

Migration and Environmental Hazards

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Several classic theoretical perspectives on migration provide foundations for examination of the association between migration and environmental hazards. Importantly, however, while contextual factors are often noted in these frameworks, they are rarely emphasized. Further, to the extent that empirical work has been undertaken with regard to the association between migration and environmental hazards, little of such work is grounded in these classic migration frameworks. The broader review (Hunter 2005, citation above) offers a summary of classic migration theories of potential use in the exploration of environmental context within migration research, in addition to a synthesis and theoretical exploration of existing efforts examining migration as associated with both natural and technological hazards. Below, the literature syntheses are provided in condensed form.

Migration as a Response to Natural Hazards

The impacts of natural hazards on society are substantial and are clearly on the rise (Abramovitz 2001). Indeed, estimates suggest that between 1/5 and 1/4 of the Earths' human population was affected by natural hazards during the 1970s and 1980s (Abramovitz 2001). Even so, impacts are expected to increase; during the period 1972-1995, actual calamities increased by 5-7% per year, while the damage resultant of these disasters increased by 5-10% per year (Kondratyev, Krapivin, and Phillips 2002). Predictions to 2030 suggest a continuation of these trends in addition to their "enhancement" (Kondratyev, Krapivin, and Phillips 2002).

Migration on a Continuum: A wide-ranging continuum characterizes the ways in which environmental hazards might act as a "push" factor in migration decision-making. With regard to natural hazards, forced migration is represented by evacuation (e.g., Ziegler and Johnson 1984), although this movement is typically only temporary and does not entail a permanent change of residential location. Some disaster-impacted residents do eventually choose to relocate, however, thereby engaging in voluntary migration. The wholesale relocation of communities represents another potential migratory outcome of natural hazards, also representing more permanent residential location. Such relocation is often mandated (therefore forced) migration, and will therefore be reviewed first below. As presented, the reviewed literature moves from forced migration to increasingly voluntary migration as a response to natural hazards.

Community relocation is one of three forms of reconstruction typically undertaken by disaster-impacted communities (Mileti and Passerini 1996). Reconstruction most often follows the path of rebuilding, whereby communities are reconstructed to restore their predisaster character with such efforts driven by human interest to reconstruct predisaster culture and interactions. Second, a community may be partially reorganized to take variation of risk within its boundaries into

account. Changes in predisaster land use may, for example, restrict residential redevelopment in flood zones, instead zoning these areas for more flexible uses (e.g., recreational space). Finally, communities may be relocated to a less hazardous site, thereby requiring migration (of varying distance) but reducing future damage (Mileti and Passerini 1996). The story of Valmeyer, Illinois, offers an example. A village of 900 residents located 35 miles southwest of St. Louis (Rozdilsky 1996), Valmeyer flooded regularly, but following devastation by the 1993 Mississippi River floods, the community took rapid action to initiate a complete village relocation project. Flood water had reached depths of 10-15 feet in the village center, destroyed the town's infrastructure, and severely damaged 98% of the village's structures. In October, 1993, a new town site was established outside of the flood plain, on top of a nearby bluff, and in April 1995, the first resident moved into his home in the new town. The community, which includes many of the town's residents prior to the flood, has reconstructed itself with a new sense of permanence (Rozdilsky 1996).

Wholesale community relocation is, however, a relatively rare occurrence, especially within the context of developing nations. Environmentally-induced permanent migration of a less organized kind typifies these interactions in less developed contexts. Hugo (1996) presents an analysis of reports on Asian environmental migrants as presented in the *United Nations Disaster Research Organization News* for the period 1976-1994. The results demonstrate that over the last 2 decades environmental disasters have displaced increasing numbers of people. As an example, in 1994, mass migration to urban areas within China took place as a result of floods and droughts in upland areas (Kaye 1994). Natural calamities also often "push" migrants from rural to urban areas in Bangladesh, such that "an unusual increase of beggars and people looking for work in cities and towns is part of the aftermath of drought and floods." (*Population: UNFPA Newsletter* 1984). It has been argued that millions are displaced annually as a result of environmental factors in Africa as well.

Local displacement also takes place, such as in portions of Bangladesh, where floods and cyclones regularly occur, often with dramatic outcomes (Lein 2000; Zaman 1991). Importantly, local displacement in contexts such as Bangladesh is sometimes temporary and may, therefore, not represent "migration" under technical terms requiring longer-term relocation. Still, these situations are noted here as instances where environmental context may consistently yield residential disruption especially within less developed contexts.

Agriculture in Bangladesh is very much dependent on annual flooding and the floods, therefore, take on unique cultural meaning. Although necessary, the persistent floods also change river courses, with many Bangladeshis losing homes and lands to erosion annually (Zaman 1991). In a survey undertaken in a Bangladesh floodplain in the mid 1980s, 64% of sample households reported having been displaced by erosion at least once, with the mean number of displacements being seven (Zaman 1991). Typically, migrant households relocate only a short distance away; in the aforementioned survey, nearly 88% of households had remained within 2 miles of their previous residence (Zaman 1991). Such short distance mobility (perhaps temporary) is a product of lack of resources, presence of kin, and belief that land will re-emerge to be reclaimed (Zaman 1991). Migration here is a household coping mechanism, with household members typically having little faith in finding permanent residence; displacees often continue to live in fear of eviction, either by governmental authorities or natural forces (Haque and Zaman 1989; Mutton and Haque 2004; Zaman 1991).

Sometimes, however, migration (short- or long-term) as a coping strategy is simply not feasible. Demonstrating the interaction between vulnerability and exposure to environmental hazards, in Peninsular Malaysia, structural factors restrict the residential choices of many inhabitants of risk-

prone regions (Chan 1995). Based on 1992-93 interviews with members of 618 flood-prone households, Chan (1995) argues that migration is an option available only to wealthier households, while options are restricted for many others due to poverty, low educational attainment and social mobility, insecure land tenure, a lack of government aid, disaster preparedness and/or relief programs (Chan 1995). Further, if provided the opportunity to relocate, many vulnerable households do so only to often find themselves on different floodplains because these are the least expensive places to live.

As another form of migratory response to environmental hazards, in some cases, particular household members will take on more permanent migration while others stay behind. Here we can look to work by Ezra and Kiros (2001) in ecologically degraded and drought-prone communities in Ethiopia. Multilevel models estimating young adult migration within this context provide evidence for the “new economics of migration,” whereby migration of some household members becomes a family strategy for those living in uncertain natural environments. Results suggest that a community’s vulnerability to food shortages as a result of drought contributes significantly to outmigration as a strategy to assist relatives (Ezra and Kiros 2001).

Household migration strategies as related to natural hazards are also seen in South America. On May, 31, 1970, a major earthquake struck Peru, killing as many as 70,000 residents and injuring 150,000 others. Osterling (1979) studied the ways in which this catastrophe contributed to outmigration of peasant workers from the highland region of Ancash, the area most destroyed by the quake, to Huayopampa a rural community four hours drive north of Lima. Results suggest that most migrants were compelled to seek employment through migration because the natural disaster had intensified traditional poverty in their origin villages. Only a handful of migrants indicated that the earthquake was their primary migration motivation. Indeed, the natural disaster is seen to have stimulated an ongoing process of modernization and acculturation, primarily with regard to Ancash young men, by “forcing some of the victims to seek their fortunes within a labor economy” (Osterling 1979: 120). Migrants were innovative in responding to the earthquake by capitalizing on social networks that facilitated migration to Huayopampa which is seen as a training ground for preparation for an eventual permanent move to Lima (Osterling 1979).

Within the context of the U.S., making use of the American Housing Survey, Morrow-Jones and Morrow-Jones (1991) find that, as compared to migrants generally, those noting natural disaster as the reason for their move tend to be older, are more likely female-headed households and minority group members, and characterized by lower income and educational levels. As such, the researchers conclude that the less socio-economically advantaged may be those most likely to migrate following a natural disaster. It is suggested that those households with more assets may be more likely to rebuild (Morrow-Jones and Morrow-Jones 1991), perhaps as a result of lessened damage due to their ability to undertake more mitigation measures such as installation of disaster-resistant windows and/or roofs (Peacock and Girard 1997).

In the end, research clearly suggests that natural hazard risks are “dynamic and complex” (Alexander 2000:11), as are the relocation responses of households to natural hazards. Within developing regions, descriptive work suggests that millions migrate annually as a result of environmental conditions, suggesting that environmental decline may be an important “push” factor fueling urbanization (e.g., Hugo 1996; Jacobsen 1988). In some cases, local (perhaps temporary) mobility is a more typical response to regularly occurring natural hazards (e.g., Zaman 1991). Finally, analytical efforts suggest that the environment as a contextual factor, interacts with individual, household and other community characteristics to shape household migration decision-making (e.g., Ezra and Kiros 2001). Within more developed regions, there is some evidence that “flight” from hazardous areas is as much related family composition,

community ties, and job status as concern with the risk itself (Goldhaber et al. 1983). Other evidence suggests that, in more developed regions, socio-economically advantaged households may be those least likely to migrate in response to natural hazard impacts (e.g., Morrow-Jones and Morrow-Jones 1991).

The following section provides a review similar to that above but with regard to technological hazards. First, technological hazards are defined. Following, several case studies illustrate research findings linking migration to technological hazards.

Summary, Conclusions, Implications

The review provided above has examined migration as a particular coping strategy with regard to environmental hazards. In general, although research on migration and the environment “remains weak” (Bilsborrow 2002:87), the work that has been done documents that migration is a coping strategy undertaken by some households in the face of both natural and technological hazards (e.g., Morrow-Jones and Morrow-Jones 1991). That said, there is also evidence that “flight” from hazardous areas is sometimes as much related to family composition, community ties, and job status as concern with the risk itself (Goldhaber et al. 1983). The summary provided in the full manuscript links insights from the review to classic migration theory in addition to theoretical conceptions of risk perception, while also discussing the policy implications of the summary’s conclusions.

As might be anticipated due to migration’s various costs, more households typically express *desire* to relocate as a result of proximate hazards than actually *do* (Flynn 1979; Goldhaber et al. 1983). As an example of linking to early theoretical work, such findings support Speare’s (1974) conceptual efforts with regard to residential preferences in which he argues that consideration of migration is a necessary, but not sufficient, condition leading to actual migration behavior. In addition, Speare notes that factors related to residential context interact with individual and household characteristics to shape migratory behavior (Speare 1974). Indeed, although research suggests individuals prefer hazard-free living situations (e.g., Blackwood and Carpenter 1978; McAuley and Nutty 1982), individual, household, or other contextual factors may simply not allow migration behavior in response to those preferences.

There is substantial opportunity for demographers to contribute to a better societal understanding of population distribution as related to environmental hazards; Numerous secondary data sources reflecting environmental hazards are readily available, and classic migration theory has much to offer.¹ Exploration of the link between population distribution is particularly timely since scholars predict increases in both natural and technological hazards, as well as increased human vulnerability due to population growth and shifts in population distribution and related infrastructure. Policymakers may find insights into migration decision-making of particular use in the creation of policies designed to reduce human vulnerability. Indeed, human coping strategies take many forms and the strategies chosen by hazard-impacted individuals will ultimately shape the success of policies aimed at reducing the social and economic losses associated with environmental hazards.

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¹ There are several secondary data sources of potential use in examination of environmental hazards as contextual factors in migration research including the National Oceanic and Atmospheric Administration (NOAA), the Environmental Protection Agency (EPA) and the Federal Emergency Management Agency (FEMA). Also, Belgium's Centre for Research on the Epidemiology of Disasters (CRED) offers a database (EM-DAT) that documents both natural and technological disasters around the world, while additional information has compiled from various sources such as UN agencies, NGOs, insurance companies, and research institutes.