Fordham Environmental Law Review

Volume 20, *Number* 2 2017 *Article* 3

On the Origins of Environmental Migration

Robert A. McLeman*

*University of Ottawa

ON THE ORIGINS OF ENVIRONMENTAL MIGRATION

*Robert A. McLeman**

In recent years, policymakers and the media have paid increasing attention to the subject of environmentally-related human migration. The Intergovernmental Panel on Climate Change (IPCC), the Stern Report on Climate Change, the Global Environmental Outlook and similar studies have all expressed concern that environmental degradation and resource depletion, exacerbated by the impacts of anthropogenic climate change, may lead to wide-scale displacements of human populations around the globe.[1] Notwithstanding the growing discussion of this subject, scientific understanding of the relationship between the environment and migration is still very much in a developmental stage.

The present article reviews how environmental factors, changes and events (particularly those linked to anthropogenic climate change) influence migration decisions and behavior. The focus is on migration decision-making at the household level, for it is here that most migration decisions are typically made.[2] There are examples of state-initiated relocations of populations in response to environmental

---

* Robert McLeman, Associate Professor, Department of Geography, University of Ottawa. PhD in Geography, University of Guelph; M.Sc. University of Hong Kong; BA, University of Western Ontario. Dr. McLeman conducts ongoing research into the vulnerability, adaptation and migration responses of households and communities to climate and environmental change in a variety of regions. He would like to thank the organizers of the *FELR* and Symposium for their assistance.

1. NEIL ADGER ET AL., INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *Summary for Policymakers*, *in* CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY 9 (M. L. Parry et al. eds., 2007); NICHOLAS STERN, THE STERN REVIEW: THE ECONOMICS OF CLIMATE CHANGE, at iv (2007); UNITED NATIONS ENVIRONMENT PROGRAMME, GLOBAL ENVIRONMENTAL OUTLOOK 4: ENVIRONMENT FOR DEVELOPMENT 86-87, 209-10 (4th ed. 2007).

2. *See* R. McLeman & B. Smit, *Migration as an Adaptation to Climate Change*, 76 CLIMATIC CHANGE 31, 31-53 (2006).

factors, but these are small in proportion to the broader scale of global migration.[3] By understanding the context in which environmental migration originates, it is possible to better gauge the reliability of future scenarios, which project climate change to become a driver of millions of environmental migrants/refugees in coming decades.[4] It is particularly hoped that this article will be of assistance to legal scholars, who are becoming increasingly engaged in issues related to the protection of environmentally displaced persons, eco-migration, and environmental refugees, as well as in the creation of programs and policies to build adaptive capacity in developing regions and in creating institutional frameworks for mitigation of greenhouse gas emissions pursuant to the United Nations Framework Convention on Climate Change (UNFCCC).

I. THE SPECTRUM OF ENVIRONMENTAL INFLUENCES ON HUMAN MIGRATION

There is a wide spectrum of interactions between humans and the environment that can potentially influence migration decisions and behavior, a spectrum that is heavily influenced by the nature of the environmental conditions, events or changes in question; the time-scale over which these conditions emerge or occur; and, the time-scale over which migration responses occur.[5] Some environmental conditions can be beneficial to human livelihoods and well-being, and thereby be seen as a positive attraction for migrants to particular locales; other environmental conditions can have adverse impacts on livelihoods and well-being, and thereby act as stimuli for people to leave, or in the worst cases, flee particular locales.[6] There are many

---

3. *See id.* at 37.

4. For some recent examples of such forecasts, see Norman Myers, *Environmental Refugees: A Growing Phenomenon of the 21st Century*, 357 PHIL. TRANSACTIONS OF THE ROYAL SOC'Y BIOLOGICAL SCI. 609, 612 (2002); CHRISTIAN AID, HUMAN TIDE: THE REAL MIGRATION CRISIS (2007). For an earlier review of such forecasts, see Robert McLeman, *Climate Change Migration, Refugee Protection and Adaptive Capacity-Building*, 4 MCGILL INT'L J. OF SUSTAINABLE DEV. LAW AND POLICY 1, 4 (2008).

5. *See* McLeman & Smit, *supra* note 2, at 32-33.

6. Influences on human migration decisions have often been cast in terms of "push" and "pull" factors following the model described in Everett S. Lee, *A Theory of Migration*, 3 DEMOGRAPHY 47, 49-54 (1966). While the discussion that follows is consistent with push-pull logic, it is considerably enhanced and

time-scales over which changes in environmental conditions and events occur. Conditions known to influence human migration can occur suddenly (e.g. earthquakes, tsunami, volcanic eruptions, tornadoes, flash floods) or may take years to emerge or accumulate and become fully recognized (e.g. drought, soil erosion, forest loss).[7] Human responses to such changes also occur across various time-scales, and may be initiated in anticipation of or in response to, environmental stresses.[8] Within this context, environmental migration may be undertaken on a temporary basis (as an *ad hoc* response or as a systematically repeated one such as seasonal labor migration); in the form of a long-term circular pattern of movement (such as where individuals migrate for part or all of their working lives but retire to the place of their childhood); or on an indefinite basis, with migrants never returning to their place of former residence.[9]

This spectrum of environmental outcomes is illustrated in Figure 1, in which duration of the migration event is represented on the horizontal axis and the nature of the environmental stimulus is on the vertical axis. The four quadrants that are created represent four possible types or outcomes of environmental migration, with an example named for each. The two quadrants above the vertical axis reflect the potential migration outcomes where environmental conditions are beneficial or attractive to human population growth. The upper right-hand quadrant describes migration undertaken on a permanent basis to take advantage of favorable environmental conditions. As an example, in recent years, the fastest growing populations in the U.S. have been the Sun-belt states.[10] Much of this growth is fuelled by migration from elsewhere, and among those

expanded. *See generally* McLeman & Smit, *supra* note 2 (providing a detailed review of migration theory as it applies to environment-related migration).

7. *See* McLeman, *supra* note 4, at 7.

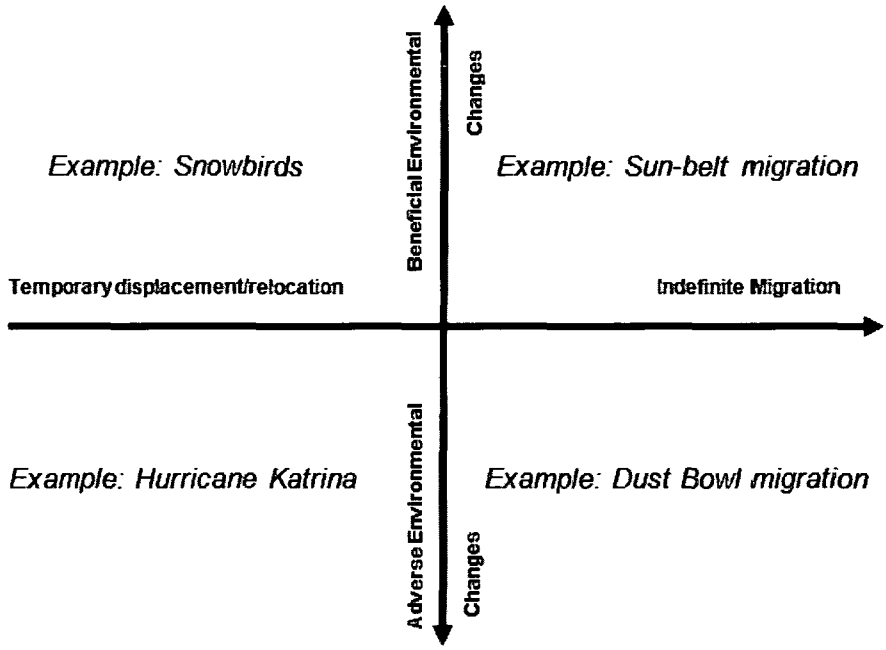
8. *See id.* at 4-5.

9. *See* Myers, *supra* note 4, at 609-10.

10. U.S. CENSUS BUREAU, CUMULATIVE ESTIMATES OF POPULATION CHANGE FOR THE UNITED STATES, REGIONS, STATES, AND PUERTO RICO AND REGION AND STATE RANKINGS: APRIL 1, 2000 TO JULY 1, 2008, 1-2, *available at* http://www.census.gov/popest/states/NST-pop-chg.html. The 2008 U.S. Census show the five states with the highest population increase in absolute numbers from 2000-2008 are, in order, Texas, California, Florida, Georgia and Arizona. Together these states have grown by almost 12 million people this decade, a figure roughly equal to the entire population of the state of Ohio. *Id.*

migrants are many retired and semi-retired former residents of the northeastern and midwestern states attracted by the year-round mild climate. Each winter, they are joined by many more "snowbirds"; that is, people who maintain their nominal permanent residences in more northerly states or in Canada, but who spend the winter months each year in the south or southwest. This latter group is captured in the upper left-hand quadrant.

Figure 1: Four categories of environmental migration



The lower half of Figure 1 captures the opposite side of the environmental impact spectrum, where environmental conditions (or changes in those conditions) have negative or potentially negative effects on livelihoods and well-being.[11] The lower left-hand quadrant

11. This article was composed in relation to the Fordham Environmental Law Review's symposium, Global Responses to Eco-Migration and Environmental Disasters: The Role of U.S. and International Law and Policy. The symposium was concerned primarily with questions pertaining to migration that occurs under adverse environmental conditions, and so the remainder of this article and the examples used will focus principally on the lower quadrants of Figure 1. Although American examples have deliberately been selected to illustrate Figure 1's categorization of environmentally related migration, many more examples from each category could easily be identified on all continents inhabited by humans.

describes short-term or temporary migration in response to adverse environmental conditions. Flight from natural disasters falls clearly within this quadrant, and would include such examples as evacuations that have been carried out in recent years in the face of hurricanes and tropical storms along the Atlantic and Gulf of Mexico coasts and in response to dryland fires in California. The lower right quadrant describes long-term or indefinite migration of households away from regions of adverse environmental conditions. The best-known and likely the largest of these in U.S. history is the 1930s Dust Bowl migration, when a period of persistent drought conditions combined with economic hardship of the Depression years to lead hundreds of thousands of Americans to leave the Great Plains states.[12]

An important observation to be made is that these categories of migration are not mutually exclusive. A single environmental event or condition can lead to multiple migration outcomes. Hurricane Katrina, for example, led to a large-scale evacuation of much of the population of New Orleans and surrounding Gulf Coast communities.[13] After the storm hit and the city's flood defenses failed, many more who had remained behind (through choice or lack of transportation) needed to be relocated. In the years that have since followed, the city has regained about two-thirds of its former population (Figure 2).[14] It is doubtful that all those who live in New Orleans today were residents prior to Katrina. It may well be that the post-hurricane reconstruction has attracted new workers to New Orleans, and so the number of people who have not returned since Katrina might actually be greater than the census data would suggest. A point to be observed here is that post-Katrina migration patterns

12. *See* JAMES N. GREGORY, AMERICAN EXODUS: THE DUST BOWL MIGRATION AND OKIE CULTURE IN CALIFORNIA, at xiii-xiv (1989); Myron P. Gutmann et al., *Two Population-Environment Regimes in the Great Plains of the United States, 1930–1990*, 27 POPULATION & ENV'T 191, 192, 199, 218 (2005). *See generally* Robert McLeman, *Migration Out Of 1930s Rural Eastern Oklahoma: Insights for Climate Change Research*, 26 GREAT PLAINS Q. 27 (2006).

13. *See* Joseph B. Treaster & Abby Goodnough, *Powerful Storm Threatens Havoc Along Gulf Coast*, N.Y. TIMES, Aug. 29, 2005, at A1.

14. *See* U.S. Census Bureau, City Population Datasets (2008), *available at* http://www.census.gov/popest/counties/files/CO-EST2008-POPCHG2000_2008-22.csv

around New Orleans likely sprawl across both left-hand quadrants of Figure 1, and possibly across all four quadrants to some extent.

Figure 2: Population, Orleans Parish, LA[15]

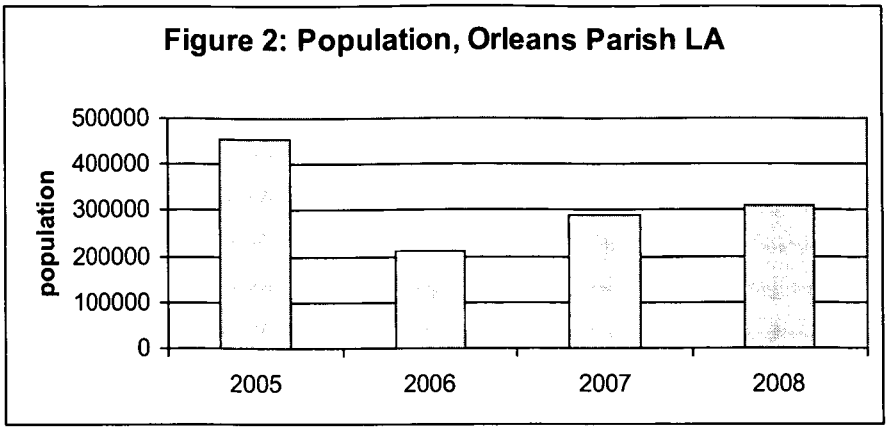


Figure 1 categorizes environmentally related population movements, but offers no information in terms of causation. In the example of the 1930s Dust Bowl migration, chosen to illustrate the upper left quadrant, while hundreds of thousands of Americans fled the drought-stricken Great Plains, many more did not. Migration was not the only means by which people responded to the droughts of those years.[16] Similarly, while many Americans today elect to retire to the Sun-belt states, they represent but a fraction of America's ever-aging population. It is also notable that in many of America's Sun-belt states, such as Arizona, Nevada, and the Gulf Coast states, rapid population growth is a relatively recent phenomenon. For much of the post-Civil War era, American population growth was concentrated in the midwest, northeast, Texas and California. The "Great Migration" period of the first half of the twentieth century saw millions migrate out of the rural south for economic opportunities in the urban centers to the north.[17] Clearly then, it is important to

15. *Id.*

16. *See* Robert McLeman et al., *Drought Adaptation in Rural Eastern Oklahoma in the 1930s: Lessons for Climate Change Adaptation Research*, 13 MITIGATION & ADAPTATION STRATEGIES FOR GLOBAL CHANGE 379, 387-92 (2008) (detailing the rural adaptation strategies in the1930s).

17. *See* Stewart E. Tolnay et al., *Distances Traveled During the Great Migration: An Analysis of Racial Differences Among Male Migrants*, 29 SOC. SCI.

remain aware that the environment-migration relationships shown in Figure 1 are necessarily nested within the much larger, broader set of social, economic, and cultural processes at work in society that also influence migration behavior.

II. THE REASONS BEHIND ENVIRONMENTAL MIGRATION

Trying to uncover the reasons behind environmental migrations raises many challenging questions. For example, droughts are a recurrent phenomenon on North America's Great Plains; rarely does the period of a decade or two pass without a period where precipitation declines sharply causing significant financial losses in the regions agricultural sector.[18] Yet why is it that some droughts have led to widespread migration while others have not? Why did hundreds of thousands flee the Great Plains during the 1930s, while equally severe droughts in the 1970s and late 1990s had less influence on migration patterns? Research has shown that the 1930s migration was not a random exodus of drought-stricken farmers, but that out-migrants disproportionately constituted young families drawn from particular socio-economic classes.[19] Why is it then that particular groups fled the droughts while other social groups stayed on? What distinguishes migrants from non-migrants in such situations?

The Katrina example raises still more challenging questions. While 150,000 people have not returned to New Orleans, it is in some ways remarkable that so many more did return (or move there from elsewhere), for that city is just as vulnerable today to hurricanes as it was in 2005. And it is inevitable that another hurricane will strike New Orleans, it is only a question of when. Why is it that some

---

HIST. 523, 523 (2005). Although the term "Great Migration" is often applied to the movement of African-Americans out of the South, this era saw the migration of rural poor of many racial origins migrating along similar patterns. *See id.* at. 523-524.

18. *See* David J. Sauchyn et al., *A Paleoclimatic Context for the Drought of 1999–2001 in the Northern Great Plains of North America*, 169 GEOGRAPHICAL J. 158, 158, 161-63 (2003). In fact, researchers have suggested that the twentieth century was likely a wetter-than-average period on the Great Plains as compared with the long-term climatological record. *See id.*

19. *See* sources cited *supra* note 12.

people leave and never return, while others immediately begin rebuilding in the same place as soon as possible?

In more general terms, these examples show that environmental conditions sometimes influence human migration patterns but at other times do not, and that a single environmental event can produce very complicated migration patterns. Environmental migration is clearly therefore not a simple cause-effect, stimulus-response type of phenomenon. To understand it and its inherent complexities requires an appreciation of the biological, chemical, geological and physical processes that shape environmental conditions AND an understanding of social, economic, cultural and similar systems and processes that shape human society and human behavior.

III. ENVIRONMENTAL STIMULI FOR HUMAN MIGRATION

The types of environmental forces that are most commonly associated with human migration fall into two general categories: sudden-onset events and slow-onset changes in environmental conditions.[20] *Sudden-onset events* are those that emerge over short periods of time, such as tornadoes, earthquakes, hurricanes, floods, tsunamis, wildfires and extreme wind, rain or snow events. In some instances, they occur with little or no warning, such as tornadoes or earthquakes; in others, communities at risk may get advance warning of an event such as a flood, storm or hurricane. Such events are characterized by the potential for considerable damage to infrastructure, property and carry with them the risk of loss of life. The duration and geographical scale of such events varies from brief and localized (e.g. tornadoes), to the many days and vast regions across which the effects of a single hurricane may be felt. A given type of sudden-onset event is often associated with particular locations, such as floods with river valleys and hurricanes with the U.S. Atlantic and Gulf of Mexico coasts. Some events may occur centuries apart, such as earthquakes along a given geological fault, while others such as tornadoes and hurricanes occur every year, and the only uncertainties relate to their specific numbers, paths, and magnitudes.

---

20. This distinction between sudden-onset events and slower-onset conditions traces back several decades of research in natural hazards to authors such as IAN BURTON ET AL., THE ENVIRONMENT AS HAZARD 23(1978).

Sudden-onset events are therefore often associated with distress migration, where those exposed may attempt to flee before the event occurs, or may be obliged to evacuate after the event due to the damages that result. Conversely, population movements are typically not among the initial responses to *slow-onset conditions*, such as droughts, land degradation or oscillations in precipitation patterns, which may emerge over the course of years, last for extended periods of time, and influence vast regions. Because climatic conditions are inherently variable both intra- and inter-annually, it may be some time before human populations recognize the full severity of the event. For example, fluctuations in precipitation from one year to the next are common in many agricultural regions, and farm operators typically develop a range of strategies to minimize the impacts of such variability on farm incomes. This capacity to adapt to climatic variability is finite, and when precipitation deviates from the expected range for multiple successive years, response options may become exhausted. It is at that point where migration, such as that on the Great Plains during the 1930s, becomes a preferred adaptation response.

Both sudden-onset events and slower-onset changes in conditions are expected to increase in frequency in coming decades. Table 1 provides a brief summary of the most likely exacerbations of existing climatic conditions and events identified by the IPCC. These do not include phenomena such as rapid increases in mean sea levels and changes in ocean circulation patterns, which have also been identified as potential risks associated with climate change.[21] Much of the uncertainty about the likelihood of these latter events occurring and/or their rate of onset is due to our inability to forecast future levels of greenhouse gas emissions and uncertainty as to how Earth systems will respond to elevated atmospheric concentrations of greenhouse gases. There is no reason to expect that earth systems will react to anthropogenic modification of the atmosphere in a predictable fashion or that changes will be incremental in nature. On the contrary, changes may occur in a non-linear fashion, and so we must accept the very real potential for climate "surprise", a situation where past knowledge and understanding of earth systems behavior,

---

21. RICHARD B. ALLEY ET AL., INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *Summary for Policymakers*, *in* CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS 5 (S. Solomon et al. eds., 2007).

and consequently the impacts on human well-being, are no longer applicable.[22]

Table 1: Expected impacts of anthropogenic climate change[23]

Expected change	**Regions to be affected**
Increases in annual average river runoff and water availability	High latitudes and some wet tropical areas
Decreases in annual average river runoff and water availability	Mid-latitudes and dry tropics
Increased extent of areas affected by droughts	Regions already susceptible to drought
More intense precipitation events	Will vary by region
Reduce water availability in regions dependent on Mountain snowmelt	South Asia, China, western North America, western South America
Increasing number of plant and animal species at risk of extinction; increased potential for significant ecosystem disturbances	Globally
Decreasing crop productivity; more frequent impacts of drought and floods on crop production	Lower latitudes, dry tropics, seasonally dry regions
Increased risk of erosion; millions more people exposed to flooding and extreme storms	Coastal regions, especially those already exposed to such risks

The Dust Bowl migration and migration responses to Hurricane Katrina are only two of many examples of environment-related population movements in living memory. One of the more familiar examples from abroad is the case of Bangladesh, where floods and storms in recent decades have displaced hundreds of thousands per event.[24] Another is that of Hurricane Mitch, which in 1998 led to the displacement of hundreds of thousands of Hondurans from their

---

22. D. G. Streets & M. H. Glantz, *Exploring the Concept of Climate Surprise*, 10 GLOBAL ENVIRONMENTAL CHANGE 97, 97 (2000).

23. ADGER ET AL., *supra* note 1, at 11-12.

24. *See generally* Rafael Reuveny, *Ecomigration and Violent Conflict: Case Studies and Public Policy Implications*, 36 HUM. ECOLOGY 1, 5 (2008) (noting that "12 to 17 million Bangladeshis have migrated to India" since the 1950s).

homes.[25] Many migrated to neighboring countries, and the United States Immigration and Naturalization Service (as it was then known) created a special program for those unable to return to Honduras, a program that has since remained in effect. In China in 1998, floods along the Yangtze River displaced an estimated 14 million people; it is not known how many of that group returned to their homes and how many migrated away from the flood-affected region.[26] Several countries in East Africa have experienced drought-related population displacements from semi-arid rural areas in recent decades (one is occurring in Kenya at the time of this writing in 2009), while in Sudano-Sahelian West Africa rural populations have adopted an institutionalized, circular pattern of seasonal intra-regional migration, something Rain describes more vividly as "eating the dry season".[27]

These and other known environment-related migrations pale considerably in comparison with the estimates being made for future environmental migration, which are heavily influenced by worries about the implications of climate change. One popular estimate suggested by British ecologist Norman Myers, projects there may be 200 million 'environmental refugees' worldwide by the end of the 21st century.[28] On the UN Day for Disaster Reduction in 2005, the United Nations University's Institute for Environment and Human Security issued a press release that predicted 50 million

---

25. Saul S. Morris et al., *Hurricane Mitch and the Livelihoods of the Rural Poor in Honduras*, 30 WORLD DEVELOPMENT 49, 53 (2002).

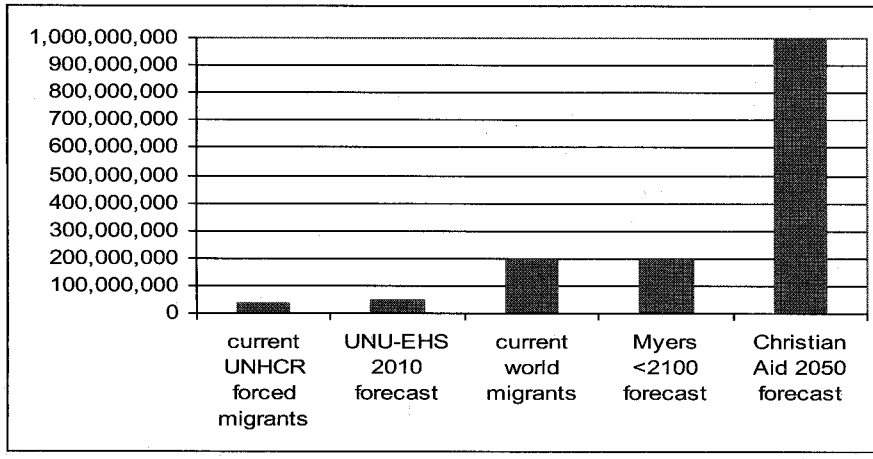
26. Great Wall Across the Yangtze, http://www.pbs.org/itvs/greatwall/dam1.html (last visited Oct. 5, 2009).

27. For examples of related research, see DAVID RAIN, EATERS OF THE DRY SEASON: CIRCULAR LABOR MIGRATION IN THE WEST AFRICAN SAHEL (Westview Press 1999); Oli Brown et al., *Climate Change as the 'New' Security Threat: Implications for Africa*, 83 INT'L AFF. 1141, 1150 (2007); C. H. D. Magadza, *Climate Change Impacts and Human Settlements in Africa: Prospects for Adaptation*, 61 ENVTL. MONITORING AND ASSESSMENT 193, 193-205 (2000); A. Adugna, *The 1984 Drought and Settler Migration in Ethiopia*, *in* POPULATION AND DISASTER 114-127 (J. I. Clarke et al. eds., 1989); Bernt Lindtjorn et al., *Population Growth, Fertility, Mortality and Migration in Drought Prone Areas in Ethiopia*, 87 TRANSACTIONS OF THE ROYAL SOC'Y FOR TROPICAL MED. AND HYGIENE 24, 24-28 (1993).

28. Myers, *supra* note 4, at 609. Note that in this article I make no attempt to distinguish 'environmental refugees' or similar terms from the more general terms environmental migrants/migration; other authors in this volume of *FELR* will tackle such themes in detail.

environmental refugees by 2010.[29] The relief organization Christian Aid suggests there could be as many as 1 billion people displaced from their homes by 2050 as a consequence of environmental change.[30] To put such figures into context, at the end of 2008, the United Nations High Commission for Refugees (UNHCR) estimated there were 11.4 million refugees worldwide,[31] and another 26 million involuntarily displaced within their own borders.[32] Meanwhile, the Population Division of the UN's Department of Economic and Social Affairs estimates the world's total migrant population at any given time numbers about 200 million people (Figure 3).[33]

Figure 3: Comparison of environmental refugee predictions with current global refugee and migration levels[34]



29. Press Release, United Nations University, As Ranks of "Environmental Refugees" Swell Worldwide, Calls Grow for Better Definition, Recognition, Support (Oct. 11, 2005).

30. CHRISTIAN AID, *supra* note 4, at 5.

31. UNHCR, Global Appeal 2009 (Update): Populations of Concern to UNHCR 110 (Dec. 1 2008), *available at* http://www.unhcr.org/4922d43a0.html.

32. UNHCR.org, Internally Displaced People Figures, http://www.unhcr.org/pages/49c3646c23.html (last visited Nov. 10, 2009).

33. *See* U.N. Dep't Econ. & Soc. Pol'y, Population Div., *International Migration Report 2006: A Global Assessment*, at xiv (2009) *available at* http://www.un.org/esa/population/publications/2006_MigrationRep/ report.htm.

34. UNHCR, *supra* note 31, UNHCR.org, *supra* note 32 (combined figures represent current UNHCR forced migrants); United Nations University, *supra* note 29 (UNU-EHS 2010 forecast); U.N. Dep't Econ. & Soc. Pol'y, *supra* note 33 (current world migrants); Myers, *supra* note 4 (Myers <2100 forecast); CHRISTIAN AID, *supra* note 4, at 5 (Christian Aid 2050 forecast).

IV. WHY POPULATIONS ARE EXPOSED TO HAZARDOUS ENVIRONMENTAL CONDITIONS

It may be asked why is it in the first place that large human populations are often found in areas where environmental hazards are common. The simplest answer reflects the historical trajectory of human development: it is because such areas are often very well-suited for human livelihood activities. For example, it is no accident that many of America's largest urban centers developed in river valleys, deltas and coastal estuaries. In the years following European settlement of the Americas, such locations provided reliable supplies of drinkable water, moving water (a critical energy source in the pre-fossil fuel era), access to agricultural land and the ability to ship commercial goods by boat. The Mississippi River system was a key factor in the development and expansion of the American economy into the interior, but as with many coastal and riverine settlements a considerable investment eventually had to be made (and continues to be made) to protect the communities along its banks from catastrophic flooding.

The same logic applies on other continents as well. An estimated ten percent of the world's population, and fifteen percent of the world's urban population, lives within ten meters of sea level.[35] Relatively large human population densities have existed in the deltas of the large rivers of Africa and Asia since antiquity, notwithstanding the proneness of such regions to periodic flooding. Indeed, it often precisely because of seasonal floods—which leave behind large deposits of organic material and nutrients—that deltaic soils remained fertile despite intensive agricultural development and thus capable of supporting ever-growing populations. These densely populated deltaic regions—the Nile, the Indus, the Ganges, the Irrawaddy, the Yellow, among others—are now regularly cited in the climate science literature as being particularly exposed to the risks of rising sea levels and extreme storm events.[36]

---

35. Gordon McGranahan et al., *The Rising Tide: Assessing the Risks of Climate Change and Human Settlements in Low Elevation Coastal Zones*, 19 ENV'T AND URBANIZATION 17, 17 (2007).

36. *See generally* ADGER ET AL., *supra* note 1, at 12, 16; M. El-Raey et al., *Adaptations to the Impacts of Sea Level Rise in Egypt*, 12 CLIMATE RES. 117, 117-128 (1999); M. Monirul Qader Mirza et al., *The Implications of Climate Change on*

These pre-existing environmental risks are further complicated by high rates of rural-to-urban migration and rapid urbanization in developing regions over the last half-century, which increase the number of people at risk. Technological progress holds the possibility of reducing the vulnerability of urban populations, but access to it at a global level is typically uneven. Wealthier nations are able to construct increasingly elaborate infrastructure to protect coastal and riverine populations from flood events and storm surges. Most readers will be familiar with the case of the Netherlands and the series of sea walls that have allowed the reclamation of land from the sea and protect the country's low-lying areas from floods, and with that of Venice, where a multi-billion dollar project is being undertaken to build dams that will regulate water levels in its famous lagoon. Perhaps less well-known in North America is that London and surrounding regions are protected from extreme high tides and flooding by a control structure known as the Thames Barrier.[37] The expected lifespan of the Barrier, completed in the early 1980s, is shortening as the rate of sea level rise accelerates, and British authorities have begun planning for its successor. Engineering works such as the Barrier need constant investment and upgrading and are often well beyond the financial means of developing countries. This skews the likelihood of future environmental migration to being most likely to emerge from developing-nation populations residing in low lying coastal areas and on small island states cannot afford the infrastructure that might protect them from the consequences of anthropogenic climate change.[38]

Technological progress of recent decades has also helped overcome many of the original preconditions that once influenced where cities could be located and enabled population growth in areas less attractive to past generations. Twentieth-century population growth in the Sun-Belt states accompanied the expansion of

---

Floods of the Ganges, Brahmaputra and Meghna Rivers in Bangladesh, 57 CLIMATIC CHANGE 287, 287-318 (2003); *see* McGranahan et al., *supra* note 35.

37. *See generally* Environment Agency, The Thames Barrier, http://www.environment-agency.gov.uk/homeandleisure/floods/38353.aspx (last visited Nov. 09, 2009)

38. This seems a particularly inequitable outcome given that developing world populations experience few of the economic benefits of rampant fossil fuel consumption, which might otherwise provide them the financial wherewithal to invest in protective infrastructure.

America's service-based economy, the advent of cheap air-conditioning, and widespread automobile ownership. New cultural preferences also emerged to create growing interest in living in places like Las Vegas, Miami, Phoenix and Raleigh. Population growth in such areas exposes ever more people to urban drought and hurricanes, while in southern California the building of homes in the dry hills around Los Angeles exposes greater amounts of people and property to wildfires.

The combined trends in human population growth, affluence and technological development of the past half-century have influenced the relationship between environment and human migration in three general ways. First, across the globe high rates of population growth and rural-to-urban migration continually raise the potential for environmentally-related population displacements and the size of such displacements, especially in developing regions. Second, in many regions human settlements are expanding into new areas where environmental hazards are present, raising the potential for future distress migration events. Third, anthropogenic climate change is exacerbating existing environmental risks and creates new ones for many of the world's most densely populated areas. The effects of these broad-based, large-scale trends on particular environmental migration outcomes at community, household and individual levels are the preoccupation of the remainder of this article.

V. CAPITAL AND ITS INFLUENCE ON HOUSEHOLD ADAPTATION AND MIGRATION

Households and individuals within any given population possess a wide and variable range of capacity to adapt to or cope with environmental stresses. When governments are unable to protect their residents from the impacts of adverse environmental conditions or provide relief after the fact, it falls to community groups or individual households to somehow adapt. The range of adaptive options varies from one household to the next, depending on the age, health, education, work skills, financial assets and other attributes of the household.[39] Migration away from the affected area, on either a

39. W. Neil Adger et al., *Adaptation to Climate Change in the Developing World*, 3 PROGRESS IN DEV. STUD. 179, 186, 192 (2003).

temporary or indefinite basis, is one of any number of adaptive options that may emerge.

The adaptive capacity of households and the response options they choose can be understood in terms of the capital available to households.[40] In this context, capital is not limited solely to economic capital (that is, money and assets readily convertible to money), but also social capital and human capital. Each household has its own particular mix of capital assets. Certain combinations of capital enable particular choices of adaptation, and deficiencies in critical types of capital may serve as impediments to adaptation, depending on the environmental conditions being experienced. The interactions of capital and migration can be illustrated with examples from drought migrations in the U.S. during the 1930s.[41]

Economic capital can be held in various forms, including cash money, financial instruments, real property and fixed assets such as automobiles, machinery and so forth. In rural societies, economic capital may also include livestock, draft animals and various farming technologies. It is inevitably distributed on an uneven basis in capitalist economies, and is a key factor in creating class distinctions within them. Some types of economic capital are portable or transferable across distances, particularly money and vehicles, and serve to facilitate mobility and migration. Others, such as real property and machinery or equipment, are less portable, and during times of crisis it may not be easy to convert these to money at a reasonable value. These latter types of economic capital therefore tend to give their owners a significant disincentive to migrate from an area under environmental stress, or encourage them to return to an area after distress migration has occurred. During the 1930s, migrants out of the Great Plains were disproportionately drawn from that region's large population of tenant farmers, who might best be described as the rural middle class. They tended to possess farm equipment, automobiles and small amounts of cash savings, but did not own title to the farms they operated. When droughts struck and

---

40. For greater review of capital in migration, *see* McLeman et al., *supra* note 16.

41. *See generally* Robert A. McLeman, *Household Access to Capital and Its Influence on Climate-Related Rural Population Change: Lessons from the Dust Bowl Years*, *in* FARMING IN A CHANGING CLIMATE: AGRICULTURAL ADAPTATION IN CANADA (Ellen Wall et al. eds, 2007); as well as McLeman, *supra* note 12, R. McLeman & B. Smit, *supra* note 2 at 41-45; and Brown et al., *supra* note 27.

crops failed, tenant farmers in large numbers were obliged to leave their homes and seek out new residences, creating a large population predisposed to migration and with the means to travel over long distances.

Social capital—that is, social networks and relationships that work to provide benefits to their members—play a critical role in adaptation to environmental stress, and can have a significant influence on migration outcomes. Social capital is found in families, in formal organizations such as churches and service clubs, and in informal groups and organizations such as people who share common interests, livelihoods or leisure activities. Residents of communities where local social networks are strong tend to lose fewer members of their population during stressful environmental conditions than do communities where social capital is lacking. Common first-order responses to 1930s droughts were for extended families to pool resources and share accommodations, and for merchants to accept barter or extend credit to families who were known to them. For many families, mobilization of social capital in these and other ways was sufficient to see them through the droughts until favorable conditions returned. On the other hand, those who lacked large extended families (especially the elderly and single parent households) and families who were not well-known within their communities were often left to fend on their own, and experienced disproportionate levels of hardship. Squatter settlements of the type we associate today with third-world refugee camps developed on the outskirts of many Great Plains towns and cities during the 1930s, filled with members of the rural poor.

Where social networks exist across long distances, the social capital that arises can facilitate migration out of areas experiencing environmental stress. To undertake migration and resettlement, even on a temporary basis, entails considerable costs that can be offset through access to social capital.[42] By drawing on assistance from relatives, former community members or contacts in another place, a potential migrant can take advantage of three key benefits. The first

---

42. *See generally* Alberto Palloni et al., *Social Capital and International Migration: A Test Using Information on Family Networks*, 106 AM. J. SOC. 1262 (2001); Douglas S. Massey, & Kristin E. Espinosa, *What's Driving Mexico-US Migration? A Theoretical, Empirical and Policy Analysis*, 102 AM. J. SOC. 939 (1997).

is the possibility of direct assistance in undertaking the journey in the form of transportation, financial assistance, and/or valuable information about the journey and the destination. The second is settlement assistance, such as finding a place to stay and introductions to potential employers in the destination area. The third is insulation or protection from hostility that migrants often face when they arrive in new places, particularly when they are seen as being undesirable by the receiving community. Those who migrated from the Great Plains to California during the 1930s typically drew upon the assistance of friends and relatives who had migrated there before them, and tended to settle in particular areas on arrival, such as the Bell Gardens suburb of Los Angeles or in the many "Okie-towns" that sprang up in the San Joaquin and Imperial valleys. Californian communities were often openly hostile to the newcomers and attempted to limit their access to public services. In 1936, when arrivals from the Great Plains were particularly high, the Los Angeles County sheriff's department went so far as to operate a blatantly unconstitutional "blockade" of highways entering California, conducting illegal searches and harassment of out-of-state vehicles whose occupants fit the profile of drought migrants. 1930s migrants formed tightly knit communities in California that are readily identifiable to this date, and which enabled them to not only cope with the hostility they faced, but to eventually gain greater representation in the formal institutions of these communities.

Cultural capital comprises the third broad category of capital that influences household adaptation strategies during times of environmental stress.[43] This category consists of what is often referred to as human capital (i.e. work-related skills, formal or informal education and training), along with other attributes including health and physical well-being, language skills, and cultural norms and practices. Such attributes are inherently variable within communities and even within families, from one individual to another. Although often difficult to measure empirically, they have a considerable influence on adaptive capacity at the household level, and sudden changes can have considerable impacts on well-being. For example, in agricultural households, where the ability to perform

---

43. *See* Pierre Bourdieu, *The Forms of Capital*, *in* HANDBOOK OF THEORY AND RESEARCH FOR THE SOCIOLOGY OF EDUCATION 47(J. E. Richardson ed., Richard Nice trans., 1986).

physical labor is a critical factor in farm success, an injury, sudden illness or death of an adult can tip that family from a position of having food and financial security to one of indebtedness, vulnerability and/or suddenly being displaced from its home.

Cultural capital is often influenced by macro-economic forces operating well beyond the community level. For example, agricultural populations typically develop particular skills and aptitudes associated with favored types of crop or livestock production. In Oklahoma in the 1930s, many farmers specialized in growing cotton, a crop where production had not yet been mechanized and consequently required the producer to learn a range of specialized skills such as working with draft animals, develop the manual dexterity to remove ripe cotton fibers from prickly bolls, and so forth. The scale and duration of the 1930s droughts meant that cotton farmers who lost their own crops were unable to find wage labor on other farms in the region, which were also experiencing crop losses due to droughts. The concurrent economic conditions of the Great Depression meant that other forms of off-farm employment—then and now a common farm-family adaptation to stress and economic uncertainty—were not available in the drought-affected region. In other words, the skills of the rural middle class were devalued within the region. At the same time, 1930s federal immigration policies closed the U.S. border to seasonal farm laborers from Mexico, creating an agricultural labor shortage in California that would help draw thousands of Great Plains families westward.

It is the interaction of these various forms of capital and the differential access to them within communities that shape the adaptation and migration outcomes witnessed during adverse environmental conditions. This logic applies as well to recovery from catastrophic events after they occur, such as the differential rates of recovery from Katrina among various neighborhoods and social classes in New Orleans. For example, Airriess et al. have demonstrated that social capital has played a significant role in the recovery of that city's small, relatively impoverished Vietnamese community, which prior to Katrina had been concentrated in neighborhoods in the least desirable parts of the city near a large

landfill site.[44] By drawing upon a nation-wide community of expatriate Vietnamese to place political pressure on Congress and channeling the networking abilities of Vietnamese Catholic Church congregations, this group was able to mobilize considerable resources and accelerate the rebuilding of their community.

It is also important to recognize that migration is typically not the first-order adaptive response of households in response to environmental stresses, and populations are often inherently predisposed toward rebuilding their communities after a sudden-onset event. Social networks and cultural capital are historically contingent—that is, they take time to form and develop—and so the abandonment of one's place of residence also results in the abandonment of these reservoirs of capital. Where the household's economic capital is bound up in real property or other assets that are not readily transferable, a decision to migrate or to not return after a catastrophic event is often a last-resort response. For example, when drought conditions emerge, a rural household might adapt by seeking off-farm employment, by changing its selection of crops or animals to use less water, or any number of other possible strategies.[45] If the usual range of adaptive strategies is inadequate and the drought becomes prolonged or especially severe, the household may then consider potential migration options. The preferred migration option might be temporary and local, such as sending some family members to live with relatives outside the drought-stricken area. The migration might also be permanent and lead the household to cross long distances to seek employment. The severity and duration of the drought, the perceived benefits of relocating versus staying, the geographic extent of a family's social networks, its financial means, its health and well-being will interact to shape the household's migration decision and destination. Such were the processes that unfolded on the Great Plains, and they continue to unfold in similar ways in other parts of the world today.

---

44. Christoper A. Airriess et al., *Church-Based Social Capital, Networks and Geographical Scale: Katrina Evacuation, Relocation, and Recovery in a New Orleans Vietnamese American Community*, 39 GEOFORUM 1333, 1342-43 (2007).

45. Barry Smit & Mark W. Skinner, *Adaptation Options in Agriculture to Climate Change: A Typology*. 7 MITIGATION AND ADAPTATION STRATEGIES FOR GLOBAL CHANGE 85, 101,103 (2002).

VI. WORST-CASE SCENARIOS AND MIGRATION

To this point, discussion has focused primarily on other-than-worst-case scenarios; that is, situations where adaptation and migration decisions are made at the household or community level in response to observed and known environmental risks after the hazardous event occurs. There are past examples where state and federal governments have proactively offered incentives to households to relocate out of areas prone to repeated occurrences of environmental hazards. In the 1930s, the government of Alberta, Canada, offered residents of drought-stricken farms in southeastern parts of the province free railway freight to move their possessions if they agreed to relocate to farms in the wetter, more temperate northwest of the province.[46] In the past decade the British government has been actively involved in the relocation of residents of the island of Montserrat, a Caribbean island dependency of Britain where volcanic activity has made the island uninhabitable for long periods of time.[47] At the time of writing in March 2009, the Red River that flows through the U.S. states of North Dakota and Minnesota, and the Canadian province of Manitoba, has swollen to its highest recorded spring water levels since European settlement of the region. Many communities along the river have been evacuated and temporary dikes are being built to protect densely populated areas along the floodplain. After the last major flood in 1997 many communities decided to remove homes from the most flood-prone areas and, in the case of Manitoba, to invest in the expansion of a floodway that diverts excess flows away from cities and towns. This combination of deliberately removing people from areas at risk, investing in infrastructure, and mobilizing emergency efforts appears to be paying off in terms of minimizing property damage and loss of life.

Examples such as these of proactive population relocations undertaken by governments in response to environmental risks are not especially common, are typically initiated on an *ad hoc* basis in response to particular environmental events or conditions, and are

---

46. Gregory P. Marchildon et al., *Drought and Institutional Adaptation in the Great Plains of Alberta and Saskatchewan, 1914-1939*, 45 NATURAL HAZARDS 391 (2008).

47. Richard Stone, *Bracing for the Big One on Montserrat*, 299 SCIENCE 2027, 2028 (2003).

done on an intra-jurisdictional basis. There are exceedingly few examples where two or more states have collaborated on a deliberate policy or program of resettling across international borders populations facing environmental risks. However, the risks associated with anthropogenic climate change suggest that such initiatives may increasingly become necessary. The most obvious and most likely emergence will be the need to relocate coastal and small island populations due to mean sea level rise, something which is likely well beyond the capacity of communities and households. Although a number of opinions have been offered on the need to develop international arrangements to facilitate such relocations, there are no existing mechanisms in international law to do so, and little evidence of any to emerge over the horizon in the near future.[48] There currently circulates a myth, popularized by the movie *An Inconvenient Truth*, that residents of low-lying Pacific Island states are migrating in large numbers because of sea level rise to New Zealand under a special immigration program. Empirical evidence has shown that no such migration is occurring, and that islanders such as those on Funafuti in Tuvalu are actually quite resistant to leaving their country for New Zealand except for more traditional reasons of reunification with family members.[49] That said, planned relocations of small island populations may well become unavoidable within a decade or so, regardless of the wishes of residents.[50]

VII. CONCLUSION

The *FELR*'s Symposium, Global Responses to Eco-Migration and Environmental Disasters: The Role of U.S. and International Law and Policy, placed much needed attention on issues that are bound to challenge the international policy-making community and the legal community for years to come. Anthropogenic climate change, land degradation and resource depletion are together increasing the likelihood that environmental migration will increase in frequency and magnitude in coming years. It is already well-established that

48. For greater review on international law and environmental migration, see McLeman, *supra* note 4.

49. Colette Mortreux & Jon Barnett, *Climate Change, Migration and Adaptation in Funafuti, Tuvalu*, 19 GLOBAL ENVTL. CHANGE 105 (2009).

50. Jon Barnett, & W. Neil Adger, *Climate Dangers and Atoll Countries*, 61 CLIMATIC CHANGE 321, 326 (2003).

environmental conditions in various forms can have significant impacts on human migration patterns. It is also well-established that current international legal structures related to migration are not designed to address existing challenges related to environmental migration, let alone increased future ones. Households and individuals in many regions today undertake migration decisions that have been heavily influenced by the interaction of environmental stresses with macro-level socio-economic and technological changes, and the migration outcomes are ultimately decided by the range of options available to them given their particular access to capital. They will continue to do so whether or not the international policy-making and legal community makes progress in establishing appropriate and effective institutional and legal frameworks. From a public policy and human rights point of view, it is obviously preferable that such frameworks be developed sooner rather than later, and it is hoped that emerging legal scholars direct their energies and attention toward this challenge.