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UNU-EHS Working Paper

No.18

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February 2015



This paper is part of a set of working papers that resulted from the Resilience Academy 2013-2014. United Nations University Institute of Environment and Human Security (UNU-EHS) publishes these papers as part of its UNU-EHS Working Paper series.

**Series title:** Livelihood Resilience in the Face of Global Environmental Change

**Paper title:** Differentiated migration as community disassembly: resilience perspectives on catastrophic disturbances in livelihood systems

**Authors:** Wrathall, D.

**Publication date:** February 2015

**This paper should be cited as:**

Wrathall, D. (2015). Differentiated migration as community disassembly: resilience perspectives on catastrophic disturbances in livelihood systems. UNU-EHS Working Paper Series, No.18. Bonn: United Nations University Institute of Environment and Human Security.

# **Differentiated migration as community disassembly: resilience perspectives on catastrophic disturbances in livelihood systems**

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## **Abstract:**

Not all migration behaviours in the context of environmental change are the same. The elderly migrate differently from the young, men from women and the relatively wealthy from the relatively poor. This working paper aims to explain demographic change in post-disaster communities in systemic terms, applying the perspective of social-ecological resilience in livelihood systems. Two concepts from ecological systems research may be useful for explaining changes in demographic composition of a community: regime shifts and ‘community disassembly’ from ecosystems ecology. Regime shifts explain disturbance and the transition between habitable/productive and uninhabitable/unproductive states. Community disassembly, explains the disappearance of particular species from a disturbed system and the consequent change in system structure. While this concept cannot be applied uncritically, it provides guidelines on the systemic effect of multiple differentiated responses to a disturbance, i.e. that responses are non-random (or rule-based). Applying these ideas to flooded communities in Honduras, this paper searches for rules governing differentiated responses and finds that neither environmental impacts nor migration responses are evenly distributed. Catastrophic flooding affects the basic architecture of livelihood systems, which provide stability in social systems. Some individuals respond to deteriorating stability in livelihood systems via migration toward new stable livelihood opportunities in urban systems. Social networks suggest a set of three context specific ‘rules’ that govern migration away from uninhabitable places: (1) the ‘cumulative causation’ of migration decisions; (2) an expanded set of parameters of migrant selectivity; and (3) the effects of a social network during crisis. Ultimately, these ‘rules’ also provide a logic for understanding systemic changes in the social fabric of the places that migrants leave behind, i.e. migration and the disassembly of communities. This working paper explores the conceptual use of these ideas to understand differentiated responses to disturbance in rich ethnographic detail.

## **Key words:**

Environmental migration, social-ecological systems, regime shift, community disassembly, urbanisation

## A. Introduction

Environmental migration is the primary adaptive measure to the impacts of irreversible environmental change inasmuch as geographic spaces become permanently uninhabitable and unproductive for human use (Adamo and Izazola, 2010; Barnett and Adger, 2003; Döös, 1994; Glantz, 2001; Hugo, 1996; Myers, 2002; O'Neill et al., 2001; Warner et al., 2009). From the perspective of the human time-scale and given constraints on resources, systems disturbances can make modes of habitation and livelihood production ineffective or impossible (Adamo, 2009; Folke et al., 2004; Pelling and Uitto, 2001). Cases of such practically irreversible environmental change are analogues for the worst-case scenarios of climate change (Ford et al., 2010; Glantz et al., 1991; McLeman and Hunter, 2010). Whilst permanent 'regime shifts' and human responses are still not well understood, evidence from recent years has underscored the growing problem of climate-related displacement and migration. And yet environmentally-motivated migration is conflated with extraordinary processes of rapid urbanization in the developing world (Adamo, 2010; Chambers, 1995; Hunter, 1998; Pelling, 2003a). Satterthwaite (2011) points out that much of climate-driven displacement and resettlement will involve cities, as centres of economic activity and governance. 'Trunk' social services like healthcare, education and security as well as mitigative protections like drainage, coastal flood protection or flood plain management serve to attract vulnerable mobile populations. But

urban environmental migrants may not be representative of the entire body of environmentally stressed populations. Recent work suggests that environmental migration, itself, constitutes a system disarticulation and that migrants practice assortative strategies. Migration in the context of environmental change differs according to gender, age and skill sets (Hunter and David, 2010). In other words, not all people affected similarly by environmental change will select urban migrations. What then, are the 'rules' that govern the self-sorting process of populations exposed to environmental stress into urban places?

To answer this question, this paper draws on two concepts: (1) migration as a signal of a transition between system states, and (2) community disassembly, as it is understood in ecosystems ecology. Firstly, migration is framed here as a signal that a system is moving from an inhabitable, productive state, to one that is no longer fit for human habitation and production. This understanding is predicated on the notion that human settlements and livelihood systems are dependent on a regular and stable set of ecological conditions. These ecological conditions provide an essential set of resources that root human livelihoods and society into a specific material context, the 'coupled system.' However, environmental disturbances can transform the structures that provision resources and maintain a system in a stable, habitable, productive state (Wrathall, 2012). Migration therefore is a signal that specific thresholds have been breached (Lenton, 2013; Wrathall et al., 2014).

Secondly, this paper draws on heuristic value of the concept of community disassembly in disturbed ecosystems for understanding differentiated responses. In sum, community disassembly holds that all species in an ecosystem do not respond equally to environmental disturbance, but rather their different responses, for example, migration, extinction, etc. Firstly, follow rather predictable patterns or ‘rules,’ and secondly, change the essential structure of the ecosystem (Sheldon et al., 2011; Zavaleta et al., 2009). While this heuristic cannot be uncritically applied to human systems, a strong consensus in migration literature shows that people with different characteristics migrate differently and that their migration affects the sending area. This is true of migration in the context of environmental disturbance. Community disassembly suggests that in social-ecological systems, resource bases help explain differences in responses to environmental disturbance (who migrates) and the effects of responses (how it affects the system).

This paper applies these ideas to a case of urban migration following catastrophic flooding in Northern Honduras. The case tests three ‘rules’ for urban migration in flooded populations related to social networks: (1) the ‘cumulative causation’ of migration decisions; (2) an expanded set of parameters of migrant selectivity; and (3) the effects of a social network during crisis. In sum, these rules suggest that resilience is based on social class, access to resources, and power networks, and that disturbances and differential responses can separate class

structures, thus reinforcing local inequalities. Environmental migration serves to reinforce and sharpen class stratification. As such, migration itself constitutes a stressor to social systems and can undermine critical social relationships that confer resilience to some sub-populations. In this sense, cascading regime shifts are both forced by environmental change and chosen by human agency.

## **B. Migration amidst regime shift**

In the literature on environmentally-motivated migration, the problem is largely framed as an issue of household adaptation that depends on resource inputs for adaptive responses (McLeman and Smit, 2006; Tacoli, 2009). Migration amidst environmental disturbance may represent both an adaptation to responses, or at the same time, a failure to effectively adapt (Tacoli, 2009). However, migration is not an exclusively individual or household endeavour, but rather a signal of changing system parameters. In this conceptualization, migration is a signal that a system is losing elements that allow habitation and modes of production. The false adaptation and/or lack of capacity dichotomy overlooks the fact that migration is a requirement for re-establishing broken system relationships that permit stable if not improving standards of living, given a limited or reduced set of local possibilities. It is a systemic search for stability involving human and non-human change. The adaptive cycle provides an understanding of system change, which holds that changing

systems are characterized by four general phases: growth ( $r$ ), conservation ( $K$ ), collapse ( $\Omega$ ) and reorganization ( $\alpha$ ) phases of environmental change (Brand and Jax, 2007; Fraser, 2007; Holling, 1994; Holling and Gunderson, 2002; Walker et al., 2004). In this cycle, we would expect environmental migration to emerge during the collapse ( $\Omega$  and reorganization  $\alpha$  phases, during which components of the system reorganize, stabilize and adapt in novel forms that may include migration strategies. In particular, urban migration and remittances are expected as one predominant strategy for adapting to shifting environmental parameters. This view of migration, as a signal of an underlying shift in the character and identity of a system, is a tractable way of merging understanding natural and social sciences.

Secondly, this paper evaluates the heuristic value of a second concept, community disassembly, applied to social-ecological systems to understand differentiated responses. Community disassembly states that, when a range of interrelated species in an ecosystem (i.e. a community) are similarly exposed to environmental disturbances, each will respond differently through range shifts, migration and local extinction (Sheldon et al., 2011; Zavaleta et al., 2009).

These differential responses are based on biological mechanisms unique to each organism, such as morphology, metabolism, etc. Disturbances affect biota differently and responses alter the trophic relationships that constitute an ecosystem, even effecting ecosystem services (Ostfeld and LoGuidice, 2003; Sanders et al., 2003). Since different

biological responses are non-random and predictable, they form the basis for modelling the effects of climate change on ecosystems, future ecological functional relationships under circumstances of disturbance, and planning for ecological conservation (Nichols, 2012). The concept of 'rules' for differential responses cannot be transferred uncritically from biological functions to social systems. However, community disassembly suggests that there are non-random 'rules' for differential responses and that different responses drive structural changes in a system.

This paper looks to literature on human migration to search for clues on possible differentiated 'rules' governing urban migration selectivity during the adaptive cycle. Social network approaches suggest three possibilities. First, according to the standard 'new economics' theory of labour migration, migration selectivity is determined by the fit between investment in migration and a potential migrants' individual characteristics (Constant and Massey, 2003; Massey et al., 1993; Stark et al., 1998; Stark and Wang, 2002; Taylor and Martin, 2001). Likely migrants are those who are most able to absorb the costs and extract benefits implicit to migration (Todaro, 1980). Thus urban migrants are expected to be healthy, young and trained, departing from places where costs of migration are low. Secondly, research on economic migration suggests that social structures and personal relationships lower the cost of migration and influence the range of migration options available to potential migrants (Massey, 1990;

Massey et al., 1993; Massey et al., 1994; Palloni et al., 2001; Wall et al., 1998; Zolberg, 1989; 1991). Thus social networks convey possibilities for migration, which are known as ‘network effects’. Finally, the leading prediction of the social capital theory of migration “is that people who are socially related to current or former migrants have access to social capital that significantly increases the likelihood that they, themselves, will migrate” (Palloni et al., 2001, p. 1263). In other words, up to certain limits, migration causes more migration. These ‘rules’ - (1) the parameters of migrant selectivity, (2) the effects of a social network, and (3) the ‘cumulative causation’ of migration decisions - are a starting point for determining ‘rules’ for differentiated migration amidst environmental disturbance.

When put together, these two concepts—regime shift and community disassembly—create an interpretation of urban migration as a signal of change in a social-ecological system experiencing catastrophic disturbance in the structures, functions and feedbacks that cohere and characterize it. Amidst environmental disturbance, modes of residence and livelihood patterns are unable to absorb environmental impacts (Bennett et al., 2005; Brand and Jax, 2007; Carpenter et al., 2005; Folke et al., 2004; Kinzig et al., 2006; Walker et al., 2006). The system reaches a tolerance threshold and the dimensions of the stability domain that the system inhabits begin to deteriorate. The human actors in a system experiencing this shift self-organize in harmony with those structures that remain resilient,

and pursue avenues toward stability (Gallopín, 2006). The members of displaced households seek forms of stability in response to chaotic systemic transformation, a process that involves modes of migration. Resilient social structures, which resist environmental disturbance, provide the three predictable ‘rules’ described earlier and lead some environmental migrants to cities.

### **C. Context: Vulnerable Garífuna villages of Northern Honduras**

This paper outlines empirical findings from Garífuna village systems in Northern Honduras that have experienced catastrophic flooding and examines the subsequent urban environmental migration that occurred. Though this research queried outcomes for migrants within villages, to resettlement communities and to urban destinations, this paper only examines urban migrants and the urban stability domains to which they gravitated. One hundred and nineteen household and expert interviews were conducted in three Garífuna communities that have experienced catastrophic and irreversible social-ecological regime shifts and in the most common urban hub to which environmental migrants gravitated, La Ceiba (see Figure 1). The criteria for participation was that the household must have been displaced with no possibility of return (i.e. the space has become uninhabitable, see Figure 2).

Honduras has been identified as particularly vulnerable to tropical cyclonic events associated with climate

change (Harmeling, 2010; McLeman and Hunter, 2010). The region experienced a series of severe tropical cyclonic events beginning with Hurricane Mitch in 1998 and in five other years of the subsequent decade. Flash flooding associated with tropical storms has permanently shifted Garífuna villages into uninhabitable and unproductive state spaces along the Caribbean coast. According to the identified ‘experts’, these experiences with hazards represent a general trend in Garífuna villages. Tocamacho, Río Tinto and Río Esteban have each been swallowed by the rivers situated alongside them, like Santa Rosa. Triunfo de La Cruz was also cut in two, like Batalla. And several communities, most notably Nueva Armenia, have experienced general repetitive flooding, like Irióna. Experts indicate that hazards are beginning to affect more and more communities as time passes.

Each of these sites has been severely impacted by hurricanes’ storm surges and subsequent flooding from the adjacent river(s). In the case of Santa Rosa de Aguán, the village was situated between two rivers that flooded into each other and engulfed the entire town. In the case of Batalla, an over-flooded lagoon cut the village in two. Villages around Irióna have received less dramatic albeit general flooding events that have resulted in displacement.

The principal adaptive strategy for these displaced villagers is environmental migration from affected areas to regional cities and international destinations. La Ceiba, the regional urban hub to which environmental migrants gravitated following disasters

in sites 1, 2 and 3, and the economic and cultural hub of Honduras’s North Coast, as well as the capital of Garífuna society. The majority of urban migrants from research sites were reported to have relocated to La Ceiba; nevertheless displaced persons from research sites also settled in great numbers in Barrio Alfonso Lacayo near San Pedro Sula to seek employment in the *maquilas*.

Figure 2 shows a complete subset of displaced households from Lado Grande in Santa Rosa de Aguán, once named ‘the capital of the Garífuna villages,’ and the areas to which they migrated. Please note that these spaces have been rendered irreversibly uninhabitable, as a result return to the original space is not possible. The data presented in this map were compiled from three separate participatory vulnerability assessments with members of a resettlement committee and the cadastral official. One-hundred and one households experienced forced migration between 1998 and 2009 (~300 households were displaced from the entire municipality during this time). The map indicates the current domains of former homeowners: 39 (38.6 per cent) self-settled within the village, 26 (25.6 per cent) migrated to the resettlement communities surrounding the village and 15 (14.6 per cent) made urban migrations. Additionally, 14 (13.6 per cent) migrated internationally, and in 7 (6.6 per cent) cases the homeowner died and the dependents moved to undetermined places outside of the village. It is important to note that these figures accounted for the current location of the former homeowner, while the locations of dependents were not recorded.



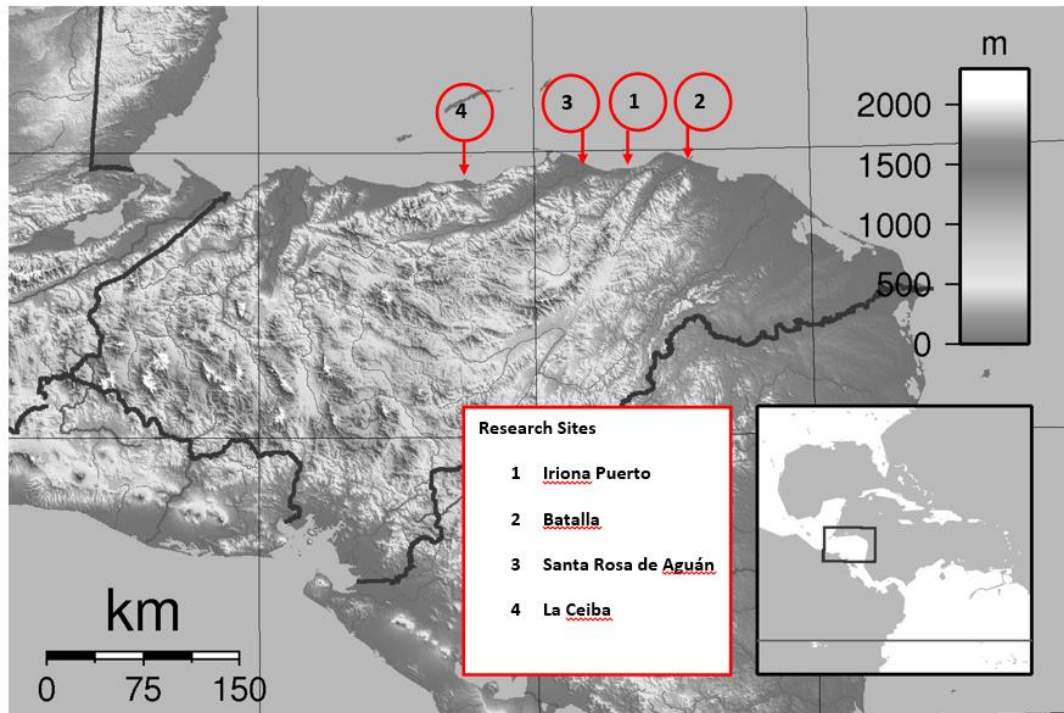


Figure 1: Honduras, research sites.



Figure 2: Displacement and migration in Lado Grande of Santa Rosa de Aguán, Honduras.

#### **D. Urban migrants: Life history data**

The sample population that participated in life history interviews consisted of 89 home owners displaced in flooding events from three particular Garifuna villages along the North Coast of Honduras conducted over the course of a year in the field (see Figure 2). Life history methodology has proven affective for evaluating strategies that stem from fundamental changes to social organization such as policies or environmental disasters (Rocheleau, 1995; Stonich, 1998). The evaluation of the three 'rules' described above follows an ethnographic account of change.

The two sampling criteria were: First, utilizing a strict definition of 'regime shifts,' as conceptualized in this research, respondents must have experienced physical displacement with no possibility of return. The second criteria were that the research would focus on the 'Head of household'. However, 'Head of household' is a problematic characterization in Garifuna villages, which defy western modes of household organization. In the end, to negotiate important post-structuralist critiques of household composition, leadership and strategy raised by Chant among others (1998), sampling was determined by individual environmental migrants whose names appeared on the property titles, or who paid the rent, or negotiated terms of tenancy with the owner. Respondents were allowed to define 'household' however they wished.

Urban migration (see Table 1) was characterized as a semi-permanent or permanent relocation of an individual or household from a rural to an urban stability domain. Of all migration types, urban migration was the single most common type with 49.4 per cent of all respondents engaging in this strategy during at least one stage of their post-displacement stabilization. This figure was naturally influenced by sampling aimed specifically at 22 urban migrants currently living in La Ceiba. However, excluding current urban migrants, urban migration also occurred at some point in strategies deployed by 34.1 per cent of resettled persons and 30.8 per cent of migrants settling within the village. Cadastral officials in both Batalla and Aguán estimated that a strong majority of displaced populations would have made urban migrations at some point.

Though data construction was not designed to achieve representativeness, several notable demographic trends prevailed in the sample population (see Table 1). Migrants who settled within the village tended to be middle-aged and represented by both sexes though tending toward male; resettled migrants were more often elderly and female; and urban migrants tended to be young and female. In the sample of resettlement communities, the median age of internal resettled migrants was 65 years old, in contrast to the median urban migrant, which was 25 years: a forty year age difference.

<b>Total sample</b> n =	<b>89</b>	
Median age (mode)	50.3 (45) years	
Sex ratio	65.2% (female)	34.8% (male)
<b>Sub-sample: Resettled</b> n =	<b>41</b>	
Median age (mode)	53.1 (65) years	
Sex ratio	73.2% (f)	26.8% (m)
<b>Sub-sample: Self-settling in village</b> n =	<b>26</b>	
Median age (mode)	52.9 (45) years	
Sex ratio	46.2% (f)	53.8% (m)
<b>Sub-sample: Urban Migrants</b> n =	<b>22</b>	
Median age (mode)	41.9 (25) years	
Sex ratio	72.7% (f)	27.3% (m)

Table 1: Displaced population sample: Age, Sex and Civil Status. □

Why was the sample so skewed toward females and where did all of the young males go? According to consensus of an array of sources, most international migrants were young and male (including five of the six international migrants interviewed). One expert respondent from Santa Rosa de Aguán, a municipal councilman, referring to an internal study conducted at the municipality, reported that of the healthy young adult males, roughly 60 per cent now live in the United States either undocumented or via legal channels.

The 2002 Honduran census, despite its biases, provides a snapshot of the post-disaster demographic distribution in transition and reflects this trend of migrant selectivity in Santa Rosa de Aguán (see Figure 3). It is important to note that in 2001, when the 2002 census was taken, demographic change had not yet stabilized. According to the cadastral officer in the municipal offices of Santa Rosa de Aguán, the 1998 pre-Mitch population of the municipality was approximately 7,200 people, but by the year 2001 the village

population was 3,787 individuals: half of pre-disaster population. Though not a perfect analogue, Santa Lucia is a demographically comparable mestizo village that was relatively unaffected by Hurricane Mitch. A comparison of the two communities highlights the large numbers of children under 15 and elderly persons above 65 present in Santa Rosa, as well as a large absence of working age populations. Many of the people that environmentally emigrated were working-age adults. This pattern partially obscures a more general set of forces that served to divide the community by class structure.

The following section will discuss the mechanisms by which this social fragmentation occurred with greater nuance. It is also important to note that by 2009 (nine years following the initial disaster) the population was approximately 3,500. In other words, the population did not return, but stayed relatively stable in the years following.

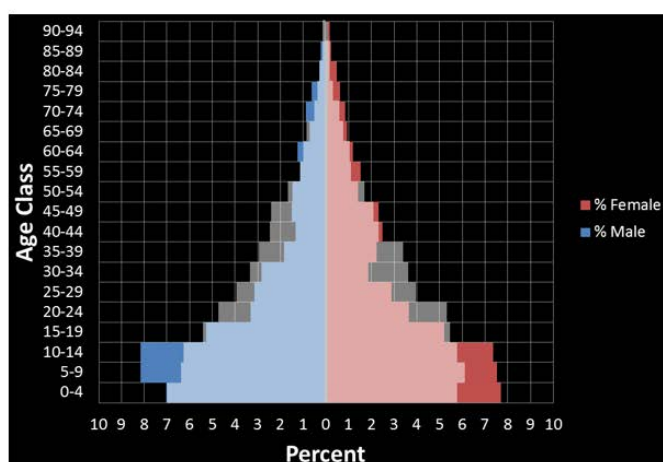


Figure 3: Population pyramid of Santa Rosa de Aguán in 2001 (2 years following Hurricane Mitch) with a population pyramid of Santa Lucia superimposed (in light grey) for comparison.

Source: 2001 National Census, Instituto Nacional de Estadísticas, Honduras

## E. Towards system re-organization ( $\alpha$ ): 'rules' for urban migration

This section reviews some mechanisms for understanding differentiated migration decisions and for understanding the effect of migration on the social fabric of impacted villages. Three observed processes in urban migration receive specific attention in this section: 'cumulative causation' of migration decisions, expanded migrant selectivity and 'network effects' of migration in states of crisis. Following an explanation of these processes, case studies of stable and unstable urban migration will be presented.

### 1. 'Cumulative causation'

The destruction of livelihoods created household needs that manifested immediately; it also shaped decisions about behaviour in the mid- to long-term. Gustavo described the basic relationship between lost resources and migration:

"Before [the disasters], almost every household had, say, five or ten cows.

With those ten cows, they would get milk, make cheese, make butter, some beef, and maybe earn a little money. The hurricane carried off almost everybody's cows. So, now you don't have milk, you don't have cheese, you don't have butter. You have to buy all of those things from somewhere else. And these people have had to make decisions. ... They bought those cattle with a loan from the bank, and after those cows were dead, the debt was still there. You still owed the bank some money. If all you had was land, then the bank took away your land. So, people ended up selling their lands, keeping maybe a tiny corner, and paying back the bank with the proceeds. The debts drove a lot of people to migrate."

The flood also covered pastures with mud and sand, so even surviving cattle had to be quickly sold or butchered. In Hernan's words:

“My cows were dead. The grass was buried in mud. I would have had to invest another great pile of money just to start my business over again. It was too much! It took generations for us to raise these businesses, and there wasn't any money. ... I wouldn't invest here. So, I will invest in other places. I'll build my businesses in other, more secure places.”

In the cases of both Batalla and Santa Rosa de Aguán, the town centres, the hub of economic and social life, were destroyed. The assets and physical capital that constituted the market centre were erased. The transport industries and infrastructure, the fish markets and processing facilities, mercantile centres, the diners, restaurants and shops, schools, community centres, churches, cottage industries, and crop land –the material bedrock, underpinning social and economic activities and determining access to resources, upon which the entire community sat - were destroyed. Selena, from Santa Rosa, summarized a sentiment expressed in many interviews:

“We had a little business selling food out of our house. It has been difficult because some of the things we lost are impossible to recover: in those times, our house was very central in the community. There were a lot of businesses. People were always passing by –they had to in order to get to the village, since our house was near the landing – so business was good.”

Victoria provides a strikingly similar analysis:

“You wouldn't believe it now, but when we lived in [Santa Rosa de]

Aguán, I had a good business. I made cured meats. I cooked and sold food, and I had a butcher shop. I would also rent rooms to people: I had a doctor from Tegucigalpa staying with me. We would cook for her. We were right in the centre, so when people would arrive to town, they would always patronise my shop. The health centre, the *colegio*, everything was right there. The boats, the busses all arrived right to that point. And we were right in the middle of it all. I made a lot of money. But I lost my business. ... Here [in the resettlement] it's not the same.... It would be hard to get into the same rhythm. So, we've had to find another economic plan, means of survival, [which includes total dependence on remittances]. ... I wouldn't think about starting that business again, because nobody has money. There aren't jobs here, so nobody has anything to spend. There isn't a city centre either. The busses just stop in the middle of the road. We don't have the right position to take advantage of it, and there aren't people that want room and board here.”

Indeed, individual losses had a collective impact and the presence of ongoing risk led people to rebuild livelihoods and invest in other safer places. This had ripple effects within villages. Roberto, formerly one of the wealthiest men in Santa Rosa, reported losing 200 head of cattle, a fortune by objective standards, he explained to me, “I was a *Don*. Now I am a nobody”. Flooding affected the assets available to Roberto for not only his own migration decision, but also for local

employment. All of his employees lost their jobs. Several respondents reported the case of Milton, who lost hundreds of cattle, sold all of his land to repay the debt and migrated without documents to the United States. “Now, supposedly, he is in New Orleans working as a mason’s assistant. He was a millionaire here with a very good position in life, and now he’s at the bottom of the stack. That happened a lot.” In the post-disaster milieu, losses to one business affected employment possibilities of others, with multiplier effects in the local economy.

In sum, migration responses are not based on individual losses; rather each individual’s losses have a cascading effect across a wider scale of social organization. One respondent elegantly stated the dilemma that many people faced, “in those first months after the storm, I would have stayed, but *everybody* was planning to leave, and so *I had to decide* to leave too.” Disturbance and migration of some people influenced the decision-making matrix of others. This important mechanism, ‘cumulative causation’, sets up a village for disassembly according to social structure.

## **2. Expanded migrant selectivity**

According to new economics of labour migration theory, migrant selectivity—the explanatory device for determining who migrates—is largely a function of the personal characteristics that allow individuals to most easily absorb the costs and maximize the benefits of migration. After material components of the system were annihilated, other non-material assets, like social networks and skill sets, allowed migrants to absorb costs and maximize benefits of migration from

Garifuna villages. Rigo explained that after displacement, “a good professional development allowed people to emigrate from the community, if they wanted to.” Individuals sampled in La Ceiba tended to be young, skilled individuals. Urban respondents reported greater livelihood specialization and more formal training, including qualifications. Among urban migrants the following livelihood activities were reported: a food quality lab technician, a factory seamstress, a construction contractor, an auto mechanic, a beautician, two school teachers, three community organizers for NGOs and several university students. Conversely, migrants within the village reported mostly subsistence livelihoods. Village ‘experts’ reported a near total and long-term emigration of young, healthy and educated villagers with remunerable skills in urban labour markets. Migrants who stayed within the village and went to resettlements were on average much older than urban migrants.

However, environmental impacts imposed a necessity to migrate, expanding migration to those individuals less able to absorb costs and maximize benefits such as: older, less healthy, less trained individuals with fewer social resources on which to draw. Urban respondents (and especially those who had been urban migrants but returned to the village) reported an increased risk of failed strategies due to an inability to absorb costs. The direst case of urban migration was an elderly woman (79 years old) from Batalla, whose daughter supported her with remittances from another large city, San Pedro Sula. ‘Sara’ was socially isolated in a dangerous neighbourhood of La Ceiba in acute poverty and she spoke

very poor Spanish. To make matters worse, she suffered from debilitating acute diabetes exacerbated by her trauma and the stresses associated with her living situation. She reported that she never would have considered moving to the city if not for the disaster. This woman, though in worse circumstances than most, is representative of a larger trend: migration of those unable to absorb costs. One community leader in Santa Rosa described what occurred as elderly people migrated into conditions of uncertainty:

“The majority of the elderly people that left here died. They left to stay with their children... They didn’t have any purpose, any friends, any community. Along comes sadness and despair. Their health deteriorated and they died. A lot of people that I knew above the age of, say, 60 that left to other places are dead. They were my friends so I heard the news of their death. Almost all of them.”

Cases like Sara’s demonstrate the unsustainability of migration strategies where the migrant is unable to absorb costs. In Dolores’s case, the entire household strategy was dependent on three incomes and when one income failed to materialize, the strategy collapsed, and the household returned back to the village.

In other cases, an inability to absorb costs exposed urban migrants to new threats. Hillary and her household migrated from Batalla to Barrio San Judas - a famously violent neighbourhood of La Ceiba controlled by a street gang - because of the inexpensive rent. Despite the mortal peril of San Judas, Hillary revealed a risk management strategy: she described

preferring the predictable and limited nature of crime over the unpredictable and devastating nature of flooding. She explained that one can take certain precautions to manage risk in the city (e.g. staying inside at night), but it is impossible to control deforestation in the watersheds, which may ultimately undermine the ground beneath one’s feet. However, other respondents, including Javier and Reina, reported becoming victims of violent assaults and break-ins. And respondents from Santa Rosa reported that one environmental migrant from the village was violently murdered after moving to the city. All migrants undergo a qualitative change in risk equation, but may inadvertently substitute one vulnerable condition for one which is even worse; the difference in environmental migration was that entire households were plunged into risk. In this sense, certain forms of environmental migration, such as moving an entire household into gang territory, had the potential to do more harm than good. In sum, environmental disturbance expands selectivity to include those unable to absorb costs and maximize benefits, including the elderly and young children, sometimes on the basis of pathological motives.

### **3. ‘Network effects’: crisis chain migration and the migration siphon**

In migration theory, opportunities for migration depend on social networks, i.e. social networks provide access to an array of resources and information that make migration possible. While this is true of environmental migration too, networks behaved differently following catastrophe in Garifuna villages. Hernan described the village in the first few months after the storm as a staging ground for migrations,

which almost always coincided with the social network.

“In those first months, everybody was planning to leave. Everybody was identifying their relatives and they were leaving to live with whomever, wherever they could. That's what we did in [Santa Rosa de] Aguán after Mitch: everyone planned their exit.”

Diego added:

“The situation was so desperate. We didn't have food. We didn't have work. There were people starving. There was pestilence all around. Whole communities left. They went to Tocoa, La Ceiba, San Pedro Sula. My mother moved from here to Trujillo, and she'll never come back. We were still here in the temporary tents, but I decided to go live with my mother.”

Initially, “everyone left Aguán because we no longer had houses here. There were some people that went to Ceiba to stay with their families. Others went to Trujillo always staying with family members.” In many cases, respondents reported families ‘sending for’ their relatives. “Some people that have family in other countries left to those countries, some left to La Ceiba, others to other cities. Their families sent for them.” In general, migrants self-selected towards available resources, which were generally made available through kinship networks. Perfecto, from Batalla, articulated a strain expressed time and again in interviews: those that migrate internally “stay because they don't have the means to survive in the city –because you have to rent a room and there are many expenses. They stay in the village

because there is more [economic] comfort and ease in the village to cultivate and share with your family and neighbours.” Conversely those that emigrate have the support of family “that were already living in the city that could sustain them [economically].”

Chain migration is one of the primary enabling mechanisms related to networks. For example, Cecilia described her daughter's urban migration immediately following Hurricane Mitch, “My oldest was in *colegio* and [after the storm] she left to Tegucigalpa ... to continue studying and working. She helped her younger siblings finish school, too. After they finished primary school, they went to Tegucigalpa to live with her” to continue their studies. Access to urban migrants within the immediate social network became a principal pathway for migration. Carolina explained that after the disasters, “We had to search for help by means of anybody who would help. You start asking everyone for help, and [on that basis] some people went to the city.” Rigo observed that:

“All of those people who left to the city had friends in those places, in Ceiba or in the States. As we say in the village, ‘Those closest to you come first.’ Let's take Clelia, for example, if she goes to the city, she has her sister and her two cousins with whom she could stay. She's has two daughters in the States that could help her pay for a room. She's got that option. If her daughters say, ‘get out of there’ she'd have a way to leave.”

However, respondents also explained a type of ‘crisis chain migration’ for



environmentally displaced persons. The catastrophic nature of the displacement expanded migrants' capacity to draw on their social network for assistance. Following displacement, respondents reported contacting extended household members, discussing alternatives and establishing temporary plan. Impacts evoked empathetic emergency responses from within the social network that release the availability of material benefits from those that would not normally contribute to the household economy, i.e. "you can stay with me until you get back on your feet." Established urban migrants, instead of facilitating remittance sending in prospective migrants, facilitated other goals of their displaced relatives: personal safety, risk reduction and adjustment to losses. For example, Nicola's original urban migration proceeded thusly:

"At the time of Mitch, I had a half-brother here in La Ceiba. He was very concerned about me from the news they relayed him about [Santa Rosa de] Aguán. He found a friend of mine in La Ceiba and ... he gave her money so that she could travel to [Santa Rosa de] Aguán to see how I was, and so she could bring me to La Ceiba. ...Not even a month later I was here in La Ceiba. I came but, I would frequently go back to [Santa Rosa de] Aguán because my grandmother was still there with my cousin, and Grandma refused to leave. It was a problem. So I needed to keep going back to [Santa Rosa de] Aguán until I finally convinced Grandma to leave with us."

Nicola's half-brother actively sponsored Nicola's urban migration because of his concern for her safety and in turn, Nicola

sponsored her Grandmother's urban migration. Nicola observed that she had planned for her cousin's migration, if environmental conditions continued to worsen in the village. However, as Anita also pointed out, respondents reported that resources made available through people's empathy became exhausted quickly.

"Say you have a cousin who gives you money one month: they reach a point that they don't want to help anymore. People love you more when you don't annoy them! But if every time you see your cousin, you're asking him for money, he'll start to avoid you. He won't come by to see you anymore. That's what has happened to us."

Environmental disturbance rapidly shifted the nature and value of the social network itself, in other ways too. For example, a critical mass of individuals from the same impacted village may deploy similar migration strategies to similar destinations, expanding the migrant network in those destinations from which other migrants may draw. Javier, Diego, Hernan and Eddie's experiences illustrated a tendency of synchronising individual migration strategies in order to reduce the costs.

As community members emigrated, whole networks changed instantly, straddling multiple places, in effect, strengthening the 'network effect' and thereby increasing pre-disposed individuals' capacity to deploy a migration strategy. The shifting network changed the nature of social capital in both the migration sources and destinations. Respondents reported that this network effect was so powerful that it drew non-displaced individuals to new destinations as well, like a demographic

siphon. One illustrative young man (aged 20) from Batalla moved to La Ceiba after the disaster and never returned and yet his household was relatively unaffected by flooding. His reported decision to migrate hinged on the fact that several young men his age had been displaced and were migrating to La Ceiba. He attributed his decision to “come with his friends” rather than to recover losses, reduce risk or cope with anxiety. This migration siphon is one social aspect of the social-ecological regime shift that may occur following catastrophic impacts. In sum, displacement and urban migration changes the conditions under which the social network operates, creating conditions for new forms of chain migration.

#### **F. Stable and unstable urban domains: Two case studies of urban environmental migration**

##### **1. Case one: Stable urban domain**

In addition to sitting for an interview, Informant 4 later became a research assistant in La Ceiba and a key informant. His case represents a ‘successful’ urban migration to a stable domain. Though urban migrations do not always result in stability, this case illustrates interaction of expanded selectivity, cumulative causation and network effects work in the unfolding of a stable urban environmental migration strategy.

##### **(a) Cumulative causation**

With Hurricane Mitch, Informant 4 lost his cattle and his house. Informant 4 was one of the protagonists in the rescue effort of 39 people who were trapped on the sinking islands in Lado Pequeño. Thus, he witnessed their tragic deaths, including deaths of beloved friends and relatives. He

described a complex set of conflicting motivations for his environmental migration and in this respect, he is not unusual: he described psychological motives of trauma, depression, social strife and food insecurity; economic motives, which juxtaposed a lack of employment opportunities in the village with an employment opportunity as a builder’s assistant with his brother-in-law in La Ceiba; and socio-cultural motivations of finding a wife and starting family outside of his sad, disaster-cloven village. Furthermore, Informant 4 felt the economic draw of an entitlement to a resettlement house near the village, but soon after arriving to the city, he realised his economic prospects were better there. It should be underscored that he lost his own livelihood and at the same time alternative sources of livelihoods vanished, i.e. “after Mitch there were no jobs in [Santa Rosa de] Aguan.” To put a finer point on the significance of cumulative causation in Informant 4’s decision, he reported that he no longer felt the desire to stay in his village because all of his friends had left too.

##### **(b) Expanded migrant selectivity**

When Informant 4 migrated to La Ceiba he was 23 years old, not any younger than a typical urban migrant from his village. Although, at that time of the disaster Informant 4 did not possess the resources to invest in an urban migration, when he arrived, he was physically healthy and a skilled builder. Informant 4 was raised speaking Garífuna to his mother and Spanish to his father and thus he acquired fluency in Spanish, an indispensable skill in urban labour markets. His father was a prominent cattle rancher in the area and eventually became the mayor of the

municipality of Santa Rosa, hence Informant 4 also learned the business of ranching at an early age. When Mitch struck, Informant 4 was well on the way to establishing himself in Santa Rosa: he owned his own house, had a girlfriend and an infant daughter, and had acquired a small herd of cattle. Informant 4 reported that in the days before Mitch, “I would come to La Ceiba on holiday with my brothers, but my mind was still back in Santa Rosa because I had a little herd and work to do! I had never thought of moving to the city in that time.” Informant 4 never would have selected migration if Hurricane Mitch had not displaced him.

Informant 4’s urban migration hinged on his ability to absorb costs. One of the most significant costs was the substitution of the village economy based on reciprocity with the monetized city economy.<sup>1</sup> Migrants that thrived were, like Informant 4, able to adapt to the monetized “system of life.” Informant 4 described his process of acclimatization to the monetized economy:

“Sometimes I hear people in the village say, ‘in the city, it’s too difficult. It’s too expensive.’ They have a certain mentality. I used to think the same way. I would say, ‘But how do my siblings live in the city? They have to pay rent and bills and food and electricity and everything.’ See, when I lived in the village, we created our own food. We would only buy condiments maybe... But meat, fish, staples? We went to the fields for that. We never ever rented. Before Mitch, I had never paid rent because I had built my own house! ... I never worried

about money. Despite not having money, you live well in the village. ... And when I moved here, I thought, ‘how am I going to do this? Now I have to pay for this and that!’ I had to settle in with a disposition of working hard and honourably. ... At the beginning it affected me because I wasn’t used to this type of life. ... At the end of the month, I would have to pay the bills, and initially, I didn’t want to, but I had to. ... Eventually I became accustomed: this is for the house, this is for food, this is for this, that and the other. I did it little by little until I became accustomed. ... Now I’ve got everything in the city –friends, family, a job, everything.”

Young, healthy migrants were not the only ones to adapt in this respect. Paula, a 75 year-old woman, credits her ability to adjust to her personal acquaintance with the urban “system of life,” which she gained during the course of many years, visiting and living in La Ceiba for short periods of time. Paula shared this element –prior experience—with all of the elderly villagers, as well as many younger villagers, that have managed to adjust to life in La Ceiba.

### (c) Network effects

The mechanism that guided Informant 4’s migration was crisis chain migration, as with many urban migrants to La Ceiba. At the time of his migration, Informant 4 merged into his sister’s household, by her invitation. He possessed only one change of clothes. For six months, he slept atop cardboard boxes on the concrete floor of his sister’s living room and worked as a builder, prioritizing purchases (i.e. first, he

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<sup>1</sup> For further reading on *mutualismo*, see Jenkins (1983).

bought another change of clothes, then, new shoes, etc.), as well as contributing to his sister's expenses. In Informant 4's case, his affiliation with an evangelical church represented a valuable social network, which led to a series of lucrative construction contracts that assisted his permanent livelihood stability in La Ceiba. After a year and a few months, Informant 4 rented a small house with three of his siblings from Santa Rosa. His successful urban migration facilitated the chain migration of other siblings from the village. Informant 4's case illustrates the interaction of network effects and selectivity. As Anita suggested, "it's not so easy to live in the city, so those who live in the city have some way of making ends meet. Either a family member or they know a trade." Informant 4 had both going for him. Valuable wage earners, like Informant 4, reported fewer problems adapting.

The particular configuration of Informant 4's urban migration placed him in a stable urban domain. Within a year, he had become actively engaged in a local evangelical congregation, where he met his eventual wife and by then all motivations to return to the village had vanished. At the time of his interview, Informant 4 was a 35 year-old building contractor, living with his wife and three children in a small apartment in the heart of the culturally ebullient Garifuna neighbourhood of La Isla, La Ceiba. His family was very active in a local evangelical Christian church. Between his neighbours and his church, Informant 4 reported having a strong social network. He and his wife were planning to buy a larger house in a suburb of La Ceiba. For Informant 4, the urban domain has

been stable, but urban migration strategies are not always successful.

## **2. Case two: Unstable urban domain**

"Sara's" case is illustrative of an unstable urban migration. At the time of the interview, she was a 65 year old single female living in a resettlement community, La Loma, near Santa Rosa. Following her displacement in Hurricane Mitch in 1998, she spent eight years living in the regional urban centre La Ceiba. She was living in an elaborately renovated resettlement home, engaged in subsistence agricultural activities and received regular remittances.

### **(a) Cumulative causation**

After her displacement, Sara moved in with her sister, who also lived within the impacted village. Her sister had lost her crops too and food insecurity became a looming problem. Furthermore, Sara had previously depended on the reciprocal economic system of the village, which allowed her to obtain food by helping people with their subsistence agricultural activities. However, since many people had lost their crops, this was no longer a dependable strategy. Furthermore Sara had cash resources to pay for an urban move: she had saved approximately \$4000USD, which she immediately decided to deploy in a migration strategy to La Ceiba, rather than reinvest it in the village. In sum, her motivation to migrate was not linked to others' migration, but rather economic losses and opportunities.

### **(b) Expanded selectivity**

Sara had seen people drown, had lost family members, and was traumatised and showing symptoms of clinical anxiety (moodiness, stress, insomnia and hyper-vigilance). She felt a psychological

compulsion to leave the village. As in the cases of Lorenzo, Sara, Dolores, Hillary and others, psychological orientation vis-à-vis environmental devastation shaped a preference for urban migration: an ‘anywhere-but-the-village’ attitude. Nevertheless, she was physically unwell, advancing in age, spoke Spanish poorly and possessed few remunerative skills in the urban labour market. In the city, Sara totally relied on remittances that her daughter sent from the United States. She moved into a dangerous area and ultimately reported the forced entry of armed thieves into her home in Barrio La Isla. Eventually she became more anxious about urban crime than flooding in the village.

### **(c) Network effects**

Sara relied on her social network from the village in the city, many of whom had been displaced and migrated together. Many urban migrants reported a disarticulating effect on social networks, which Sara described in La Ceiba:

“While I was in La Ceiba, I had plenty of family, friends, acquaintances [who were displaced] from Santa Rosa de Aguán. Yes, because a lot of people moved there. Tons of people! ... Everybody moved there, and yes, I spent time with them. ... Well, I really only saw one old friend. It’s because the rest lived far away. One lived in [my neighbourhood], another in [in a distant neighbourhood], and another way out [on the other side of the city]. ... We would try to get together on Sundays, so sometimes I would see them. Others I would see randomly when I was running

errands. We would talk about fleeting things: about our lives. Sometimes we mentioned what had happened (the disaster). ... ‘Look, now, we’re all separated, while we used to be all together!’ we would say. That’s how God wanted it. Or maybe the Devil, who knows.”

The effect of this geographical separation was dissolution of a type of ‘bonding’ social capital that provided material benefits in the village. Sara lived preventatively far away from most people that could provide resources but regardless, resource sharing was no longer an expectation as it had been in the village. Urban migrants like Sara unanimously reported that no resource sharing occurred with new urban neighbours. This was cited as the primary challenge to urban life and a strong motivator for return migration to decimated villages. Social capital was part of the reason for the urban domain’s shallowness.

Moreover, Sara’s daughter’s empathetic willingness to support her with remittances eventually diminished. Respondents like Sara, who both depended on remittances and rented accommodations, reported a higher likelihood of return migration to the village. Urban migration strategies that required a remittance sender became economically unsustainable when relatives grew “tired of remitting”. In the end, her social network could not support her in meeting her financial obligations and the social isolation eventually drove her back to the disaster-cloven village.

### **G. Discussion and conclusion**

Migration is a signal of changing habitability. Not all people move alike, however, differentiated forms of

migration, like urban migration, follow general identifiable 'rules'. The 'rules' that govern migration identified in this paper depend on resilience in social networks, when modes of habitation and livelihoods are not. In general, social networks provide the primary opportunities for the assortative behaviours that distinguish mobility types. Social networks respond to disturbance, expand the availability of resources for migration decisions, and create conditions for migration chains that function differently in crisis. As shown, even households and individuals that were not directly affected emigrated because of the effect of disturbances on the system. Citing the example of young Freddie: he left after the disaster and never returned, despite his household being relatively unaffected by flooding. He attributed his decision to "come with his friends" whose households had been displaced and were moving to La Ceiba.

However the 'disassembly' of communities according to social networks has important implications for environmentally disturbed communities. Julio described the effect of this demographic shift as young people left toward international and urban destinations:

"That storm provoked a lot of migration to the city, and to the United States. The problem is that [displacement and migration] is provoking weakness, an ageing of our towns because the people aren't building in their hometowns. People of productive age are building their new homes outside of their hometowns, and economically, this is debilitating their municipalities. Migration affects the whole town."

Like catastrophic flooding, migration itself was part of a cascading social-ecological regime shift and reinforced class divisions between relatively wealthy and the poor.

Urban migration, while conferring resilience to one set of people, undermined resilience of another. Following disasters, emigrants included those that were less able to absorb costs and capitalize on benefits: elderly, sick, unskilled and non-Spanish-speakers. Because displaced people had lost assets, homes and livelihoods, their migration strategies were made in the context of diminishing alternatives for adaptation. As a result, investing scarce resources in urban migration strategies, some respondents reported increasing risks that migration strategies would become unsustainable, i.e. would not achieve the goals of stabilizing livelihoods and modes of residence. These migrants had to reformulate and invest in other adaptive strategies, prolonging the search for stability.

Some attention has been paid to the human-to-nature relationships that accompany system shifts, e.g. loss of access to land and loss of access to water resources (Robson and Berkes, 2011; Wrathall, 2012). However, less attention has been paid to cascading transformations in human-to-human relationships that occur in the process of state shifts. Migration is one process of social transformation where there is room to develop research on cascading shifts. Social-ecological resilience provides an important theoretical and methodological bridge between social and natural sciences to facilitate this kind of research.

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Livelihoods are the lattice upon which all human organization hangs, and some of the worst-case scenarios of global change – displacement, migration, conflict and famine – all centrally concern the problems that people face in sustaining productive livelihoods.

The 2013-2014 Resilience Academy is a group of 25 international researchers and practitioners who have recognized that dangerous global change is a threat to the livelihood systems of the world's poor. The Academy met twice, in Bangladesh and Munich, Germany, and developed a set of working papers as an evidence base for the concepts and practices that we, as a cohort of colleagues, propose for addressing this pressing challenge.

