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About the Author

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Dr Oliver-Smith has done anthropological research and consultation on issues relating to involuntary resettlement and disasters in Peru, Honduras, India, Brazil, Jamaica, Mexico, Japan, and the United States. He has served on the executive boards of the National Association of Practicing Anthropologists and the Society for Applied Anthropology and on the Social Sciences Committee of the Earthquake Engineering Research Institute. He is also a member of La Red de Estudios Sociales en Prevención de Desastres en América Latina and is on the editorial boards of Environmental Disasters, Sociological Inquiry, and Desastres y Sociedad.

His work on involuntary resettlement has focused on the impacts of displacement, place attachment, resistance movements, and resettlement project analysis. His work on disasters has focused on issues of post-disaster aid and reconstruction, vulnerability analysis and social organization, including class/race/ethnicity/gender-based patterns of differential aid distribution, social consensus and conflict, and social mobilization of community-based reconstruction efforts. He is the author, editor, or co-editor of eight books and over 50 articles and book chapters on these topics.

Nature, Society, and Population Displacement

Toward an Understanding of Environmental Migration and Social Vulnerability

Anthony Oliver-Smith

Acknowledgements

Foreword

In this InterSecTions, Professor Oliver-Smith in his capacity as Munich Re Foundation Chair on Social Vulnerability addresses in a scientifically meticulous manner the issue of population displacement and the role environmental factors may or may not play in pushing populations away from their original place of living. In the context of global environmental change and in particular climate change and increased incidences of and damages by environmental hazards, the topic of environmental migration or displacements is increasingly at the forefront of political discussions and is gathering global attention as exemplified recently by the symbolic cabinet meeting of government ministers from the Maldives which took place underwater.

The issue of environmental migration/displacement is vigorously debated by scientists and policymakers alike. The main and possibly only consensus on the topic is that there is a need for an objective discussion on definitions of environmental migration, a clear identification of push and pull factors forcing people to move, and a wider scientific base for characterizing these movements and the relevant factors. Oliver-Smith addresses here some of these gaps. His critical review on population displacement in the context of environmental change stresses the importance of the notion of nature and environment as a social construction which requires a mutualistic approach so that depoliticizing and naturalizing environmental migration can be avoided.

Oliver-Smith departs from recognizing the causal relation between factors such as sea level rise and population mobility. However, he criticizes the reductionist view of a linear link between environmental degradation and migration. He emphasizes the need to rigorously understand the interaction between people and their environment. Oliver-Smith explores the climate/environmental change and migration nexus from a unique angle by embedding the environmental migration discussion in ecology and vulnerability theories. This adds an in-depth theoretical background to the current debate on this issue. Oliver-Smith then draws empirical evidence from Honduras to highlight crucial aspects of the interplay between society, nature, and migration. The focus of reference is then widened to politics of environmental displacement in general. As a conclusion, Oliver-Smith recommends that the research and analyses on climate/environmental change induced migration must be multiscalar, multi-scaled, and informed by the concepts of resilience and vulnerability to gain greater understanding of these changes.

This InterSecTions from Oliver-Smith is an important, objective contribution to the topic of environmental migration/displacement. It is likely to be referred to in the future by many scientists interested in this topic and it will certainly serve as a key reference in the work of UNU-EHS on environmental migration.

Fabrice Renaud, Director a.i. UNU-EHS

Foreword

Global warming will continue to bring about extreme weather events such as severe windstorms and flooding. There is already clear evidence of this today. A direct consequence of these suddenly occurring events is the migration of large populations, as shown by hurricane Katrina, which devastated New Orleans in 2005. In the current issue of InterSecTions, Anthony Oliver-Smith impressively demonstrates that these are not isolated incidents, using the example of tropical cyclone Mitch, which struck Honduras in 1998. In addition to these individual catastrophes, climate change is also responsible for gradual, but no less grave environmental change. Heatwaves and droughts, the globally rising sea level, and also other environmental phenomena will increasingly force populations to abandon their ancestral homelands.

The Intergovernmental Panel on Climate Change (IPCC), which was awarded the Nobel Peace Prize, outlines this in its fourth Assessment Report. The International Organization for Migration (IOM) estimates the migrating population today at 170 million. Experts assume an additional 25 to 50 million migrants by 2010 and nearly 700 million by 2050.

A cause for serious concern is that the governments in emigrant and immigrant nations are far from being prepared for the phenomenon of environmental migration, as current examples in Canada and Alaska show, where environmental change is forcing Inuit populations to move. The situation does not appear to be much better in the Pacific, where inhabitants of countless small island states will have to settle elsewhere to escape the rising sea level.

It took a long time for the different scientific disciplines to recognize the fact that resolving the complex issue of environmental migration will require intensive cooperation amongst widely varying specialist fields. One example of a step taken in the right direction is the foundation of the Climate Change, Environment and Migration Alliance (CEEMA), established by the IOM, the United Nations Environment Programme (UNEP), the UN University and the Munich Re Foundation. It is the objective of CCEMA, among other things, to pool migration research and draw politically relevant conclusions.

In this issue of InterSecTions, Anthony Oliver-Smith gets to the core of the question: reliable solutions for politics can only be identified when climate change, migration research, sociology, and cultural understanding in different areas of the world have been coordinated with each other.

Thomas Loster, Chairman of the Munich Re Foundation

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The Margins of the InterSecTions Series – A Service for the Cursory Reader

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Additionally, the quotations are placed directly beside the respective paragraph, so if the reader wishes to find out more, the quotations can easily be found in the text and the reading can be taken from there.

The editorial team of UNU-EHS hopes this format will be well received. However, any comments and/or recommendations of improvements are very welcome.

Abstract

This article approaches the problem of environment and migration, variously expressed by the terms "environmental migrants", "environmental refugees", "climate migrants", "environmentally displaced peoples", and other similar labels or categories, through a consideration of convergent themes regarding nature and society in ecological theory and in social scientific disaster research. The articulation between ecological and social theory provides grounding concepts for both framing the issue and research on the problem of actual and potential mass displacement of human populations by environmental change, specifically global climate change.

Introduction: Environment and Migration

The complex interplay of social and economic factors in the environment is increasing the vulnerability of people and environments.

Throughout human existence, adapting to environmental fluctuations, often expressed in the form of "natural" disasters, has been a consistent necessity for societies around the world. In some cases, an adaptive option has been migration, either temporary or permanent, to enable the survival of people impacted by those changes (Hugo 1996). Today, the impacts of societal development are driving environmental changes that are potentially more extreme than at any other time in recorded history, bringing with them a serious potential for uprooting massive numbers of people. Moreover, the complex interplay of social and economic factors in the environment is increasing the vulnerability of both people and environments. Larger numbers of people are also more vulnerable to the impacts of such changes than ever before, due partially to increases in population and density in exposed locations, but also to social, economic, and political processes that create or exacerbate risk and vulnerability to such dangers. Principal among these environmental changes currently occurring is global climate change. It is highly likely that people in vulnerable contexts will experience the impacts of climate change, whether of slow or sudden onset, as disasters, particularly if they result in involuntary displacement and resettlement. Indeed, disaster risk reduction strategies can play a major role in adaptation to global climate change (Birkmann and von Teichman 2009).

The Intergovernmental Panel on Climate Change (IPCC) asserts that human induced factors are generating significant increases in temperatures around the world. These factors produce increases in the rate of sea level rise, increases in glacial, permafrost, arctic and Antarctic ice melt, more rainfall in specific regions of the world and worldwide, more severe droughts in tropical and subtropical zones, increases in heat waves, changing ranges and incidences of diseases, and more intense hurricane and cyclone activity (2007a, b). In addition, these alterations compound each other to accelerate the rates at which they are proceeding and are predicted to impact natural systems globally, producing changes in aquatic, terrestrial, and biological subsystems. The real and potential impacts of these changes are also predicted to gene-rate environmental and social processes that will displace large numbers of people, obliging them to migrate as individuals and families or permanently displacing them and/or relocating them as communities. Global climate changes, in addition, may also be combined with other factors, such as environmental contamination, to drive people from their homes.

Section I

1.1 Environmentally Displaced People: The Contemporary Debate

The issue of environment and migration is among the most discussed and debated dimensions of the impact of global environmental change on human beings. The research and scholarship focusing on the relationship between environment and migration is shot through with controversy, centering largely on the issues of predicted numbers, appropriate terminology for people uprooted by environment and other causes, and the political implications of both research and policy pertaining to environmentally displaced people. The contingent nature of prediction of environmental impacts, the vast disparities in predictions of numbers of people to be affected, the elusive nature of definitional issues, the difficult question of causation and the overall complexity of society-nature relations - all present serious challenges to researchers attempting to analyze the relationship between environment and migration. Renaud et al., in their summary of the debate, conclude that the scientific and empirical bases of the issue require greater elaboration (2007: 16).

Therefore, despite a general scientific consensus on global environmental change, the degree to which it will generate mass displacements and migration is debated. In fact, despite some modest consensus about the mechanisms, character and extent of the contribution that environmental factors make to population mobility, there is still considerable debate about what exactly constitutes an environmentally induced move and how to measure and explain it (Adamo 2008: 2). Although the actual mechanisms through which major population dislocations might occur are still only partially understood, predictions of displacement from climate change range from 50 million to as high as 250 million people in this century, an indication of both the challenges of research and the potential gravity of the problem. The predictions are highly problematical. At present sufficient quantitative evidence is not available to justify either present predictions or to substantiate historical cases over the last two hundred years (Moriniere et al. 2009). However, the inconsistency of predictions of forced migrations notwithstanding, the increasing confidence of climate scientists in their own predictions of environmental change points to the probability of substantial environmentally induced population displacement in the relatively near future.

Since the 1980s researchers have linked the issue of environmental change with human migration, explicitly designating as "environmental refugees" people who are forced to leave their homes, temporarily or permanently, due to the threat, impact or effects of a hazard or environmental change (El-Hinnawi 1985). Although environmental studies have traditionally focused on the natural world, the impacts of pollution, deforestation, soil erosion, degradation, desertification, and other environmental processes on human beings have also been a source of both interest and concern to ecological and social scientists. Indeed, the impacts of many of these processes have often been framed as "disastrous" because they create stress, disrupt normal social processes, and force people to adapt by making temporary adjustments or permanent changes in how, where, and when they do things in life. Myers has asserted that recent human-induced environmental change, such as desertification, deforestation, or soil erosion, compounded by natural and man-made disasters, could force as many as 50 million people to migrate from their homes by 2010. He sees environmental change and disasters as triggers or detonators that lead to land competition, resource degradation, occupation of fragile regions and

There is still considerable debate about what exactly constitutes an environmentally induced move and how to measure and explain it.

impoverishment that eventually force people to migrate (1997). Recently, the Global Humanitarian Forum has predicted that over 20 million people will be displaced by environmental causes (2009). Guterres sees five displacement scenarios emerging in the near future: hydrometeorological disasters, population removal from high risk areas, environmental degradation, the submergence of small island states, and violent conflict (2009: 4). While Guterres attaches no numbers to these scenarios, as previously mentioned, predictions of environmentally displaced people range from 50 million (Myers 1997) to 250 million (Christian Aid 2007).

Objections to these contentions are derived from basically three perspectives: theoretical, legal, and political. Some scholars assert that it is erroneous to attribute causality to the environment since migration is always the result of multiple factors. They attribute the displacement of people to a complex pattern of factors including social, economic, and political as well as environmental forces, underscoring the fact that human demographic movement is both a social and an ecological phenomenon, both impacted by and impacting the environment. These scholars dispute the accuracy of the term "environmental refugee," finding it misleading (Kibraeb 1997; Black 2001; Castles 2002). Moreover, according to Black, much of the migration allegedly caused by environmental factors, is really nothing new but merely a traditional form of cyclic coping that has been practiced by people for centuries and as such part of people's overall adaptation rather than a response to environmental change (2001: 28). Natural disasters are seen to cause some temporary displacement, but not "authentic" i.e., permanent migration. Indeed, if permanent migration does occur as the result of a disaster or environmental change, it is seen as more the result of deficient responses of weak or corrupt states rather than the environment as expressed in the form of a natural hazard impact.

The legal objections question the term "environmental refugee" in two ways. The 1951 United Nations Convention Relating to the Status of Refugees legally defined a "refugee" as a person who flees his/her country of nationality for fear of persecution based on race, religion, nationality, ethnic or social group, or political opinion. People displaced by environmental causes do not qualify under the UN convention definition of "refugee." Moreover, critics also fear that applying the term "refugee" to environmentally displaced people will mask the political causes of displacement and allow states to evade their obligation to provide asylum. Indeed, Kibraeb alleges that the term "environmental refugee" was "…invented, at least in part, to depoliticize the causes of displacement," a plausible if unsubstantiated claim (Kibraeb 1997: 21). They fear as well that labeling environmentally displaced peoples as refugees will weaken the protective aspects of the convention and diminish the resources available for those so defined.

Other scholars object to the term politically because of instances when "refugee" has nourished xenophobic and racist perspectives, pointing to the fear of climate-induced migration that has recently entered European and North American political discourse. They are disturbed by press predictions of waves of desperate climate migrants flooding into Europe or over the southern US borders and the manipulation and fear-mongering by politicians intent on stirring up nativist and anti-immigrant feelings among local populations. For example, Hartmann (2007, 2009) and Wisner (2009) are concerned that research on environment and migration runs the risk of energizing anti-immigration and racist polemics. They also assert that tying migration to environmental change provides a convenient language to policymakers and opinion leaders to divert blame away from failed policies and corrupt

People displaced by environmental causes do not qualify under the UN convention definition of "refugee."

governments. Wisner, in particular, is concerned that the use and interpretation of the environmental migration question tends to be oversimplified by the media, by lobbyists, specialized NGOs, and foundations, and by economic and political elites. "Words matter, and terms such as 'environmental refugee' and 'climate migrant' have been used in contexts that could accidentally give fuel to xenophobia and racism" (Wisner 2009).

Hartmann, criticizing principally the literature on environmental change and conflict, objects to the term "environmental refugee" on three grounds. She asserts that the term naturalizes or depoliticizes the economic and political causes and masks the role of institutional responses to it. She further claims that "environmental refugee" is dehistoricizing, eliding the causes of why particular populations are more vulnerable. And finally, she opines that it has its roots in neo-Malthusian thinking that over-emphasizes the role of demographic pressures in migration (2009: 146-7). Wisner characterizes much of the research on environment and migration as environmental determinism, reductionist, and altogether lacking a dispassionate measured approach that carefully and above all quietly researches the role of environment in migration. Hartmann accuses the media, policymakers, and much environment and migration research of racism, claiming that "we are taught to fear not so much global warming as the dark people it will set loose, on the move…" (2009: 151).

Hartmann also has serious concerns regarding the "securitization" of the climate change problem. Framing climate change and population displacement as security issues serves a number of dubious purposes, according to Hartmann, including militarization of immigration enforcement, enhancement of military spending, and justification for further overseas interventions in regions afflicted by severe climate change, population displacement, and potential conflicts. Enhancing the role of the military in dealing with climate change crises also undermines the role of civilian institutions in developing democratic solutions that focus on poverty reduction, equity, human rights, and sustainable development (2007). There are also concerns about the possible strengthening of the relationship between the military and environmental science that would compromise the scientific integrity of climate research (2009).

While the substance of all these assertions on environmental migration, both pro and con, may be questioned, the concerns they express are valid and reflect the difficulties of developing appropriate political, policy, and practical responses for environmentally displaced peoples in the near future. The relationship between environment and migration is far from linear or straightforward and understanding it presents a number of conceptual challenges. These challenges are embedded in the complexity of the relationship between social and ecological systems and in the nature of causality between such complex phenomena. It is also clear that the "environmental refugee" controversy is deeply embedded in the way complex nature-society relations are understood by scholars, politicians, and the general public. The debate, like many academic debates, is interesting and useful more for the issues it illuminates than for what it resolves. Indeed, packed into the dispute over "environmental refugees" are some serious conceptual issues in the social and natural sciences as well as a number of political problems regarding migration and human rights that have emerged over the last thirty years.

One particular dimension of the debate stands out. The debate over environmental displacement is rarely framed in terms of society-nature relations. Generally

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speaking, human-nature relations in this literature have been relatively unproblematized and the discussions have been limited to fairly linear understandings about the causality of environmental factors in migration. Environmental scientists generally tend to see people uprooted by environmental factors (e.g. El - Hinnawi 1985; Myers 1997; Jacobson 1988). Migration specialists, on the other hand, attribute uprooting to a multiplicity of social factors (economics, politics, governance, etc.) (e.g. Black 2001; Castles 2002). More than just a loss of resources, there is little attention to the fact that displacement and migration alter the fundamental relationship that people have with their environment. It is the contention of this article that to address effectively the issue of environmentally displaced peoples, analysis has to be based on an understanding of society-nature relations. Moreover, we must recognize that the interactions between people and their environment are energized by human aspirations and social and cultural institutions, while at the same time, however, being ultimately constrained by the laws of nature (Newell et al. 2005: 300). One of the goals of this article is to explore those issues to reflect on the problem of environmentally displaced peoples. The article proposes that this exploration may be accomplished by examining the reenvisioning of society-nature relations that has taken place over the last 30 years in two fields whose concerns have begun to overlap, especially in regard to climate change: ecology and disaster/vulnerability research. The reframing of society-nature relations in these fields may clarify the issues that have led to this multi-sided debate and hopefully contribute to clearing the way for linking science and policy productively in climate change and migration.

1.2 Society-Nature Relations in Contemporary Ecological Theory

Throughout the history of the west, traditional constructions of the relationship between human beings and nature place them in opposition to each other, but have shifted back and forth between varieties of environmental determinism and a strongly utilitarian cultural triumphalism (Milton 1996). But for a passing medieval portrayal of a partnership between nature and society (Harvey 1996), the oppositional utilitarian perspective toward the natural world became eventually dominant in the 17th and 18th centuries (Redmond 1999: 21).

The philosophical opposition of nature and society ultimately became deeply embedded in scientific thought and practice that emphasized the domination and control of nature by society. Scientific and philosophical discourses saw humans as ontologically distinct from nature. Indeed, nature provided a contrasting category against which human identity could be defined as cultural rather than natural. As the basic element of the observable world, nature was thus subject to study and ultimately control through understanding its order and its laws. The separation between culture and nature also permits a separation between observer (of nature) and observed (nature itself) which is the basis of the natural sciences (Soule 1995: 148). Moreover, nature was also constructed as a fund of resources into which human beings regardless of social context have not only a right to dip, but a right to alter and otherwise dominate in any way they deem fit. In brief, human life would progress by dominating the natural world through technology and scientific knowledge.

The belief in social domination further specified that nature would also benefit from human action. Western ideology frequently summoned up images of nature replete with savagery and violence. From the disaster perspective, such a vision also implicitly juxtaposed the violence and disorder of nature with the order of human

culture and civilization. This has led to a construction of hazards as disturbances or violations of order (Oliver-Smith 2002).

The classic paradigm in ecological science, still very much in operation in managerial contexts, reflects those concepts and is based on the idea that without human intervention, ecosystems can be portrayed in terms of an ideal, stable state of equilibrium, achieved through a linear path of development. Disturbances such as fire, insect infestation, disease, etc. are considered rare or external events, rather than intrinsic features of the system. Nature is governed by mechanistic natural laws that are knowable. Thus, the policy implications are clear. The endpoint of ecosystem development is inherently predictable and human managers should eliminate disturbances from ecosystems (Wallington et al. 2005). Thus, the equilibrial approach to nature became embedded in the framing of policies and the enactment of practices by state agencies, NGOs and development projects. In disaster management many interventions were designed to eliminate or diminish the potential for "disturbance" of climate extremes through, for example, the construction of dikes, levies, dams, and channeling of rivers.

Although human ecology appeared in the 1920s, due largely to lingering enlightenment beliefs in the distinctiveness between nature and culture, it was not until the 1960s that the relationship between society and nature began to claim greater attention from both the scientific community and the general public because the enormous impacts human beings have on natural systems were beginning to be understood. And, since the 1970s, ecological science has been in a process of transition, shifting from an emphasis on ecosystems as static entities in equilibrium to complex systems that are dynamic and unpredictable across space and time (Wallington et al. 2005; Scoones 1999). Ecosystems are now considered to exist in a relatively constant state of change, with much less long-term stability. Variations from any given state - whether caused by natural hazard (fire, flood) or by human induced factors - are seen as common occurrences. More importantly, disturbance is characterized as inherent to the internal dynamics of ecosystems and may play key roles in the regulation of change. Frequent disturbance makes ecosystems subject to sudden, unpredictable change, causing systems to abruptly flip into entirely new states (Wallington et al. 2005; Holling 1994).

Since disturbance is so central and the contingent outcomes key in subsequent development, history, in particular human history, is now important in ecological analysis. Recent longitudinal research suggests that historical land use activities continue to affect composition, structure and function of most ecosystems and landscapes for decades after such use patterns have ended (Bellamare et al. 2002; Foster et al. 2003). The implications of these findings are that understanding current ecosystem conditions must be based on patterns of change that encompass past human land use and other interventions, climate and natural disturbances, as well as endogenous successional processes (Wallington et al. 2005). Historical contingency, thus, is reflective of the cumulative impacts of many processes operating at multiple scales.

Indeed, questions of scale are critical since processes of change may result from interactions across scales. The new ecology holds that ecosystems are internally variable across space and time and research must address all interacting levels at multiple spatio-temporal scales. Variability across space and time in combination with the fact that many critical environmental problems occur at large spatial and temporal

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scales indicate that research should examine the interaction between spatial pattern (structure) and ecological process (function). In essence, it should examine the causes and consequences of spatial heterogeneity across a range of scales (Wallington et al. 2005). Thus, society-nature, or socio-ecological systems are interlinked in never-ending adaptive cycles of growth, accumulation, restructuring and renewal, taking place in nested sets of scales "…ranging from a leaf to the biosphere over periods from days to geologic epochs and from the scales of family to a socio-political region over periods from years to centuries" (Holling 2001: 392). All processes play out in interaction with other processes and the temporal sequence in which they occur may be key in understanding environmental change.

Thus, current environmental problems and changes (in atmospheric conditions, land use, water quality, etc.) may occur gradually over time horizons that surpass human attention spans, but their effects accumulate and are likely to trigger more rapid changes that take people unaware with serious consequences. Unusual events, management problems, and resource exploitation all can shape in unpredictable ways, the structure of an ecosystem at critical moments or vulnerable sites, even causing the system to flip into a new irreversible state (Holling 1994). One clearly worrisome implication of this finding is that gradual changes in temperature may have little impact until a certain tipping point is reached, bringing about a large shift into a novel state that may be difficult or impossible to reverse (Scheffer and Carpenter 2003).

There are broad implications in these assertions for understanding patterns of vulnerability and resilience. Classical ecology defines stability in qualitative terms of the system's ability to return to equilibrium after a disturbance. The emphasis here is on "return". On the other hand, non-equilibrium ecology, emphasizing the open and dynamic nature of ecological systems in which change is normal, asserts that disturbances actually increase the chances that a given ecological system will not return to a former state, but will nonetheless persist. In other words, it is resilient.

The concept of resilience, dialectically related to vulnerability (Aguirre 2007), refers to conditions where disturbance can tip a system into another stable state. "Ecological resilience is therefore the capacity of a system to undergo disturbance and maintain its functions and controls and may be measured by the magnitude of disturbance the system can tolerate and still persist" (Wallington et al. 2005: 15). In the human context, the ability of social groups or individuals to bear or absorb sudden or slow changes and variation without collapsing is social resilience (Holling and Meffe 1996). In terms of disaster, resistance, resilience, and adaptation are basic to reduce the impacts of actual or future hazards on society.

This "new" ecology, with its insights into complexity and nonlinearity, has a number of important implications for environmental perception, policy, and practice (Scoones 1999: 494). Ecological dynamics always contain a large measure of uncertainty, indeterminacy, and surprise. Holling tells us that "knowledge of the system we deal with is always incomplete, surprise is inevitable, not only is the science incomplete, the system itself is a moving target, evolving because of the impacts of management and the progressive expansion of the scale of human influences on the planet" (1993: 553). However, from this perspective, instability has a productive role in maintaining diversity and persistence as well as in developing policy to maintain ecosystem function in the face of the unexpected. Vulnerability reduction or increasing resilience therefore involves addressing the already built-in capacity of ecosystems to adapt to environmental disturbances.

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Hence, with no fixed, predictable, or equilibrial nature to provide a template for action, standard managerial interventions based on conventional ecological models may be inappropriate. The new approaches in ecology require policy and practice frameworks that can encompass the large spatial scale of natural processes, the high degree of natural variability, and the inherently unpredictable behaviors of complex ecological and human systems (Holling 1993: 553). Such approaches must be sensitive to and integrate into analysis the uncertainty, indeterminacy, and surprise that characterize the ecological problems that present themselves.

The new ecology is therefore moving beyond a mechanistic, Newtonian position toward a perspective that is integrative and holistic, focusing on variability and uncertainty as central in its scientific inquiry where complexity and non-linear dynamics are fundamental. Again Holling argues that this stream of research "…has the most natural connection to related ones in the social sciences that are historical, analytical, and integrative. It is also the stream that is most relevant for the needs of policy and politics." (1993: 553). Moreover, it provides potentially productive guidelines for assessing the effects of climate change for population displacement.

1.3 Nature, Environment, and Society in Disaster and Vulnerability Research

Disaster research in some sense has paralleled the developments in ecological thinking that have taken place over the last thirty years. The degree to which there has been a direct influence is unclear. As issues in both society and environment have become more complex and interrelated, the research in both fields has tended to reflect that complexity as well as more systemic approaches.

Regardless of the particular theoretical perspective, the construction of nature in mainstream social science as holistic, integrated, and regulated, and of environmental change as linear, stable, and predictable was fairly consistent into the 21st century (Scoones 1999: 484). In social scientific disaster research it was much the same. Starting in the 1950s two approaches developed. The first was what has been characterized as the hazards approach, emerging largely from geography, with a focus on the hazards in specific environments and their impacts on people and communities. There was some recognition of vulnerability, but largely caused through human error or ignorance. The temporal and spatial scales employed in their analyses were relatively reduced to the area affected by the hazard and the time frame in which the event unfolded. The second approach, emerging largely in sociology, with some contributions from political science and psychology, and a few from political science, economics and anthropology, focused on the behavior of individuals, organizations, and institutions in the disaster moments, mostly the threat, impact, and immediate aftermath stages. The spatio-temporal scales were also rather narrow, being focused around the actual event of the disaster impact.

In the 1970s and 80s geographers and anthropologists from and working in the developing world, principally found that mainstream disaster studies brought little of value to the task of analyzing disasters in third world contexts (Wisner et al. 1977; Hewitt 1983; Oliver-Smith 1986). These researchers criticized the essentially passive role prior investigators had assigned to society in risk etiology and the scant attention paid to local, national, and international factors in creating or exacerbating both risk and impact. Researchers from and in the third world called for a rethinking of disasters from a political economic perspective, based on the high correlation be-

The new approaches in ecology require policy and practice frameworks that can encompass the large spatial scale of natural processes, the high degree of natural variability, and the inherently unpredictable behaviors of complex ecological and human systems.

tween disaster proneness, chronic malnutrition, low income, and famine potential, leading to the conclusion that the root causes of disasters lay more in society than in nature. The concept of vulnerability focused attention on those aspects of society that reduce or exacerbate the impact of a hazard.

Moreover, the concept of vulnerability expanded the spatial and temporal scales of analysis. Using the Wisner et al. model as an example, vulnerability is understood to be generated through a causal chain of root causes embedded in ideological, social, and economic systems, leading to dynamic pressures of a demographic, socio-economic, or ecological nature that produces specific sets of unsafe conditions which, when combined with a natural hazard, produce a disaster (2004). One analytical utility of this model lies in its expansion of spatial, temporal, and hierarchical scales of analysis and its chain of causation. The root causes of a disaster thus are sought in ideological, social, and economic systems that develop often over centuries and have contributed to the formation of patterns that over extended periods of time produce unsafe conditions. By the same token, vulnerability may be produced by participation in broader systems that may have their locus of control a continent away from the actual disaster. Research into the causation of disaster began to involve multi-scalar analysis with an emphasis on interaction across multiple spatio-temporal scales.

We now assert that most natural disasters are more explainable in terms of the "normal" order of things, that is, the conditions of inequality and subordination in the society rather than the accidental geophysical features of a place. This perspective shifted the focus away from the disaster event and towards the "ongoing societal and man-environment relations that prefigure [disaster]"(Hewitt 1983: 24-27). The interpenetration and interaction of both the social and environmental domains became the focus of analysis.

Disasters are no longer defined solely in terms of their natural, technological, or social agent or triggering event. Clearly, agents that are rooted in nature such as hurricanes or earthquakes, if they are of equal intensity, may produce very different outcomes according to the characteristics of the communities where they occur. So-called "natural" disasters are now more accurately referred to as socio-natural events/processes, a term that recognizes that natural hazards are systemic features of environments whose occurrence and expression are deeply affected by social features and processes.

The vulnerability/risk approach now clearly informs a large part of the research agenda. It has helped to change the way we think about disasters and, complemented by the concept of resilience, has been part of the general rethinking of society-nature relations that has taken place over the last 25 to 30 years. The concept of vulnerability thus demands a more complex understanding of disasters because it recognizes that disasters are not caused by a single agent but by the complex interaction of both environmental and social features and forces.

By the same token, disaster outcomes are rarely the result of a single agent (i.e., a hurricane), but are brought about by multiple complex and intersecting forces acting together in a specific social context that is complex in its own right. These linkages and interdependencies are often referred to as coupling processes between social and ecological systems. The functioning or operation of these coupling processes in the context of crises and catastrophes is now a major research challenge (Bohle

Disasters are no longer defined solely in terms of their natural, technological, or social agent or triggering event.

2008; Birkmann 2009). The focus thus, has now shifted to the interaction of society and nature, in some ways paralleling theoretical developments in the field of ecology.

Section II

2.1 Parallels and Convergences in the New Ecology and Disaster Research

As the new ecology and the vulnerability perspective in disaster research developed over the last three to four decades, a number of parallels emerge. It is interesting to consider the similar paths that both fields were exploring in advancing both theory and research. In the first place, both fields of inquiry "routinized" risk and disturbance. Both the new ecology and vulnerability research framed risk and disturbance as inherent to systems rather than as exogenous. The new ecology began to see disturbances as part of the overall system that enabled ecosystems to sustain variability and function (Holling 1994). Vulnerability research framed disasters as inevitable outcomes of the functioning of particular configurations of society. The natural hazards that visit societies are no longer seen as "acts of God", but rather systemic features of environments (Hewitt 1983) that become disasters because of the vulnerability of social systems.

Both the new ecology and disaster research emphasized issues of scale and multiscalar interaction. The new ecology asserted that resilience and adaptability in nature lay in the variability and diversity of the interactions among biotic, abiotic, and geophysical variables, operating over a different range of spatial and temporal scales, ranging from centimeters to kilometers and from days to centuries. An example of such an array can be seen in the spatio-temporal scales involved in the linkages between a pine needle, a branch, a tree, and a forest, each of which occurs on a different time scale and occupies a different spatial scale, but is still part of the overall system (Holling 1994). In disaster research, similar multi-scalar analysis can be seen, for example, in the production of vulnerability to earthquakes in Peru, which can be traced over a temporal scale that encompasses pre-Columbian adaptations, the Spanish conquest, and contemporary conditions of underdevelopment and a spatial scale that must reference that nation's insertion in a global political economy since the conquest (Oliver-Smith 1999). Indeed, both fields stressed the importance of history in the task of understanding change and persistence in basic social and natural processes (Oliver-Smith 1999; Wisner et al. 2004; Gunderson and Holling 2001; Wallington et al. 2005)

Both fields also developed the concepts of vulnerability and resilience as basic tools in the analysis of both social and environmental processes. The new ecology sought to explain how environmental processes function over time and space to enable a continual adaptation to change in nature. They were particularly interested in the role that human societies played in these processes both positively in supporting spatial hetereogeneity and functional diversity in nature and negatively through impacts on terrestrial and acquatic ecosystems. Holling developed the concept of resilience to explain how nature could absorb so much change and still continue functioning, but warned that resilience was not unlimited (1973). He was particularly concerned that human adaptive capabilities have made it possible to expand natural limits artificially and thus render nature more vulnerable to collapse (1994). In that context, disasters actually became a topic that the new ecology began to address as pertinent to their own research concerns.

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Disaster research, seeking causes as to why disasters were so much worse in the developing world, developed the concept of vulnerability to frame how social systems generate the conditions that place different kinds of people, often differentiated along axes of class, race, ethnic, gender, or age, at different levels of risk from the same hazard and suffering from the same event. As risk and vulnerability are socially distributed, disasters are also both socially constructed and experienced differently by different groups, according to different levels of vulnerability. This more complex understanding of disasters recognized that disasters originated in the interaction of both environmental and social features and forces rather than in the action of a single agent. Furthermore, in the dialectical relationship that vulnerability has with resilience (Aguirre 2007), we see the potential for the generation of variability and functional diversity that similarly characterizes those found in the new ecology.

Finally, the developments in both the new ecology and disaster research required a new perspective on the relationship between society and nature. Both fields had to discard a dualistic perspective in which nature and society maintained discrete identities, interacting but essentially separate, and move toward more synthetic, mutualistic approaches to understanding human-environment relations. Indeed, since the 1970s in both the social and natural sciences, the relationship between society and nature has been undergoing considerable reconsideration and revision. Starting from a fundamentally similar conceptual position, i.e. the essential separation of nature and society, the social and natural sciences have been moving along parallel paths, each toward a construction of the nature-society relationship that is more synthetic, mutualistic, and dynamic.

2.2 From Society and Nature to Socio-Ecological Systems

Traditionally nature and society have been constructed from a fundamentally dualistic perspective in which society exists as a collection of human constructs and relations, and nature is context or "out there". Concern for ecological degradation was and in many contexts still is based on the idea that society is out of step with some supposed natural order. The solution to these problems is for society to learn to live in balance with nature. From one perspective the general tenor of these positions evokes general agreement, but they are still constructed from a fundamentally dualistic perspective. In many contexts the relationship between society and nature still continues to be framed in dualistic terms with two separate entities in some kind of interaction, whether healthy or distorted (Wallington et al. 2005).

However, in the 1980s the duality, in both the natural and the social sciences, and particularly in the field of disaster research, became much more interactive with the emergence of the concepts of social vulnerability and resilience. Social and environmental processes were brought together in the analysis of disasters, with the recognition that nature and society were both implicated in the construction of vulnerability. The concept of vulnerability to disasters is just one of many contexts that oblige us to rethink the relationships among society and nature (Oliver-Smith 2002, 2004). In situating causality in disasters in societal-environment relations, the concept of vulnerability forced a reenvisioning of the nature-society relationship.

As such, disaster research joined ecology in a major reconsideration of human-nature relationships. In the social sciences in general a trend emerged "to decipher the social implications of what has always been the case, namely a nature elaborately

entangled and fundamentally bound up with social practices and their characteristic modes of cultural representation" (MacNaghten and Urry 1998: 30). However, the mutuality of nature and culture does not mean the "socializing" nature to the point that it disappears in a forest of interpretations. As those who "ecologize" culture, those who would "culturize" ecology risk obscuring as much as they illuminate, particularly in terms of the agency of nature in society-nature relations. The natural forces present in any environment have enormous power to affect society, but it is society that actualizes their potential. This perspective strives to recognize that, given the human impact on nature, the objective circumstances that natural processes occur in are now socio-historical products (Oliver-Smith 2002).

Alternative views began to question the dualism in constructs of the relationship between nature and society in efforts to create more synthetic approaches that can address the mutuality of nature and culture (Biersack 1999). At one extreme some spoke of the end of nature or the abolition of nature, positing that human interaction with nature had transformed the entire globe into a human environment. The difference between nature and society for some scholars now could no longer be maintained and nature became fundamentally a social entity (Bluhdorn 1997; Eder 1996; Beck 1995; Giddens 1991; Ingold 1992; Escobar 1999). Others prefer to develop approaches that stress a kind of critical realism, emphasizing a balance between the social construction of nature and the natural construction of the social and cultural (Stonich 1993; Oliver-Smith 2004). These and other approaches are part of an effort to seek a fuller recognition of the role human beings have taken in shaping as well as being shaped by nature by conceptualizing a "bio-cultural synthesis" (Goodman and Leatherman 1998). The "new materialism", as Biersack dubs it, addresses the challenge of bringing nature into the cultural realm without "effacing nature's autonomy from the cultural realm" (1999: 11).

Understanding environmental change and its effects, such as population displacement, requires reframing nature-society relations from a duality to a mutuality, positing that nature and society are inseparable, each implicated in the life of the other, each contributing to the resilience and vulnerability of the other (Oliver-Smith 2004). That is, in this understanding, people are not just vulnerable to environmental changes, but also environmental changes are increasingly the result of human activity, not just technologically but in terms of human alteration, or construction of the environment. In a sense, the question of how well a society is adapted to its environment must now be linked to the question of how well an environment fares around a society. The issue of mutuality is now at the forefront. Environmental change and disaster more than ever now express and energize most clearly that mutuality.

Hilhorst, addressing disaster causality, considers the mutuality concept a new paradigm, not just an elaboration of a theme derived from vulnerability models. She contends that the mutuality idea differs from what she refers to as the structural approach because it rests on different notions of causality, social change, and responses to disaster vulnerability (2004: 53). The structural approach is based on the idea that the causes of disaster vulnerability can be reduced to a limited number of root causes of social and ideological origins. To appropriately address disaster vulnerability, these root causes must be confronted, involving a distinct political agenda for the necessary radical changes.

The mutuality concept is an approach that perhaps has more in common with complexity theories that are concerned with stability and change in systems. These

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systems are complex in the sense that they consist of many independent features that interact with one another in a variety of ways (Hilhorst 2004). The concept of mutuality indicates that we are moving from an understanding of nature and society as a duality of separate entities in interaction to an approach informed by the idea of component parts interacting in a single complex system, now essentially referred to as a socio-ecological system. Each component in this system operates in relationship with the other, although each also has its own autonomous processes that are capable of acting independently of the other. It is no longer possible to understand the operation of one component without taking into account the operation of the other. In effect, the impacts of society on nature are now so widespread and profound that for some the two have become conflated. Some have even suggested that human action now dominates and that we are living in a new geological epoch referred to as the anthropocene (Vitousek et al. 1997; Crutzen and Stoermer 2000).

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Certainly, because of the intensification of social processes, it is more difficult than ever to define where nature ends and society begins and vice versa. Indeed, it is now arguable that there are no more natural environments. For all intents and purposes natural processes are now in interaction with social processes in the production of global and specific vulnerability, environments, and problems. The recognition of the human influence on global climate patterns now confirms that human action both purposefully and inadvertently shapes natural systems into human constructed environments. From the 20th century on, when exactly might be debated, we are speaking more about degrees of human constructedness in environments than nature or natural systems.

Human action notwithstanding, however, we still have to contend with forces within nature, albeit inflected profoundly by human processes, that clearly transcend any social efforts to transform or control. Most important, at least for our purposes, are natural hazards: earthquakes, hurricanes, tornadoes, droughts, floods, forest fires, etc., as well as the disaster provoking effects of climate change. It is in these forces that nature or natural processes maintain their agency. However, the agency of a nature that has been profoundly socialized challenges an adequate theorization of the relationship between environment and migration.

If such is the case, how are we to understand the basic properties and processes of these interacting components? In socio-ecological systems, can we still divide things into natural and social categories and study their interactions? Kotchen and Young (2007) use the economic methodologies of partial and general equilibrium analysis to illustrate the challenges of understanding these interactions. Partial equilibrium analysis assumes changes in one side of a coupled system and focuses analysis on the consequences of those changes on the other side. Thus, for example, assumptions are made about climate changes, and the consequences for social welfare such as effects on agriculture, health, or migration will be analyzed. The biophysical agent - Greenhouse Gases - is treated as exogenous. However, as they freely admit, the behavior of socio-ecological systems cannot be understood unless both sides are treated as endogenous, which suggest the need for general equilibrium analysis or other methods capable of capturing that mutuality (Kotchen and Young 2007: 150). However, applications of methods like general equilibrium analysis have only just begun.

The endogeneity of both sides is the challenge. Both society and nature are highly interactive, incorporating dimensions of the other in their own processes. Social features now infuse what have previously been purely natural processes and by the

same token, natural processes have always been part of society. As Ingold asserts, environmental history and human history are inseparable, each implicated in the processual life of the other, each contributing to the resilience and vulnerability of the other (1992). For this type of analysis, the barrier between human activity and ecosystemic activity must be collapsed, transforming a relation of difference into a relation of mutuality of the natural and social worlds. Therefore, environmental features and ecological processes, such as earthquakes, hurricanes, floods, and soil erosion, must be recognized as features of social life; and social and cultural elements, such as racism, religion and politics or commodities, land markets and circulation of money, must be seen as functioning ecologically (Harvey 1996: 392). While this transposition would not seem deeply problematical, failure to engage this process lies at the heart of much of the environmental migration debate.

If we are to understand the dynamics of coupled socio-ecological systems and the challenges they currently pose, our approaches must be able to factor in the endogenous nature of both sets of variables to identify key linkages and specify the mechanisms that generate feedback, tipping points, emergent properties, and pervasive uncertainty (Kotchen and Young 2007: 150). Moreover, to add to the complexity, our approaches need to account for the reflexivity of human systems. To make decisions about current options, individuals and societies draw from past experiences and anticipate possible future occurrences (Hilhorst 2004; Kotchen and Young 2007). Reflexive behavior can solve or alleviate problems; it can also make them worse. Thus, the endogeneity and the interactive nature of coupled socio-ecological systems constitute a formidable analytical challenge.

A principle aspect of the difficulty in addressing the endogeneity of features in socio-ecological systems is that the words and concepts that we employ to designate elements in these systems, words such as nature, environment, or society, for example, are both part of common usage with very general definitions as well as concepts that are employed in scientific discourse where meanings have to be more precise. The lack of conceptual clarity and precision for many terms employed in the discussion of the problem of environment and migration may be at the root of some of the misunderstandings. If we are to adequately address the endogeneity in socio-ecological systems, we need to develop a language that we can describe it in.

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Although most people are fairly sure of what they mean when they speak of "society", "nature", or "environment", there are many ambiguities in the way the words are used (Urry 2000: 200). The term "environment", for example, has multiple meanings. Sometimes the meanings overlap or coincide; sometimes they conflict. There is also the issue of what the relationship is between the concept of environment and the concept of nature. Nature and environment are words whose meanings seem frequently to be taken for granted. Indeed, they are often used interchangeably and in some instances this has led to a blurring of important distinctions that may impede our understanding of complex vulnerability-related phenomena such as disasters or environmentally driven population uprooting and resettlement.

It is universally recognized that human beings have had an enormous impact on the biophysical world, profoundly altering what we have traditionally called "nature". Yet, "nature", even its profoundly altered and socialized state, which has convinced some theorists to write of the death of nature or the end of nature, still has the capacity to drive processes with enormous impact on human society. Indeed, what kind of nature are we talking about here? We need to develop the conceptual

tools to articulate the complexities that are emerging out of these new, and some not so new, conditions in socio-ecological systems. Both social and natural sciences need to develop concepts and approaches that reflect the interactions between society and the agency of nature (Dickens 2001: 94). In particular, we need to distill out of the general and scientific discourse a language to address these complex relations and interactions.

Today in the "environmental" subfields of the social sciences, such as ecological anthropology, environmental sociology, and cultural geography, the concepts of nature and environment are not interchangeable, but have become quite distinct. Nature is biologically constructed, referring to those biological, chemical, and geophysical features and processes that compose the substance and functioning of terrestrial systems, which are characterized by spatial/temporal heterogeneity and functional diversity (Holling 1994). These systems are maintained by cycles of renewability that ensure the capacity of the global system to reproduce itself, maintaining within a range of variation the set of biotic conditions that enable life to persist. What I have referred to as the laws of physics, biology, chemistry and geology, Murphy calls "primal nature", that is, "trees, photosynthesis, bacteria, viruses, earthquakes, hurricanes…" (2001: 326).

Murphy discusses a further state he calls "pristine" nature, which applies to regions unaffected by human action (2001: 326), although he acknowledges that pristine nature has been largely replaced by a "primal" nature that retains its capacity for autonomous action (2001: 331). While undoubtedly at some early point when the human population was much smaller and more widely dispersed, it is possible to speak of something called "pristine nature", it is also a well documented fact that human beings have been integral parts and active shapers of "nature" throughout time. For example, recent archeological research in the Amazon, long imagined as "pristine," reveals that pre-Columbian population densities, settlement patterns, and landscape transformations were far more extensive than has been portrayed. Far from being a "pristine" natural environment, the Amazon was evidently a deeply affected cultural landscape in the pre-Columbian era that, nevertheless, did not endanger biodiversity (Heckenberger et al. 2003). Nonetheless, some conservationists call for the removal of long resident populations from a wide variety of environments in which floral and/or faunal species are considered endangered. Sometimes referred to as "greenlining" or "ecological expropriation", this strategy of the forced removal of people from their homelands, often without notice or consultation, produces yet another variety of "environmental refugee" (Geisler and de Sousa 2001).

Unlike "pristine" nature, environment is socially constructed. It is the outcome of the interaction of natural features and processes with social features and processes. In that sense the term "natural environment" is an oxymoron. Environments by definition are not naturally created, but socially constructed. Environments consist of the instantiation of social processes in nature, thereby converting the natural into a social product (Harvey 1996). There are natural features and processes at work in environments, but they are expressed and channeled socially, either as resources, recognized or unrecognized, or threats, recognized or unrecognized. In effect, nature's dynamics are infused in social processes and are thus used by humans for their purposes. Murphy refers to this as "recombinant nature" (2001: 325).

Clearly, however, at the same time natural features and processes continue to operate with effects that are far from entirely controlled by the social (Oliver-Smith

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2004). In Murphy's terms, technology, also part of recombinant nature, is the blending of socially constructed elements and features and forces of nature (natural materials and the laws of chemistry, physics, biology, etc.) for socially defined purposes. Technology always has the capacity to malfunction, often with catastrophic effects. The second half of the twentieth century has seen the creation of completely new technologies, whose mere implementation, regardless of potential or actual malfunction, has had profound environmental and, in some cases, catastrophic impacts (Perrow 1999). Many of these new technologies, ranging from toxic chemicals to nuclear power plants, have been added to the list of hazards which now threaten communities, not necessarily with material destruction, but with altogether novel biologically derived hazards, creating new forms of injury (Quarantelli 1991). Human technological interventions, while in many cases providing more security, in other instances added many degrees of complexity to existing natural threats.

Latour has called these features and processes that come into existence and act in both the material and the social world, perhaps in some space between them, "hybrids" (1993). When we have a way of theorizing that hybridity, fundamental as it is to human life, we will have achieved a great deal, not only in our own work, but for the social sciences and humanities as well (Oliver-Smith 2004). At its most profound, that is the conceptual challenge that environmental migration sets before us. Other issues that reside at the convergence of social and ecological systems such as disasters, food security, and health pose similar challenges to theorizing nature society relations.

In effect, social and material practices in combination with natural processes frequently evolve into novel conditions that we must cope with and adapt to. In the case of hazards, potential and actual disasters, we may encounter forms that we have little experience with. The degradation of the environment, in some cases driven by the quest for profit and in others created inadvertently by those subsumed disadvantageously in that quest, now accounts for conditions of accentuated vulnerability to both natural and technological hazards around the world. Inappropriate forms of natural resource exploitation engendered by western conceptions of the relationship between society and nature are now driving many of the processes that endanger both. A finer-grained understanding of both environmental conditions and disasters must be based on an approach that can include the mutuality of the agencies of nature and society. It must be recognized that the environment is a socially mediated force and context experienced by people, both positively and negatively, just as society expresses itself environmentally both positively and negatively (Oliver-Smith 2004).

Section III

3.1 The Interplay between Society, Nature, and Migration: Honduras and Hurricane Mitch

The situation in Honduras prior to Hurricane Mitch provides an example of the linkage of multiple variables in environmental change, disaster, and forced migration. A case can be made that Mitch was the prototypical 21st century disaster. Vulnerability in Honduras was related to international economic policy, development economics, demography, agricultural policy, land use, and environmental degradation. These root causes are deeply embedded in the institutionalized forms and practices of a

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dominant but fundamentally unsustainable development model based on intensified exploitation of the region's natural resources through augmented exports of agricultural commodities and forest products, and industrial fisheries (Stonich 1993: 2).

A large measure of vulnerability in Honduras was due to environmental degradation that resulted from these factors. While hurricane winds and rainfall were major damaging forces, the changes wrought in Honduran environments over the last half-century, undoubtedly contributed to accentuated social and environmental vulnerability and to the level of death and destruction. These changes consisted of intensified soil erosion and degradation due to shortened fallow periods, overgrazing and burning, deforestation, micro-climate alterations, changes in hydrology and soil stability, and biocide use impacting water, soil, air, and health conditions (Jansen 1998).

The deteriorating environmental situation compounded an array of grievous social conditions that placed Honduras among the poorest of the poor for all of Latin America.

Thus, environmental deterioration was produced by multiple causes and is deeply embedded in the social forms and practices that structure property relations, markets, local-state relations, political clientelism, knowledge, demography, non-commoditized relations, and specific forms and processes of nature (Jansen 1998: 204-212). The deteriorating environmental situation compounded an array of grievous social conditions that placed Honduras among the poorest of the poor for all of Latin America. Rural poverty and land concentration produced Central America's highest rates of migration to cities, such as Tegucigalpa, where people occupied unsafe locations and structures on hillsides made unstable by deforestation. In the lowland cities, the migrants occupied areas prone to flood, creating densely populated urban neighborhoods along riverbanks and in flood plains.

The disaster produced more than 6,000 dead and two million affected people, many left homeless and jobless, and forced to migrate. It is impossible to tell exactly how many people migrated out to La Mosquitia, the last relatively unimpacted rain forest of Central America. Although little data is available, Honduran farmers were marginalized to steep hillsides first by the expansion of cattle ranching, shrimp mariculture, commercial melon and banana production, and subsequently to La Mosquitia by the ecological devastation of Hurricane Mitch. It is likely they were faced with uprooting again as they encroached upon indigenous reserves and protected areas of that rainforest region. These unfortunate people would be triple losers.

It is equally difficult to tell exactly how many people joined the international migrant stream in search of employment in the US. One indication, however, is that from November 1998 - just after the hurricane - to January 1999, US agents along the Texas border caught 6,555 people described as "other than Mexicans", almost all of them Central Americans, which is an 86% increase compared to the previous year. There is no telling how many got through undetected. Mexico also caught and expelled 31,995 migrants, a 70% increase (McConahay 2000). In this case Hurricane Mitch was both the result of a series of intersecting forces, one of which was rural to urban migration, and the trigger event for another series of processes which produced the forced migration of many thousands of people, whose multidimensional vulnerability left them after Mitch with few options but to migrate.

The development policies that had been implemented over the previous 50 years had led the Honduran environment to the brink of collapse. Hurricane Mitch was simply a powerful detonator, carrying a series of social, economic, and environmental processes over the edge (Oliver-Smith 2009).

Disasters thus frequently become the outcome of unresolved development problems that produce a particular kind of relationship between natural or physical hazards, and the changes they enact on nature and the organization and structure of society. Social and economic structures and institutions entrain environmental changes that increase vulnerability and accentuate impacts of natural agents, leading to cases of forced migration. The uprooted people of Honduras were not refugees of nature, but were displaced by socially inscribed and enacted changes in their environment that combined with a naturally formed agent called a hurricane (Comfort et al. 1999).

3.2 Revisiting the Debate: The Politics of Environmental Displacement

Given the increasing urgency in global climate change predictions and the expansion of hazards and disasters that threaten to generate population displacement, the debate on environmental migration has not only sharpened, but has acquired both scientific and political overtones that must be addressed. As in the case of Hurricane Mitch, there is little question that in some cases disasters do force people to migrate, but there is a wide variety of factors at work, both prior to and after onset, that drive the disaster and entrain subsequent migration. The South Asian tsunami is another example. While the tsunami itself temporarily uprooted hundreds of thousands, the actual permanent displacement and resettlement was carried out by governments responding to multiple agendas (Fernando et al. forthcoming).

It is also important to remember here that the analysis of environmental crises, including disasters, is also no longer restricted to event aspects only, but embraces both the processes that set them in motion and the post-event processes of adaptation and adjustment in recovery and reconstruction. Forced migration can be part of the process prior to the event or after, but it is not inevitable. As noted, environmental crises are not caused by a single agent but by the complex interaction of natural and social features and forces that produce an environmental event or outcome. By the same token, outcomes are rarely the result of a single agent (i.e. a hurricane), but are brought about by multiple complex and intersecting forces acting together in a specific social context that is complex in its own right. A range of factors of different orders - cultural, social, environmental, economic, institutional, and political - all take place in the context of potential spatial change as well as multiple levels of adaptations. Therefore, forced migration associated with disasters or other environmental crises is commonly the result of the interactions that both bring about the event and are then accentuated by the event itself. Seeking single causes for complex outcomes is usually difficult in any context, and particularly with forced migration, whether the obvious "cause" is to be found in an international or civil conflict, development projects, or natural or technological disasters.

Therefore, Black's critique that focusing on "environmental" factors as causes of migration, often obscures the role of political and economic factors is well taken.It echoes the position held by most disaster researchers today that focusing solely on agents reveals little about the political or economic forces that together with agents produce disasters or, for that matter, any forced migration that might ensue. Castles recognizes a similar complexity in the Ruandan genocide "disaster", noting that it is alternately glossed as "a classic case of population growth" (i.e. environmental), a "political struggle for power in which both ethnicity and natural resources played a major part", and the outcome of Belgian colonial practices of divide and rule (2002).

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Castles is correct in pointing out the complexity manifested in the multiple interpretations, but his assertion suggests that all such crises, and the subsequent forced migration they may or may not engender, regardless of "cause", are equally complex. In the face of such complexity then, the question thus becomes how causality is to be reckoned.

There are two fundamental questions regarding causality. The first asks what empirical evidence is required for legitimate inference of cause-effect relationships. The second suggests that if we are willing to accept causal information about a phenomenon, what kinds of inferences can be drawn from that information (Pearl 2000)? The key word here is "inferences". Clear and direct relationships of causality are hard to come by. In the strictest sense of word, if A causes B, then A must always be followed by B. In common parlance, when we say A causes B, as in smoking (A) causes cancer (B), we instead should say that smoking causes an increase in the probability of cancer (Spirtes et al. 2000). In other words, for present purposes, disasters, or environmental change, A increases the risk of B, or forced migration. Hilhorst contends that the fact that disasters involve the interaction of multiple adaptive subsystems within social and natural systems renders them acutely unpredictable in their development and outcome, if not entirely so in their occurrence (2004). We now understand that most environmental changes, particularly those generated by climate change, are similar.

In addition, apart from their quite reasonable distrust of the disparate estimates of people facing displacement, the objections of Black, Wood, Castles, and other scholars to the term "environmental refugee" are derived from three problematic issues. The first is the construction of human-nature relations as a duality, in which each domain is separate and capable of causing things to happen in the other. The change of focus in society-nature relations from a relation of difference to a relation of mutuality implicates human thought and action in the construction of environmental change and disasters. In effect, rather than speak of nature, as something "out there" that acts or is acted upon, society-nature relations should be framed in terms of a mutuality, which is both material and ideological in expression.

The assumption that human-nature relations are a duality, in which each domain is separate, is the rationale behind the use of partial equilibrium analysis, which is capable of informing on direct and linear causality, but that is rare in the natural and social worlds. Partial equilibrium analysis is insufficient to capture the endogeneity that is characteristic of socio-ecological systems. That endogeneity complicates seeking single agent direct causality in the environment since it tends to elude the fact that environmental resources as well as hazards, are always channeled for people through social, economic, and political factors, even in the best of times. Thus, it is difficult to point to the environment, even in natural agent disasters, as the single cause of anything. Again, seeking single agent causality to such complex phenomena would seem a doomed effort in any context. By the same token, eliminating environment factors as the single cause of forced migration hardly warrants discounting them as part of a multiplicity of forces combining to generate forced migration.

The second problem area is a conflation of the terms nature and environment. Recall our discussion of the difference between the two concepts. Nature refers to the features and processes that characterize the biotic community. Environment, or in Murphy's terms recombinant nature, refers to the issue of mutuality, the mutual

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constitution of humans and nature in socially constructed contexts. Problematically, however, in objections to assessments of environmentally driven displacement and migration the terms nature and environment are characteristically conflated. One of the objections to the idea of environmentally driven migration is that it tends to suggest that nature is at fault, when in fact humans are deeply implicated in the environmental changes that make life impossible in certain circumstances. A rigorous definition of environment as recombinant nature (Murphy 2001), that is, the social construction of nature's features and processes for human purposes, gives full recognition to the complexity, including the human role in environmental change that drives environmental displacement and migration.

The third issue is fundamentally a legal one, in that the term refugee has a formal, convention based definition referring to people who are uprooted and flee beyond their national borders because of a "well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion". Despite the attention that the issue of environmental displacement has garnered in recent years, there are no legally binding internationally recognized instruments that pertain to the needs of people displaced by environmental causes. Recognition of this lack has prompted a number of proposals for appropriate forms of governance pertaining to environmentally displaced peoples (Biermann and Boas, forthcoming; Koivurova 2007). Recognizing the problem of complicating the status of legally defined refugees, these proposals argue against including environmentally displaced peoples under the 1951 Geneva Convention Relating to the Status of Refugees. Instead, they propose new legal instruments designed specifically to address the needs of environmentally displaced peoples.

The objections to the linkages being made between environment and migration of Wisner, Hartmann, Kibraeb, and others are fundamentally political and based on what they see as a reductionist and simplistic approach to nature-society relations. Hartmann and Wisner are particularly concerned that the political economic and social structural drivers of displacement and migration are elided by the term "environmental refugee". Apart from the legal difficulties with the term, Hartmann, as pointed out earlier, assigns a number of features to the concept of "environmental refugee" (depoliticizing, dehistoricizing, and Malthusian). Hartmann's concerns address the naturalization and dehistoricization of the economic and political causes of environmental degradation that, as she asserts, the term "environmental refugee" implies. Indeed, her criticism of "neo-Malthusians" who argue that resource scarcities cause conflicts (e.g. Homer-Dixon 1999) is not misplaced. She is also perfectly correct in criticizing any constructions of Hurricanes Mitch and Katrina as natural disasters (2009: 150). However, the vast majority of research on both of these disasters neither naturalizes nor dehistoricizes them (Comfort et al. 1999; Laska 2004; Laska et al. 2005; Oliver-Smith 2009; Ensor 2009). And even though some may actually employ the term "environmental refugee", most of the scholarly literature on those two events, and even some of the popular media fully recognize the role of historical and political-economic structures in the construction of those tragedies. That is, outside some of the resource scarcity and conflict literature, the term "environmental refugee" is usually not used in a depoliticized, dehistorized, or Malthusian way.

Hartmann also uses the term "Malthusian" somewhat loosely. Recognizing environmental limitations does not make one a racist. The work of Holling, who wryly describes himself as a "gloomy Malthusian" hardly fits that description (1994). Most

of the researchers who include population pressure as a cause, usually include it as one of several. Larger (and longer term) systemic political economic features appear as more causal in environmental change and migration, but there is a legitimate argument that can be made to include demographic pressure as contributing to particular cases as well. To sum up, approaching environmentally displaced people from a political ecological perspective rules out a depoliticized, dehistoricized analysis. Indeed, since the 1990s, if not before, the general acceptance and use of the vulnerability/risk approach in the analysis of disasters precludes such limited approaches. It is not the term that is dehistoricizing or naturalizing, but the way it is used, largely in the media and in political discourse.

The principle issue for Hartmann seems not to be whether people will be displaced (migrate), but how it will be interpreted and represented. This is a valid concern, and it is important to deconstruct the assumptions behind these representations. However, in launching this critique there seems to be little distinction drawn between research and popular media representations, and they tend to be grouped together as racist, Malthusian, and lacking any perspective on socially constructed conditions of vulnerability. The dangers in the potential misuse of issues of environment and migration are unquestionable, but those dangers are present in most research on social and environmental issues. The research that is now emerging is nuanced, recognizes complexity, and clearly addresses issues of socially constructed vulnerability in exploring the relationship between environment and migration (Lazrus 2009a, b; Marino 2009; Marino and Schweitzer 2009). Hartmann dismisses the numbers associated with environmentally displaced people and it is true that they are "all over the map". But it is also true that the number of documented cases is increasing. While it may be dangerous to depend on unsubstantiated numbers, it is equally dangerous to dismiss the issue as only politically motivated, designed to raise funds, or to fuel ethnic or racial anxieties. Climate change (or environmental change and migration) is an incredibly complex issue, but it is happening. And human displacement is one of its potential effects. Research on environment and migration is politically volatile, and certainly vulnerable to misuse and misrepresentation, but despite that, it must be taken absolutely seriously because the potential outcomes are serious.

Representations in the media of scientific findings are frequently problematic. Indeed, in the United States science reporting today is considered to be in crisis. Science journalism was once a required component of any newsroom, but recent restructuring of media markets has led many formats to reduce the number of experienced science journalists on staff or to discontinue in depth science reporting altogether. The loss of experienced science journalists has led to very inconsistent reporting on such issues as the relationship between vaccines and autism, HIV and AIDS, and climate change (Mooney and Kirshenbaum 2009). In today's journalism, the more dramatically the implications of scientific findings can be framed, the better. Thus, "The Human Tsunami" which is the title of an otherwise balanced and well written article dealing with climate change and migration, actually sensationalizes the problem by framing it in terms of the century's most grievous catastrophic disaster (Knight 2009). Other articles that blame environmental migration on "nature" rarely take the trouble to differentiate the meanings of environment and nature, generally conflating the two terms and muddling the whole issue of causality.

As Wisner, Hartmann, and others assert, there is also no question that the issue of causality has also been manipulated by politicians for a variety of motives. This would not be the first time politics has misused science. They have used the issue of

Research on environment and migration is politically volatile, and certainly vulnerable to misuse and misrepresentation, but despite that, it must be taken as absolutely seriously because the potential outcomes are serious.

environmental migrants to raise the alarm that the developed nations of the north, particularly Europe and the United States, will be inundated by millions of environmentally displaced peoples from the south. Some politicians make these claims to generate support for anti-immigrant policies, with the triage or lifeboat ethic that is covertly associated with that perspective. Others, such as former US Vice President Al Gore, use the specter of millions of unfortunate refugees rushing over the US borders to generate support for stabilization of green house gases and other forms of climate change mitigation. Clearly related, the distortions that politics and the media engage in when discussing environmental migration, constitute a serious concern and it is incumbent on climate and migration researchers to clarify issues of causality when discussing the complexity and interrelationships of drivers in the displacement of populations.

Conclusion

Fundamental to all the objections to the terms "environmental refugee" or "environmental migrant" is the idea that nature is being blamed for complex human events, such as violent conflicts, migration or famine, constituting a form of environmental determinism. Indeed, blaming nature does allow governments and development agencies an easy out if they can explain such disasters as hunger and conflict in terms of overpopulation and environmental change (Wisner 2009). This critique of the term would be entirely valid if the term environment referred to nature, rather than to a human constructed context in which human processes and natural processes interact dynamically to produce specific kinds of outcomes. That is, as pointed out earlier, for some analysts atmospheric, geologic, hydrologic, biospheric, and other earth systems have been so altered by humans that the world has entered into a new geologic time period characterized as the anthropocene (Crutzen 2002).

Therefore, as I have gone to some lengths to point out, we are not talking about nature in some essential or pristine state, but rather an array of human derived and driven processes that construct the global environment. Some might claim that the distinction I draw between nature and environment is too subtle or merely rhetorical, but if we are to advance our analyses with any precision, the terms we use must be specific and not subject to conflation of one with the other. Indeed, in issues of such importance, as Wisner says, words matter. Particularly in climate change, people will not be displaced by nature, but by a set of processes created and driven by human agency. That can clearly be seen using the example of the specifically massive production of green house gases that have entrained a series of processes that are transforming global climate and therefore nature. The fact that these processes manifest themselves in and as events that transpire in the environments that we live in or in ways that take the form of natural processes (wind, rain, drought, erosion, etc.) obscures their partial human origins. Under no circumstances should they be interpreted as natural; they are most certainly environmental processes that combine human and natural forces and features.

This approach to the mutualism between nature and society is the product of advances in the fields of ecology and social vulnerability research over the last thirty years. Both fields established that risks and disturbances are in fact largely internal to both ecosystems and social systems. Therefore, although it may seem obvious, climate change is not something "out there", but is fundamentally tied to both social and ecological processes driven by human action. Nevertheless, the language often

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used to discuss environmental migration continues to reflect an interacting but still dualistic separatism, ignoring the endogeneity of nature and society, particularly when discussing causality. Furthermore, both fields have established that if we are to gain greater understanding of these changes, our research and analyses must be multi-scalar, that is, capable of linking changes at one temporal and/or spatial scale to others at different levels. Finally, the parallel development of the concepts of resilience and vulnerability in both fields now informs the way we understand environmental change and the manner in which we must respond.

Although the recent report from the Global Humanitarian Forum estimates that as many as 20 million people may be displaced by climate change this year (2009), at the moment it is more probable in most cases that climate change effects are only making matters somewhat worse for the majority of the world's most vulnerable people. Where displacement is occurring, it is generally the outcome of multiple factors, including environmental, political, and economic causes. In fact, at present the problems afflicting, for example, the slum dwellers of Mumbai, are not primarily climate change, but rather the conditions of poverty and exclusion that they are consigned to by the larger political economy encompassing their region, nation, and the world.

However, if predictions from the IPCC and other research organizations are even half right, and confidence in estimates for sea level rise, coastal erosion, desertification, and other forces that may displace people is considerably higher than that, then we must be prepared for significant increases in the role environmental factors will play in displacement in the relatively near future. To discount environmental causation, particularly that represented by climate change, on the basis of current forms of multi-causality constitutes a serious dereliction of responsibility on the part of the social scientific research community and decision makers. In effect, we are in a rare situation: on the one hand, we are facing unusual changes that will generate very particular and potentially devastating threats. On the other hand, we have the scientific tools at present to make predictions with sufficiently high probabilities that allow us to prepare to meet those threats. It would indeed be tragic if we defaulted on the opportunity for preparation that those predictions present because of a lack of clarity in the way we conceptualize the threats.

Where displacement is occurring, it is generally the outcome of multiple factors, including environmental, political, and economic causes.

Abbreviations

CCEMA Climate Change, Environment and Migration Alliance
IOM   International Organization for Migration
IPCC   Intergovernmental Panel on Climate Change
UNEP   United Nations Environment Programme
UNHCR United Nations High Commissioner for Refugees

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