakos in the 1930s colonial officials doubted whether the district could feed itself. Since then the growing population has evolved a complex farming system which appears to be sustainable and even produces enough to export some products. Wang'ati attributes these positive outcomes to the slow and systematic evolution and development of locally based farming and pastoral systems along with the emergence of farmers' organizations. The case demonstrates the capacity for some semi-arid lands to support greater populations, increase productivity and contribute to the national economy. It also could support the hypothesis that population pressure can lead to innovation and development, rather than ecological collapse (Boserup 1988). It is interesting to note how macro-level variables were unable to capture the local-level diversity and dynamics that might contain the seeds for success on a broader scale. The inconsistency in this case illustrates how important it is to choose the scale of analysis, as well as intervention, with great care. Relying on overly general indicators alone can mask both problems and potentials.

From this and other cases, Wang'ati draws some recommendations for what he calls a 'sustainable development strategy' (SDS). His strategy follows from the simple tenets that sustainable development must build on existing successful resource management strategies, and that development should proceed by progressive improvements on proven coping strategies. He argues that wholesale changes in land use and large-scale projects should be avoided in favor of gradual, or 'stepwise' community-based improvements. While Wang'ati does not use the language of vulnerability – entitlements, political economy and empowerment – these stepwise, locally based, locally organized improvements reflect the importance and role of empowerment. The people of Machakos are enfranchised to proceed as they see fit. They have been able to use this freedom to shape the institutions and activities that underpin their wellbeing.

On a national scale, Wang'ati asserts that SDS should include the creation of urban income-generating opportunities so that rural–urban migration can be a positive way to help relieve excessive pressures on semi-arid lands. In addition, development of alternative agricultural and non-agricultural rural livelihood systems, research on drought-resistant crops, improvements in marketing and transport infrastructure, increased interstate trade, greater rural retention of added value, and increased diversity of crop and economic activities are all part of Wang'ati's sustainable development recommendations. Again, these are all moves to support from the state's side the enfranchisement of rural populations – by providing access to resources and livelihood options. Through these opportunities, and with increased savings, local populations can build their entitlements, ultimately reducing their vulnerability.

In 'Climate change and sustainable development in China's semi-arid regions' Zong-ci Zhao characterizes the climatic conditions, natural resources, economic productivity and populations of China's semi-arid northwest. Zhao also outlines some major changes in these variables and climate-related problems facing development of the region. This chapter is unusual in that Zhao has at her disposal temperature measures dating back 500 years and information on drought and floods for more than 2000 years. Her recent data show that in the last 40 years the local climate has warmed between 0.5 and 1.8°C. Regional climate modelling exercises show that warming will continue; however, as in other chapters, the uncertainties are too great to draw conclusions.

Zhao demonstrates that China's semi-arid lands are harsh. She leaves us with the somewhat pessimistic regional adage: 'Eat your fill in summer, grow fat in autumn, get thin in winter, and die in spring.' But, she also leaves us with the sense that the region has enormous potential for development. China's semi-arid regions have been a target for development as the central government regards them as a population pressure valve for the overpopulated South and Southeast (quite the contrary of the role of Brazil's semi-arid Northeast: see Bitoun, Guimarães and Araújo, this volume). As such, government policies have encouraged migration into this region. Zhao points out that not only are there solar, wind, hydro and mineral resources, but there are enormous expanses of uncultivated land into which she suggests farming could be expanded. There are also great expanses of grazing land. But to use them sustainably could be risky without appropriate measures. Indeed, deterioration of currently utilized grasslands of Northwest China still must be turned around through water and soil development and conservation.

This chapter compels us to ask how vulnerability to crop failures, hunger and famine are different in a centrally planned nation where land is presumably already equitably distributed (cf. Przeworski 1990). How does the social structure of vulnerability differ from non-centrally planned Mexico, the African Sahel and Brazil's Northeast? Whose

decisions shape the relative vulnerability of different social groups and livelihoods within semi-arid China, and how? Zhao's comments also indicate how critical government decisions are in making these 'marginal' lands more productive in marked contrast to the examples given by Heathcote and by Glantz in their chapters. Here is a clear example of the critical nature of state political economy, through policy decisions, in shaping vulnerability or security in these lands. In the language of vulnerability, a centralized state control over political-economic relations of access and development would be inversely related to the degree of local empowerment and enfranchisement in shaping local entitlements.

R. Les Heathcote, in his chapter 'Settlement advance and retreat: a century of experience on the Eyre Peninsula of South Australia,' tells the story of the clearing and occupation of South Australia's semi-arid Eyre Peninsula, and of responses to and perceptions of climate-related land use and land quality changes. By carefully reviewing the past 100 years of public records and evaluating data available on climatic, ecological and economic conditions, he brings out the primary variables involved in sustaining the region's agricultural viability. In this region, periodic droughts associated with the fluctuating economic fortunes of a region producing grains and livestock for an international market have created stresses which have led, in part, to conditions that exacerbate the desertification process. Governments have played various roles, ranging from that of real-estate broker through to steward of the national environment. The general trend has been toward increased and more centralized government control over land use. These state policies have generally supported the family farm, which remains the region's basic form of productive unit. Heathcote argues, however, that growing costs of production and diminishing real income have pushed producers to gamble increasingly with the seasons and with the ability of the environment to recover from drought-related deterioration.

Heathcote's study shows that farm households are vulnerable to ecological decline – that is the undermining of their productive entitlements, of which the ecological base is one – in the face of economic as well as climatic fluctuations. Farmers on the Eyre Peninsula had to increase the area farmed or intensify farming during periods of low farm-product prices. Here, farm viability is a function of the crop yield per hectare necessary to break even. When prices drop so low that yields must exceed the sustainable productive capacity of the land, debts are incurred, forcing farmers to intensify farming and 'mine' the land.

This chapter locates the causes of farmers' vulnerability and related land degradation – which occur in the face of fluctuations of factor markets and climate – somewhere between state policies supporting settlement on these lands and the risk-taking these policies facilitate. Contrary to the notion that state support and development initiatives reduce vulnerability, Heathcote's case study implies that state support encouraged farmers to settle these marginal lands – supporting Glantz's arguments (this volume). The assumption of part of the risk by government reduced risk to the farmer while increasing the potential economic losses to society, or the nation as a whole. While some types of vulnerability may have increased, it is possible that vulnerability to hunger, famine and dislocation were reduced. Whether the economic losses associated with farm failures in this region were worth the broader economic and social benefits of producing on these lands appears still to be an open question. It is also an open question as to why government intervened here in the first place. Is this an instance of a relatively empowered and enfranchised population being able to make claims on government, shifting risk from themselves and their bodies – as in risk of hunger or famine – to a more economic form of risk shared by government institutions?

Part III of this volume, 'Climate variability and vulnerability: causality and response,' includes chapters exploring the causes of climate-related vulnerabilities, as well as past and potential policy responses. The first of these chapters, 'Drought follows the plow: cultivating marginal areas,' by Michael Glantz, argues that contrary to beliefs of the past that rain would come to those areas brought under cultivation, new lands brought under the plow are drought-prone. Glantz argues that this is because all the world's best rainfed agricultural land is already in use. Hence, the only new lands available for farming are, by necessity, lower quality and higher risk. Putting forth this hypothesis, Glantz then describes conditions, illustrated by cases in Africa, Brazil and Australia, under which populations end up in the precarious position of farming drought-prone lands. The conditions Glantz describes include 'push' and 'pull' factors. Population growth, environmental degradation and particular government policies constitute pushes into more marginal, dryer lands, while the attraction of good growing conditions during unusually wet periods constitutes the pull.

As do O'Brien and Liverman and Heathcote in their chapters, Glantz is challenging the relative importance of changing climate as a causal factor in *increased* incidence of drought and its associated consequences. He is exploring the relative importance of social effects in shaping the negative outcomes usually associated with climate. Glantz is effectively posing the following hypothesis: What is being read as increased frequency and intensity of droughts is really an indicator of greater numbers of people farming more marginal lands – that is, the location of human populations with respect to climate resources helps explain the increased frequency and magnitude of negative climate-related outcomes better than do characteristics of climate variability or change. This formulation directs us to examine more care-

fully why populations move into these lands, rather than why these lands are dry. In short, he is proposing a chain of causality of increased vulnerability to climate-related disasters that begins with social forces pushing or pulling populations into marginal lands and ends with exposure to the pre-existing conditions of those lands. Hence, to understand the increased vulnerability of these populations we must understand the roots of their need to eke out a living at this particular margin.

Glantz's formulation begs an additional question, partly addressed by Heathcote's exploration here of the effects of state policies in Australia and also provoked by Zhao's assertion in her chapter that agriculture *should* be expanded onto currently uncultivated lands. The questions are: What conditions are necessary to farm and raise livestock in these dryer, and hence more drought-prone, regions with less risk? What kinds of investments are necessary? What kinds of social security are needed? These questions must be asked, since movement into these areas is under way, and this is one place where productive action can be taken. Does Zhao's recommendation have to increase vulnerability, as in Heathcote's and Glantz's cases, or can measures be taken that assure low levels of vulnerability in these dryer lands. With proper state interventions, or local initiatives, as shown by Wang'ati's case study, secure and sustainable farming could perhaps be integrated into these regions. This latter question links the causes of vulnerability to the *lack* of action – state and local – and the social and political-economic conditions that systematically bias against or prevent investment, and producer organization and innovation, in marginal lands occupied by marginalized populations. That is, what shapes state or private investment in these lands and what prevents or facilitates those living there using their resources, knowledge and capabilities to reduce their own vulnerability through adaptation and innovation (see Deere and de Janvry 1984; Blaikie 1985)?

In essence, Glantz's formulation points out that marginality and drought-proneness are partly inherent characteristics of *place*, with the social forces and causes of vulnerability being linked to the reasons people arrive in these places. Yet the types of social organization – such as the cooperative farming in Machakos described by Wang'ati – or the availability of infrastructure, ranging from irrigation and extension services to marketing facilities, social security systems or credit, are also essential determinants of whether these 'marginal' lands can be productively and securely farmed (cf. Zhao, this volume; Wilhite, this volume). Perhaps, once again, this is a function of how well the populations of these lands can retain their income locally, or make claims on state institutions – both of which are issues of economic and political enfranchisement.

Jan Bitoun, Leonardo Guimarães Neto and Tania Bacelar de Araújo's chapter, 'Amazonia and the Northeast: the Brazilian tropics and sustainable development,' examines the history of the relation between Brazil's semi-arid Northeast and humid Amazonia – two regions linked more by their geographical, economic and social marginality within Brazil than by their physical characteristics. The authors argue that Brazil's more economically developed Southern and southeastern region shaped development in the Northeast and Amazonia, as well as the relation between them, through systematic biases in the perception of the national role of, and hence the policies toward, these regions. The authors locate the causes of environmentally unsustainable relations between peasants and the land in the inequitable development policies resulting from these political, economic and ideological biases.

The authors make four critical points in their analysis. First, sustainability of the Amazon cannot be considered separately from the broader geographical, social and political-economic context in which the Amazon is located; part of this context is Amazonia's close relation to the semi-arid Northeast from which much of Amazonia's population has migrated. Second, the Amazon and Northeast Brazil are integrally linked, since without proper development in the Northeast – capable of curbing out-migration – the flow of colonizers from the Northeast into the Amazon will continue to undermine the Amazonian economy and ecology either directly or via the South and Southeast. Third, unequal national-level development policies have supported inequitable relations of production in these two regions and have undermined, rather than supported, ecologically sustainable practices. Last, the conjuncture of recent developments in awareness of the importance of locally rooted development, national and international attention to ecological concerns in the development process, and recent media focus on Amazonia, has created an opening in which to examine development strategies suitable to the Amazon and Northeast and compatible with the national development agenda. But the authors warn that development in the region will not be sustainable until it addresses land distribution and labor issues, and challenges the deeply rooted agrarian structures that remove surpluses from local producers, thus precluding the reinvestment of resources into the maintenance and development of ecologically sound agricultural practices. In addition, they point out that ecologically sound development proposals 'will not be viable if political and interregional considerations are not analyzed, along with the economic and technological criteria.'

These authors locate the causes of and responsibility for environmental decline and human vulnerability at the level of national political economy. They also show that the lack of development in one region – which they attribute to geographically inequitable national development policies – can have profound social and environmental repercussions on other regions. This implies that social vulnerability and

environmental decline must be addressed on the geographical and political-economic scales that shapes them. It also implies that the vulnerability of regions is interconnected: those interested in preserving the Amazon will have to attend to the development of surrounding regions if they are to stem the influx of landless farmers.

Donald A. Wilhite's chapter, 'Reducing the impacts of drought: progress toward risk management' documents an important transition taking place in government response to drought from one of crisis management to one of risk reduction. After illustrating this transition with cases from the United States of America, South Africa and Australia, he recommends a procedure for developing and implementing integrated drought policies and plans. The chapter demonstrates the importance of proactive planning for reducing drought impacts, and the relatively low cost of planning compared with the high economic, human and environmental costs of a late or inadequate response. Wilhite's proactive program develops an approach to crisis planning and touches on the notion of vulnerability reduction. This is an appropriate chapter to close this section, since it is about where to go from here. It is about points of entry into reducing both vulnerability to and impacts of the expected but unpredictable normal variations of our climatic resource.

Part IV of this volume, 'The International Conference on the Impacts of Climatic Variations and Sustainable Development in Semi-Arid Regions,' presents the collective efforts of over 600 social scientists, physical scientists, politicians and diplomats from 46 countries to state clearly the common problems, needs and prospects of the semi-arid regions of the world. These efforts are embodied in the 'Declaration of Fortaleza' and the findings of the ICID Working Groups into which conference participants divided and from which the first draft of the Declaration was formulated. The Declaration was circulated and a final draft hammered out in an animated set of debates in the final plenary meeting. The contents of these documents are too varied to flesh out here, but they speak for themselves, and the participants of ICID hope they also speak to the concerns of the peoples who live their lives in semi-arid regions around the world.

USES OF HISTORY: PUTTING VULNERABILITY IN THE PAST

Vulnerability to hunger, famine, dislocation or material loss results from the dynamics of the social system in which agricultural and pastoral households are located. Vulnerability is shaped by ongoing processes of social differentiation and marginalization, within a specific social history of access to productive resources, formal and informal social security arrangements, state development policies, conflicts, etc. The resulting distribution of material stocks and of access to income opportunities, land and other material resources, as well as access to formal and informal social security arrangements, spells out the material and social conditions circumscribing vulnerability for some households and security for others. Climate extremes may trigger subsistence crises, but these crises come at the confluence of historical processes, as well as actions and events that make individuals, households, enterprises or regions vulnerable.

Vulnerability must be examined with an eye to vulnerability reduction. First and foremost, vulnerability must be understood by examining its historical antecedents – this is an essential part of the switch from impact analysis to vulnerability analysis (Downing 1991; also see Ribot, Najam and Watson, this volume). In examining historical antecedents we must ask: What types of processes and events cause vulnerability? What can be done to reverse deleterious processes and buffer against crisis-triggering events? Which processes are reversible, and which are not? We must also ask: Which processes can, both technically and politically, be modified and which cannot? Historical analysis reveals the underlying causes of vulnerability, but not all these causes are tractable. Here we need to reflect on the uses of history, rather than just retreating into proximate analyses that ignore history, or falling into paralysis by insisting on redressing all of the deepest causal relations at once. For example, early warning of the onset of hunger and famine does not have to focus on the moments before bodies begin to drop. Relief does not have to come in to avert only the most acute and horrifying crises. Identifying vulnerability gives us warnings of acute crisis even years in advance. Understanding vulnerability should thus be used to produce more durable and earlier, proactive responses. The uses of history in developing these understandings and in formulating responses needs further exploration.

Enfranchisement and empowerment must be part of any pathway for ushering vulnerability into the past. Security is about having the material resources – entitlements – to buffer against contingencies. However, as Drèze and Sen (1989) argue, it is more about the *capability*[3] to achieve food security and other valued 'functionings,' such as attaining sufficient entitlements. Capabilities are partly predicated on the rights that allow the pursuit of such wellbeing. The concept of capabilities, as Watts and Bohle (1993) state, 'approaches the totality of rights by which individuals, groups and classes command endowments and commodity bundles.' It is this formulation of capabilities that links the material with the political-economic aspects of vulnerability and security. Capabilities, through their basis in freedoms and rights, link entitlements with enfranchisement. In this manner, enfranchisement becomes a means by which material wellbeing can be pursued and maintained through intervention in political-economic relations and processes.

The entitlement approach complemented by empower-

ment and political economy reveals two complementary directions for vulnerability reduction: (1) redistribution (of ownership and access) and development in the material realm, relating to the material basis for entitlements; and (2) enfranchisement in the political-economic domain, relating to the ability to shape political economy. The political-economic relations that produce vulnerability by structuring access to resources and affecting maldistribution through processes of social differentiation and marginalization, could be directly confronted by legal reforms over access and redistribution of material wealth. But, because the processes of differentiation, stratification and marginalization are ongoing, there needs to be a countervailing set of processes, not just one-time moves to shift access control or redistribute assets. The process of overlapping spatial and social marginalization – marginalizing particular classes of people onto marginal lands – is, for example, a theme that runs through the chapters of this volume. In response, there needs to be a constant process in which those being marginalized are themselves constantly able – capable, that is – to reincorporate themselves and make claims that redress the constant production of their disadvantaged position. Enfranchisement and empowerment provide such ongoing countervailing forces. Enfranchisement and empowerment, along with other countervailing mechanisms and forces, are areas still wide open for theoretical development and empirical research – if vulnerability, rather than the people of the semi-arid tropics, is to be denied a future.

While this introduction focuses on the causes of vulnerability as they impinge upon the household, other units of social aggregation, such as the community, enterprises, civil organizations, markets, the state, or regions, can also be vulnerable, and can also be subject to a similar analysis of the causes of their vulnerability. Vulnerability exists at all levels of society. In addition, vulnerability of one segment of society influences vulnerability of others. Vulnerable households can render the state vulnerable to a legitimacy crisis, or to a costly set of state emergency interventions. Indeed, a state vulnerable to legitimacy crisis may provide a receptive forum for households to press the state for vulnerability-reducing goods and services. Each institution must be understood in the set of relations in which it is embedded; this includes its relation to the vulnerability and security of other groups within society. This relation among institutions or regions (see Bitoun, Guimarães and Araújo, this volume), and the interdependence of their security, is another important area for further study.

Vulnerability analysis is a good starting place for rethinking rural development.[4] It is local by definition: it builds outward from the household or whatever specific institution it focuses on (cf. Vayda 1983; Blaikie 1985; Watts 1987; Schmink 1992). Yet, while both the building and failure of entitlements occur concretely at this local level, a focus on vulnerability systematically includes the multiple temporal, spatial and social scales that impinge on the production and reproduction of everyday life. In this manner the local is not conceptually isolated from the global, and the analysis of vulnerability at each level is constantly referenced back to the security and wellbeing of those at risk. It is this multilayered analysis that traces causality outward, through space, through social relations and through history, from which an understanding of the conditions for secure and productive development can grow.

The semi-arid tropics are filled with Severinos whose lives are harsh even when there are no extreme droughts or floods and no changes in natural conditions. It is this chronic condition of deprivation that must ultimately be addressed. Climate variations and extremes are not new – and they may not even be changing. But, as Glantz argues in this volume, disasters associated with them will be more frequent and more intense as more people occupy more marginal lands. O'Brien and Liverman also point out in their chapter that these disasters will increase as the conditions of marginalized populations already occupying semi-arid lands for generations deteriorate – unless development of productive capacities proceeds in a timely manner. Those interested in analyzing or mitigating the 'impacts' of climate in semi-arid lands must begin through attention to causes of and responses to deprivation, underdevelopment, poverty and other aspects of vulnerability. Underdevelopment, poverty and vulnerability are also not new. There has been much scholarly thinking on these subjects. It is time to take advantage of what is already well understood and apply it to the crises of the present.

Ironically, this volume was launched by concerns articulated by those focusing on *future* climate change. Projecting climate change into the future, to a time distant enough to be free of commitment to immediate action or change, has brought to world attention a chronic tragedy taking place in the semi-arid tropics today. But hunger, famine, dislocation and material loss can still best be understood and redressed by learning from the past. By enabling current populations to buffer themselves against today's climatic variations, they will be better able to cope with future contingencies. Rather than focusing on the distant future, we must use the opportunity that the specter of climate change brings to slide back down the projection lines to point to and address the crisis at hand.

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ENDNOTES

1. Downing (1991, 1992) develops the concept of vulnerability (for a summary see Ribot *et al.*, this volume). Watts and Bohle (1993:46), who take the concept further, define vulnerability as follows: 'Vulnerability is a multi-layered and multi-dimensional social space which centers on the determinate political, economic and institutional capabilities of people in specific places at specific times. In this sense a theory of vulnerability should be capable of mapping the historically and socially specific realms of choice and constraint – the degrees of freedom as it were – which determine exposure, capacity and potentiality. In a narrow sense this is about individual command over basic necessities; in a still broader sense it also speaks to the structural properties of the political economy itself.' Also see Chambers (1989:1), who defines vulnerability as follows: 'Vulnerability refers to exposure to contingencies and stress, and difficulty in coping with them. Vulnerability has two sides: an external side of risks, shocks, and stress to which an individual or household is subject; and an internal side which is defenselessness, meaning a lack of means to cope without damaging loss.'
2. Household models are often limited by their failure to account for intra-household dynamics of production and reproduction, but they do not have to be (see, for example, Guyer 1981; Guyer and Peters 1987; Carney 1988; Hart 1992; Agarwal 1993; Schroeder 1992).
3. Capabilities are defined by Drèze and Sen (1989:12ff) as 'a set of functioning bundles, representing the various alternative "beings and doings" that a person can achieve with his or her economic, social and personal characteristics.' 'While the *entitlement* of a person is a set of alternative *commodity* bundles, the *capability* of a person is a set of alternative *functioning* bundles' (13ff). 'The focus here is on human life as it can be led, rather than on commodities as such, which are means to human life, and are contingently related to need fulfillment rather than being valued for themselves' (13). They go on to define capabilities as 'the extent of the freedom that people have in pursuing valuable activities or functionings' (42).
4. Also compare with farm systems theory as used by Blaikie (1985).

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