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**Migration and Climate  
Change: an Overview**

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## **Abstract**

Climate change has become a major concern for the international community. Among its consequences, its impact on migration is the object of increasing attention from both policy-makers and researchers. Yet, knowledge in this field remains limited and fragmented. This paper therefore provides an overview of the climate change – migration nexus: on the basis of available empirical findings, it investigates the key issues at stake, including the social and political context in which the topic emerged; states' policy responses and the views of different institutional actors; critical perspectives on the actual relationship between the environment and (forced) migration; the concepts and notions most adequate to address this relationship; gender and human rights implications; as well as international law and policy orientations. Two major interconnected arguments arise. The first regards the weight of environmental and climatic factors in migration and their relationship to other push or pull factors, whether of social, political or economic nature. The second is about the political framework in which such migration flows should take place and the manner in which to treat the people who move in connection with environmental factors. The two issues are deeply intertwined, as the extent to which the environment determines migration is intimately connected to the status to be associated with the people concerned.

## **Keywords**

migration, climate change, policy, environmental migrants, forced migration

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## Introduction

Climate change has become a major concern for the international community. Among its consequences, its impact on migration is the object of increasing attention from both policy-makers and researchers. Yet, knowledge in this field remains limited and fragmented: there are uncertainties surrounding the actual mechanisms at stake, the number of persons affected and the geographical zones concerned; there are debates between those who stress the direct impact of the environment on population flows and those who rather insist on the social, economic and political contexts in which such flows occur; different disciplines bring in their respective inputs to the literature. Moreover, the available information is heterogeneous, as research outcomes coexist with numerous 'grey' publications, such as policy reports<sup>1</sup>, advocacy brochures by IGOs and NGOs<sup>2</sup> and conference proceedings<sup>3</sup>.

This paper therefore provides an overview of the climate change – migration nexus. On the basis of available empirical evidence, it investigates the key issues at stake, including the social and political context in which the topic emerged; states' policy responses and the views of different institutional actors; critical perspectives on the actual relationship between the environment and (forced) migration; the concepts and notions most adequate to address this relationship; gender and human rights implications; as well as international law and policy orientations.

Two major interconnected arguments arise. The first regards the weight of environmental and climatic factors in migration and their relationship to other push or pull factors, whether of social, political or economic nature. Understanding the role of the environment in migration dynamics implies analysing how and why people are vulnerable to climate change, as well as an examination of the different strategies they develop to cope with (or adapt to) environmental stress - migration being one among other such strategies. The second argument is about the political framework in which such migration flows should take place and the manner in which to treat the people who move in connection with environmental factors. This implies a discussion of the possible protection to be granted to those in situation of vulnerability and the responsibilities of states and of the international community in providing such protection. The two issues are deeply intertwined, as the extent to which the environment determines migration is intimately connected to the status to be associated with the people concerned.

This paper is structured in the following way. It first provides a short historical overview of the debate. It then discusses the impact on migration of three major environmental factors linked to climate change (tropical cyclones, heavy rains and floods; droughts and desertification; and sea-level rise). The following sections explore the core issues that are raised by the relationship between

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<sup>1</sup> Barnett and Webber, 2009; Intergovernmental Panel on Climate Change, 2007; Stern, 2007.

<sup>2</sup> Christian Aid 2007; CARE/CIESIN/UNHCR/UNU-EHS/World Bank 2009.

<sup>3</sup> IOM and UNFPA 2008 ; IOM 2009; Afifi and Jäger (forthcoming).

climate change and migration, namely the plurality of factors that shape migratory dynamics, the social determinants of people's vulnerability to climate change, the diversity in the migration patterns associated with climate change, and issues of data collection and methodology. The different concepts used by researchers in the field, along with their analytical and political implications, are reviewed, which leads to a discussion of the legal implications of environmental migration and the responsibilities of states. The last section explores the possible policy orientations to address the climate change – migration nexus.

## **A short history of the debate**

Environmental migration is an issue that is commonly presented as 'new' or as part of 'future trends'. Yet, it is an old-standing phenomenon, as the history of the debate shows. Environmental factors indeed ranked highly in the first systematic theories of migration. In 1889, Ravenstein (1889: 286) mentioned 'unattractive climate' as 'having produced and still producing currents of migration' (along with 'bad or oppressive laws, heavy taxation, uncongenial social surroundings and compulsion' and, most importantly in his view, economic motivations). The American geographer Ellen Churchill Semple later wrote that 'the search for better land, milder climate and easier conditions of living starts many a movement of people which, in view of their purpose, necessarily leads them into an environment sharply contrasted to their original habitat' (1911: 143). However, despite these early historical insights, references to the environment as an explanatory factor were to progressively disappear from the migration literature over the course of the twentieth century. Indeed, core publications such as J.W. Gregory (1928), Donald R. Taft (1936) or Julius Isaac (1947) do not mention environmental factors. The same applies to Zelinsky's hypothesis on 'mobility transition' (1971) and to Stouffer's 'intervening opportunities' approach (1940). The environment is also absent from neo-classical economic theory (Harris and Todaro 1970), from geography (Olsson 1965), as well as from the so-called 'ecological models' (Sly and Tayman 1977).<sup>4</sup> Since the end of the eighties, there have been numerous theoretical publications on international migration, but without any mention of environmental factors.<sup>5</sup>

Four main trends explain this decreasing interest in natural or environmental factors. First, according to a powerful Western-centric idea, technological progress would decrease the influence of nature on human life; Petersen (1958) thus views environmental migration as a 'primitive' form of migration bound to decline as human beings gradually increase their control over their environment. Second, environment-based explanations of migration were progressively rejected for their supposedly deterministic nature, to the benefit of socio-cultural approaches or Marxist/economic

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<sup>4</sup> When the term 'environment' is used in this context, it has nothing to do with natural variables but refers to population factors such as the density of habitation, the ethnic composition of neighbourhoods, etc.

<sup>5</sup> See notably Portes and Böröcz 1996; Massey et al. 1998; Cohen 1995; Brettell and Hollifield 2007. One notable exception is Richmond (1994).

perspectives. A third reason is the rise of the economic paradigm in migration theory: while already present in Ravenstein's work, economic factors were given the most central role, whether in Marxism-inspired or neoclassical research (Harris and Todaro 1970; Castles and Kosack 1973).<sup>6</sup> Finally, forced migration studies, while they could have included environmentally induced displacements, rather developed upon a strong political premise according to which 'States make refugees' (Marx 1990).

It is in this intellectual context that 'environmental migrants' came back in the picture, as one of the pressing issues raised by climate change. In the eighties and beginning of the nineties, a few landmark publications raised the issue and provided alarmist estimates of the number of people foreseen to move because of climate change; Norman Myers (1993) argued for example that up to 150 million environmental refugees were to be expected by the end of the 21st century (see also El Hinnawi (1985), Jacobson (1988)). In 1990, the first UN intergovernmental report on climate change stated that 'the gravest effects of climate change may be those on human migration as millions will be displaced' (Intergovernmental Panel on Climate Change (IPCC-I) 1990). And in 1994, paragraph 10.7 of the *Programme of Action of the International Conference on Population and Development* (held in Cairo and widely understood as the first major occurrence of migration issues in international debates) stated that 'Governments are encouraged to consider requests for migration from countries whose existence, according to available scientific evidence, is imminently threatened by global warming and climate change'.

These early research and policy discussions were heavily embedded in a climate change agenda, characterised by a strategy to raise awareness surrounding the potential impact of climate change on migration – and on security at large. In this approach, 'environmental migrants' were portrayed as forced to leave their country and as moving exclusively for climate change-related reasons, while the tone of the debate was future-oriented – hence favouring usually alarmist predictions rather than empirical analysis of already-existing flows. This clearly clashed with most migration researchers' convictions and led to a long-standing divide between natural and social scientists: while the former took for granted the interrelation between environmental deterioration and migration and stressed the very high number of people concerned, the latter considered the environment as, at most, one driver of migration among many others and were very cautious regarding the estimates put forward (Black 2001; Castles 2002). Moreover, alarmist predictions that aimed at sensitising governments and public opinions rather contributed to further stigmatise migrants from less developed states, while migration researchers reacted in a very defensive way that did little to favour a sound debate between disciplines.

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<sup>6</sup> One could nevertheless note that environmental factors are implicit in the New Economics of migration; households' collective risk strategies in rural societies include for example droughts or other environmental factor (thus motivating the emigration of part of the household, see Stark and Bloom 1985).

Today, it would seem that, although the debate still goes on, the disciplinary divide is gradually being overcome: environmental scientists tend to be more cautious while migration specialists do recognize the role of the natural environment in migration dynamics. On the whole, most scholars now dismiss the apocalyptic predictions that used to influence debates; there is also a consensus on the fact that available evidence regarding the processes at stake is still far from satisfactory.<sup>7</sup> Yet, in a context in which climate change has become an overarching priority for a wide range of actors worldwide, the vision of ‘climate refugees’ escaping environmental disasters remains a powerful way to catch the imagination of the public – hence the numerous initiatives taken by politicians, environmental activists, international organizations and, to a certain extent, by lawyers, climatologists or social scientists (CARE/CIESIN/UNHCR/UNU-EHS/World Bank 2009; Biermann and Boas 2010; Collectif Argos 2010). Alarmist future predictions thus remain popular; as Nicholas Stern wrote in his 2007 report on the economic consequences of global warming: ‘Greater resource scarcity, desertification, risks of droughts and floods, and rising sea levels could drive many millions of people to migrate’ (Stern 2007).

In sum, there are at least three lessons to be learnt from this history of the debate. First, the controversy between natural and social scientists is deeply rooted in intellectual history and the weight given to environmental factors in migration dynamics is therefore both a matter of ‘hard facts’ and of intellectual traditions; thus, a single historical migratory event can be initially understood in environmental terms, and be later reframed in economic or political terms.<sup>8</sup> In this respect, the current focus on environmental migration appears less as a ‘new’ research issue than as an expression of another paradigmatic shift. Second, this field of study is inherently political, which means that research and statements regarding the climate change – migration nexus are very hard to dissociate from the highly politicised debate on climate change itself. Third, as a result of this specific history, this field of study is contested while poor in empirical evidence. While terms such as ‘environmental migrants’ have been growingly used over the last two decades, the number of in-depth studies remains surprisingly low.

Before proceeding to the examination of the core issues raised by the climate change – migration nexus, the next section therefore provides a review of the available knowledge on three main environmental factors that are predicted to grow in significance due to climate change in the years to come and that are held for having an impact on migration: 1. the increase in strength and frequency of tropical cyclones, heavy rains and floods; 2. droughts and desertification and 3. sea-level rise.

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<sup>7</sup> For recent studies and synthesis that illustrate these trends, see Hugo 2008; Kniveton, Schmidt-Verkerk et al. 2008; Piguet 2008; Jäger, Frühmann et al. 2009; Morrissey 2009; Tacoli 2009; Brown, 2008; Perch-Nielsen, Bättig et al. 2008; Jonsson 2010.

<sup>8</sup> Examples of this paradigmatic shift include the Irish famine exodus of the mid-nineteenth century and the 1930s droughts in the American Dust Bowl, which are nowadays reinterpreted as complex socio-political processes rather than ‘simple’ environmental disasters (Scally 1995, McLeman, Mayo et al. 2008).

### ***Tropical cyclones, torrential rains and floods***

Tropical cyclones<sup>9</sup>, storms and floods are typical examples of rapid-onset phenomena impacting on population displacement. The approximate estimates of the number of persons already affected yearly by flooding (99 million between 2000 and 2008<sup>10</sup>) and by tropical cyclones and storms (39 million) give an idea of the amplitude of the threat (Rodriguez, Vos et al. 2009), but the number of people who would be affected by a climate change-induced increase of such disasters is very difficult to estimate. No climate model is indeed able to accurately predict the exact localisation and timing of such disasters and there is therefore no certainty as to whether or not the affected zones will be densely populated.

According to a number of detailed studies<sup>11</sup>, rapid onset phenomena lead overwhelmingly to short term internal displacements rather than long-term or long-distance migration. This is linked to the fact that victims, who live mainly in poor countries, lack the resources to move. They tend to stay where they live or to move only within a short distance. Moreover, many return and reconstruct their homes in the disaster zone. A synthesis of results on the fate of victims of natural disasters displaced in eighteen sites showed (twenty years ago) that there are few exceptions to the strong propensity to return and to the weak potential of long term migration (Burton, Kates et al. 1993). Paradoxically, extreme events may even act as *pull* rather than *push* factors: in the case of the Indian Ocean Tsunami in 2004, relatives moved to the area to find out whether their family had been affected and to offer support; in addition, reconstruction projects increased the demand for labour and attracted migrant workers from other areas; finally, new economic opportunities arose out of the presence of numerous aid-providing institutions (Paul 2005; Naik, Stigter et al. 2007). This being said, macro-level investigations that compare rates of emigration with local exposure to disasters lead to more contrasted results. Several studies demonstrate that a high frequency of disasters (including floods, storms, hurricanes, drought and frost) encourages people to move away from their town or country (see Saldaña-Zorilla (2009) for Mexico, Naudé (2008) for Sub-Saharan Africa, Reuveny and Moore (2009) for developing countries and Affi and Warner (2008) for a sample of 172 countries of the world).

Overall, the potential of tropical cyclones, floods and torrential rains to provoke long-term and long-distance migration, while ascertained, remains limited. As pointed out by Kniveton et al. (2008), the level of vulnerability can be tremendously different from one region to another and it is only if the affected society is highly dependant on the environment for livelihood and if social factors

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<sup>9</sup> We use the generic term tropical cyclone to include hurricanes (western Atlantic/eastern Pacific), typhoons (western Pacific), cyclones (southern Pacific/Indian Ocean), tropical storm, etc.

<sup>10</sup> We use the classification of natural disasters taken from International Disaster Database EM-DAT (<http://www.emdat.be/classification>). Floods are classified as hydrological disasters whereas hurricanes are labeled as meteorological disasters.

<sup>11</sup> See in particular Lonergan 1998; Hunter, White et al. 2003; Kliot 2004; Paul 2005; Pais and Elliott 2008.

exacerbate the impact of the disaster - as was typically the case with Hurricane Katrina (Reuveny 2008) - that significant migration takes place.

### ***Drought and desertification***

In the recent past, the number of persons affected by climatic disasters such as extreme temperatures, droughts or wildfire is estimated at around 83 million each year (between 2000 and 2008) (Rodriguez, Vos et al. 2009). The IPCC foresees that 74 to 250 million people will be affected, in 2020, by increased water shortages in Africa and Asia; it also states that 'freshwater availability in Central, South, East and Southeast Asia, particularly in large river basins, is projected to decrease due to climate change which, along with population growth and increasing demand arising from higher standards of living, could adversely affect more than a billion people by the 2050s' (Intergovernmental Panel on Climate Change 2007: 10).

Compared to cyclones and flooding, a lack of drinking and irrigation water usually generates much less sudden impacts, and thus leads to more progressive patterns of mobility. Empirical evidence is mixed. On the one hand, there are many well-known cases of mass population movements attributed to droughts in Africa (Sahel, Ethiopia), South America (Argentina, Brazil), the Middle East (Syria, Iran), and Central and Southern Asia (Black and Robinson 1993). The impact of droughts on migration is also documented in the Malian Gourma region by an historical overview over the 20<sup>th</sup> century (Pedersen 1995). In South America, Leighton notes that 'the periodic drought and desertification plaguing northeast Brazil contributed to factors causing 3.4 million people to emigrate between 1960 and 1980' (Leighton 2006: 47). On the other hand, many researchers question the link between drought and emigration by emphasising the multiplicity of causes determining migration and the other survival strategies available to affected populations (De Haan, Brock et al. 2002). According to Kniveton et al., 'drought seems to cause an increase in the number of people who engage in short-term rural to rural type migration. On the other hand, it does not affect, or even decrease international, long-distance moves' (2008: 34). In the absence of a consensus, three broad kinds of results can be identified in the literature.

The first confirms the link between drought and emigration. Barrios et al. (2006) use a cross-country data set of 78 countries over a 30-year period and observe that shortages in rainfall increased rural exodus in the Sub-Saharan African Continent (but not elsewhere in the developing world) and thus contributed significantly to urbanization in Africa. In the Americas, Munshi (2003) establishes a correlation between emigration to the United States and low rainfall in the region of origin in Mexico. Van der Geest (2008) uses a geographical analysis to evaluate the relation between out-migration propensities and two indicators of natural resources scarcity in Ghana: rainfall data (average annual rainfall in Northern Ghana from 1986 to 1995) and the 'greenness of the environment' measured by a vegetation index; he concludes that migration propensities are higher in

environmentally less-endowed districts and that lack of rainfall is the strongest predictor of migration but this result is partially contradicted by a time series analysis by the same author showing a positive impact of rain on migration levels. Finally, Afifi and Warner, in their above-quoted study of 172 countries, find that indexes of desertification, water scarcity, soil salinization and deforestation are all correlated with emigration (Afifi and Warner 2008).

A second group of case studies, on the contrary, conclude that droughts have a minimal impact on migration. The most often cited relies on two surveys (1982 and 1989) conducted in rural Mali with over 7,000 individuals and 300 households before and after a series of droughts affecting the country; a reduction (and not an increase) in international emigration was observed due to the lack of available means to finance the journey, even if short term internal migration of women and children did rise (Findley 1994). Smith (2001) also found a limited impact on emigration during the 1994 droughts in Bangladesh, as less than one percent of households had to resort to emigration. This result is coherent with the analysis on interprovincial migrations in Burkina Faso by Henry et al. (2003), where environmental variables and drought contributed only marginally to the explanation of migrations; the authors conclude that, in this country, even if migration is influenced by biophysical changes in the environment, claims that environmental change alone is causing massive displacements are not supported by the data. Kniveton et al. find similar result in their analyse of the relationship between climate variability and migration to the US in the droughts-prone Mexican regions of Zacatecas and Durango between 1951 and 1991 (2008, p.42-47): they find no significant correlation in Zacatecas whereas, in Durango, more rainfall generates more emigration and not the contrary. In the same way, Naudé finds no correlation between emigration and water scarcity (proxied by the surface of land under irrigation) across 45 Sub-Saharan African countries (Naudé 2008).

Finally, several studies show contrasting patterns according to the type of migration concerned (long-term versus short-term and long-distance versus short distance). Henry et al. collected individual migration histories among 3911 individuals and environmental data at community-level in about 600 places of origin mentioned by migrants; the environmental indicator consists of rainfall data covering the 1960–1998 period and the dependant variable is the risk of the first village departure; findings suggest that people from the drier regions are more likely to engage in both temporary and permanent migrations to other rural areas and that short-term rainfall deficits increase long-term migration to rural area but decrease short-term moves to distant destinations. The evidence that scarcity of water and desertification do have an impact on migration patterns, but that they mainly generate short distance moves and that their impact is mediated by numerous other variables, is also confirmed by local case studies, among other in the context of the EACH-For project (Hamza, 2008, see also Meze-Hausken (2004)).

Again, one can conclude that a link does exist between rain deficits and migration, but that it remains highly contextual - so that projections of increased migrations linked to drought-related

phenomena are hazardous. Just as for rapid onset phenomenon, it would be difficult to provide an estimate of the magnitude of populations at risk and of the potential migration flows arising from droughts induced by global warming.

### ***Sea-level rise***

In contrast with the two environmental factors discussed so far (tropical cyclones-heavy rains-floods and droughts-desertification), the link between sea level rise (SLR) and migration appears much more straightforward. Unlike most other hazards, SLR is virtually irreversible and manifests itself in a more or less linear way over a long period of time. In the absence of new infrastructures such as dykes, this would make definitive out-migration the only possible solution, while allowing for progressive and planned departures. SLR is also at the heart of some of the most dramatic and publicised manifestations of climate change, including the possible disappearance of island states.

Compared to other climatic events, SLR is a rather new phenomenon and the number of available studies remains limited. Historical evidence nevertheless exists; for example, the Chesapeake Bay islands on the Atlantic coast of the USA have experienced SLR since the mid 19th Century at rates of about 0.35cm/year, which contributed, beside other factors, to the abandonment of most of the islands by their resident populations in the early 20th Century (Arenstam Gibbons and Nicholls 2006). The consequences of SLR can be quite reliably predicted and localized, because the configuration of coastlines, their altitude and their population are simple to integrate into Geographical Information Systems (GIS) that permit simulations and projections. It is therefore possible to calculate - on a global scale - the number of persons living in low elevation coastal zones and threatened by rising water levels, higher tides, further-reaching waves, salinization or coastal erosion.

MacGranahan et al. (2007) define 'low elevation coastal zones' as being situated at an altitude of less than 10 metres. Even though these zones only account for 2.2 percent of dry land on Earth, they are presently home to 10.5 percent of the world population – i.e. around 602 million people, of which 438 million live in Asia and 246 million in the poorest countries of the world. Anthoff provides a slightly lower figure, at 397 million people, which nevertheless remain considerable (Anthoff, Nicholls et al. 2006). Yet, it would be premature to conclude that these people will all be forced to evacuate their houses in the near future. The IPCC report evokes a 7-metre rise in sea level (consecutive to the possible melting of the Greenland ice cover), but this would occur over several centuries or even millenaries. Of more concern is the scenario of future CO<sub>2</sub> emission based on continuing economic growth with a moderation of fossil fuel use (scenario A1B of the IPCC), which predicts an increase of 0.3 to 0.8 metres of the sea level by 2300 (Intergovernmental Panel on Climate Change 2007). More recent estimations show that this process might go significantly faster than previously thought. On this basis, it seems reasonable to consider that populations living at an

altitude of less than 1 metre above sea level are directly vulnerable – and within a few decades. According to Anthoff (2006), 146 million people would be concerned here, 75 per cent of which in the major river deltas and estuaries in South Asia (Indus, Ganges-Brahmaputra etc.) and East Asia (Mekong, Yangtze, Pearl River, etc.). Although far less populated, certain islands (such as Tuvalu or the Maldives) are the most threatened in the short-term, as they are situated only centimetres above sea level.

In sum, SLR probably constitutes the aspect of climate change that represents the clearest threat in terms of long-term forced migration. But reaction to SLR is more complex than the mere abandonment of lands. Migration can indeed happen long before an area really becomes uninhabitable; and symmetrically, concerned populations can elaborate strategies of adaptation and mitigation that may significantly postpone the necessity to leave. The recent decision by the Dutch government to improve its dyke's protection system illustrates that financial resources constitute a key factor in this respect (Kabat, Fresco et al. 2009).

### **The multiple determinants of migration**

The studies reviewed above highlight the complexity of the relationship between environmental factors and migration and the fact that climate change is only one factor among several others in explaining migration dynamics. In its simplest form, this refers to the fact that any migratory movement is the product of several converging factors and that environmental stress is always mixed with other causes, which may include economic constraints or opportunities, social networks, political context, etc.

Moreover, factors fostering mobility are not only numerous, but also intertwined. For example, environmental change can generate health problems or food insecurity, which may in turn foster migration. In such cases, identifying the 'primary' cause of migration is probably impossible, as all causes may mutually reinforce each other. Environmental factors may also play a greater role if they emerge in a context already characterised by political, demographic, economic or social tensions; climate change would thus be an *additional* burden, which can have a multiplier effect. In other words, climate change is unlikely to trigger migration in wealthy and democratic societies, which echoes Amartya Sen's well-known work on famines, according to which these are due less to environmental factors than to ill-founded political choices (Sen 1981). Environmental and non-environmental factors can also interact in a step-by-step manner: if people have already moved for predominantly economic reasons, they could be more likely to move again because of climate change.

Discussing multi-causality therefore implies acknowledging the non-direct relationship between climate change and migration, and the factors that mediate between the two. Climate change is

clearly a complex environmental process that does not have uniform consequences everywhere; and societies have always had to adapt to changing environmental contexts – a multifaceted process of technological, organisational, institutional, socio-economic and cultural nature that is likely to be just as complex as climate change itself. The number of variables is therefore important, leading to high uncertainty and local variability.

Policy-wise, multi-causality implies that states are unlikely to suddenly witness the arrival of ‘environmental migrants’, as policy-makers sometimes seem to believe. To a large extent, future migration flows will resemble current ones – at least from the perspective of receiving states in the developed world. This is not to say that climate change has no impact, but rather that its impact will be difficult to identify at first sight.

### ***The social dimension of vulnerability***

The mediating function of social factors in the relationship between climate change and migration points to the fact that people do not have access to the same resources when it comes to reacting or adapting to environmental change. Vulnerability is therefore shaped by a wide range of social variables that determine people’s exposure to climate change. From a social sciences perspective, this would seem to go without saying; yet, studies on the climate change–migration nexus have long privileged top-down approaches in which so-called ‘hotspots’ are identified and mechanically understood as places where migration will occur – regardless of ‘from below’ considerations on the ways in which people will react and adapt. This is manifest in many of the available maps on the topic, in which one can see the geographical zones likely to be affected by climate change – but which say nothing of the social context.

This includes for example gender, as changes in livelihood patterns affect men and women differently, not only because of their different social positions, but also because gender is known to influence the perception of risks (which is a crucial variable in migration strategies), as well as the way people experience displacement. Another core variable in the construction of vulnerability is of course class resources and wealth. Climate change affects disproportionately poor agrarian communities, precisely those that have the least resources to leave their home. The consequences of climate change thus vary according to the context, as the same environmental factor will have different impacts according to the characteristics of the people it affects. It follows that environmental degradation does not mechanically lead to displacement and that one should resist the ‘tendency to equate populations at risk with population displacement’ (Hugo 2008: 31).

### ***The diversity in migration and mobility patterns***

To understand the impact of climate change on migration, it is necessary to disentangle the different kinds of mobility that may be connected to environmental factors. Indeed, notions such as

‘displacement’, ‘mobility’ or ‘migration’ (and the associated predicted numbers of people concerned) refer to situations that range from a few hours spent in a temporary shelter in fear of a hurricane to the relocation of whole communities whose land has disappeared following sea-level rise.

There are at least three variables to take into account. First, migration may be short- or long-term. Discussions could gain in clarity if, for example, the UN-inspired distinction between temporary displacements (less than three month), short term migration (three month to one year) and long term migration (more than one year) was more systematically used<sup>12</sup>. Most authors argue that, at present, temporary and short-term patterns of migration are predominantly associated with environmental change. The temporality of migration also has to do with the nature of environmental processes: slow onset phenomena such as desertification or sea level rise are likely to be associated with long term migration, whereas sudden disasters such as tropical cyclones will generate temporary displacement. But this typology is far from systematic. Moreover, droughts have long fuelled seasonal migration dynamics, which also points to the differences between permanent departures and back-and-forth types of mobility.

A second key distinction is between short- and long-distance migration, or between internal and international moves. Debates on the climate change–migration nexus often seem to focus overwhelmingly on international migration, and particularly on flows from the ‘South’ to the ‘North’. But this bias tells more on Western fears than on actual trends, as there is evidence that most migration triggered by environmental factors concern internal migration. The third distinction is between forced and voluntary migration. The often-used notion of ‘environmental refugee’ conveys the idea that people are forced to leave their home because of the natural environment. But the more or less constrained nature of migration is open to debate. It is indeed extremely difficult to capture the decision-making process among potential migrants and to understand why, how and when people decide to leave. This also points to the above-mentioned social dimension of vulnerability, as people’s strategies depend upon their resources and opportunities. Finally, the possible interventions of governments in moving people (in the case of resettlement schemes for example) further contribute to challenge the distinction between forced and voluntary movement.

This echoes the long-standing debate on the extent to which migration stems from a failure to adapt to climate change. The dominant view is that people who move because of environmental factors are in fact unable to adapt – and thus have no option but leave. In this view, migration is the worst scenario and the option to avoid, and policies should strive to enable people to stay. But others argue that migration is not only a reactive, but also a proactive strategy; rather than being a last-resort option, it represents a coping mechanism and a way of adapting to climate change, for example through seasonal migration patterns or by arranging for one member of the family to leave (and thus enabling the other members to stay).

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<sup>12</sup> United Nations (1998) *Recommendations on Statistics of International Migration*. New York, United Nations.

This being said, one should note that the distinctions between various forms of migration are not always neat. For example, temporary migration may eventually turn out to be permanent, as people may wish to return but be kept from doing so for various reasons. Short-term mobility may also make people more prone to envisage international migration at a later stage. The distinction between forced and voluntary migration may also be quite thin, as people develop strategies in reaction to external constraints.

## **Methodology**

Discussions on the relationship between climate change and migration have long been marked by a methodological divide and, despite recent attempts toward improvements (Kniveton, Smith et al. 2009, Bilsborrow 2009, Piguet 2010), it is widely recognized that a lack of rigor and clarity characterize research on the climate/migration nexus. Indeed, data pertaining to the environmental and migratory dynamics rarely come from the same sources and are therefore difficult to combine. Moreover, researchers coming from different disciplinary backgrounds and empirical traditions have different methodological orientations and have not always managed to work together.

Two main methodological orientations may be distinguished. The first is mainly descriptive and prospective. It focuses on the identification of the main regions and populations threatened by environmental degradation (the so-called 'hotspots') and on integrated assessments of the vulnerability and resilience of their inhabitants, which provide insights into possible future migrations. The second research strategy is more analytical and attempts to disentangle the specific environmental component among other drivers of migration. The purpose is to question the role and weight of environmental factors in already occurring phenomena.

In any case, while fruitful results can emerge from either quantitative, qualitative or mixed methodologies, it is of paramount importance to take into account not only the objective characteristics of the environmental degradations but people's perceptions and representations of these evolution and of their potential migration consequences. The measure of the impact of environmental factors on displacement should be complemented by an examination of the socio-cultural perceptions and representations of these threats among concerned populations (Mortreux and Barnett 2009), a turn recently advocated in relation to climate change studies in general (Hulme 2008).

## **Conceptual issues**

Conceptual issues are a major source of confusion in the debate on the climate change – migration nexus. There are persistent disagreements over the notion to be used to refer to the people migrating because of environmental factors; while popular, terms such as 'environmental migrants' or 'climate refugees' have raised controversies that are both scientific/academic and political.

From a research perspective, the juxtaposition of the terms ‘environment’ or ‘climate’ with ‘migrants’ or ‘refugees’ has been criticised for implying a mono-causal relationship between environmental factors and human mobility, and thus for negating the multi-causality discussed above. As noted by Stephen Castles, ‘the term environmental refugee is simplistic, one-sided and misleading. It implies a monocausality which very rarely exists in practice (...) [Environmental and natural factors] are part of a complex pattern of multiple causality, in which [they] are closely linked to economic, social and political ones’ (Castles 2002: 5). In this sense, there will never be any ‘environmental migrant’ (or ‘climatic refugee’) because it will never be possible to identify a group of people who migrate *only* because of environmental variables.

Although quite widely accepted, the definition of ‘environmental migrants’ provided by the International Organization for Migration suffers from the same shortcoming (‘Persons or groups of persons who, for compelling reasons of sudden or progressive change in the environment as a result of climate change that adversely affect their lives or living conditions, are obliged to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their country or abroad’<sup>13</sup>). The term ‘environmentally induced population movements’ (EIPM) might constitute a more neutral solution, but it is vague and not very appealing to the general public. Another option is the term ‘environmentally displaced person’ (EDPs), which was for example used in the Each For research project. It encompasses three subcategories: environmental migrants (people who chose to move voluntarily from their place of residence primarily due to environmental reasons); environmental displaces (people who are forced to leave their place of residence because their livelihoods are threatened as a result of adverse environmental processes and events); and development displaces (people who are intentionally relocated or resettled due to a planned land use change). The boundaries between these 3 sub-groups remain nevertheless fuzzy.

Politically, conceptual discussions have focused on the use of the ‘refugee’ notion. Legally, this notion refers to the status recognised by the UN 1951 Geneva Convention and to its definition of ‘refugee’ as a person leaving his/her country of residence for ‘well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion’. Environmental reasons are absent from this definition, which can lead to two opposite positions: one may either advocate for an extension of this definition to include environmental factors (and hence for a modification of the Geneva Convention or for a new treaty specifically addressing the case of ‘environmental refugees’); or one may reject the very reference to ‘refugees’ in the case of climate change, mostly for fears of diluting a specific legal category into a broader and ill-defined category. This led the UNHCR to cast ‘serious reservations with respect to the terminology and notion of environmental refugees or climate refugees’, noting that ‘these terms have no basis in international refugee law and the majority of those who are commonly described as environmental refugees have

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<sup>13</sup> This definition was first put forward in a 2007 background paper (MC/INF/288) at the 94th IOM Council.

not crossed an international border. Use of this terminology could potentially undermine the international legal regime for the protection of refugees and create confusion regarding the link between climate change, environmental degradation and migration' (United Nations High Commissioner for Refugees 2009: 7).

Indeed, in a context in which the respect for the Geneva Convention is already under threat, incorporating environmental factors in refugee debates could eventually jeopardise the protection afforded to recognised refugees. The reasons given are threefold. First, this could strengthen the already widespread fears surrounding uncontrollable waves of poor refugees to developed countries, thereby fuelling xenophobic reactions or serving as a justification for increasingly restrictive asylum policies. It could also further blur the already fragile distinction between voluntary (i.e. economic) and forced (i.e. political) migration – thus undermining the very foundations of the asylum principle. And finally, in a more fundamental manner, it could introduce a sort of 'natural' connotation to asylum issues, which would be incompatible with the political nature of the persecutions considered by the Geneva Convention: 'In so far as the term environmental refugee conflates the idea of disaster victim and refugee, its use brings with it the danger that the key features of refugee protection could be undermined and the lowest common denominator adopted. Because environmental can imply a sphere outside politics, use of the term environmental refugee may encourage receiving states to treat the term in the same way as economic migrants to reduce their responsibility to protect and assist' (McGregor 1993 162). In other words, the danger here would be 'to evacuate political responsibility by overplaying the hand of nature' (Cambrézy 2001: 48).

This 'hand of nature' argument could be challenged, however, on the ground that climate change (unlike tsunamis or earthquakes) is not a neutral or apolitical phenomenon, but to a large extent the product of world economic development. The 'world' would thus be responsible for the situation of climate 'refugees' (which is not the case with the many traditional refugees who leave local conflicts or dictatorships that may not be directly connected to world politics). As Zetter writes: 'The strength of the climate change argument lies in a common conception that specific moral burdens rest on global society. Such global burdens do not readily appear to exist for the other, more localized, categories of migrants such as refugees and IDP' (Zetter 2009: 400). One could go one step further and argue that a small number of wealthy states are, in fact, at the origins of most of climate change, and that past CO<sub>2</sub> emissions could consequently determine the respective share of responsibility of States. According to IOM's 2008 *World Migration Report*, 'some analysts are beginning to argue that migration is both a necessary element of global redistributive justice and an important response to climate change; and that greenhouse gas emitters should accept an allocation of "climate migrants" in proportion to their historical greenhouse gas emissions' (International Organization for Migration (IOM) 2008: 399). In this context, states and populations in the 'South' display resentment

(and make claims) toward the 'North' on the basis of its responsibility in fuelling climate change – even if developed states have so far remained largely indifferent.

As has become clear, the conceptual discussion around the definition best suited to describe and analyse the link between migration and environmental change goes far beyond purely conceptual issues and raises the question of the protection and status to be granted to the people concerned, and of the responsibilities of the international community toward them. Given the far-reaching complexity of these debates, a consensus is unlikely to be reached in the near future, neither among researchers, nor in policy and public debates. As a consequence, differences in terms, notions and definitions are likely to persist. But as Walter Kaelin (Representative of the UN Secretary-General on the Human Rights of Internally Displaced Persons) stated, 'we should not be distracted by semantic discussions with little practical meaning about whether to call affected persons climate change refugees, environmental migrants or something else. Instead, what is needed is a thorough analysis of the different contexts and forms natural disaster induced displacement can take' (Kaelin 2008). In other words, as long as participants in the debate share core concerns (including multi-causality and the recognition of the social construction of vulnerability), a variety of terminologies does not hamper the development of a coherent common approach on the issues at stake.

### **Protection of environmental migrants and states' responsibilities**

As argued, the different terms referring to people who migrate in connection with environmental factors imply different representations of how states could or should treat these people and of the protection that they should receive. The starting point of this complex and sensitive issue is the current absence of standards in defining this protection; indeed, none of the concepts mentioned above have a legal definition – leading to an institutional and normative vacuum.

In the absence of specific norms, one could try to rely on existing instruments and explore how they relate to the issues relating to environmental migrants. In the case of people moving within their own country (which, as argued above, is the most frequent case), existing soft law instruments, and notably the Guiding Principles on Internal Displacement, do recognise some environmental factors (e.g. disasters) as a cause for displacement. But they suffer from implementation challenges, which are due to problems of definition and to the non-binding nature of the Principles. Concerning international migration, some elements of existing international law could be of relevance to environmental migration (like the international responsibility for wrongful acts for example). But they address only part of the issues raised by environmental migration and are difficult to implement, in particular because of the difficulty of identifying single responsible states in the case of environmental disasters or climate change.

If there is a consensus on the existence of legal loopholes, there are disagreements over the remedies to this situation. On the one hand, there have been numerous calls for the elaboration of

new standards to define the responsibilities of states and the protection of the people concerned. These range from amending the Geneva Convention to the development of entirely new instruments, either at the bilateral, regional or international level. On the other hand, one should note that calls for new normative instruments will not only face a deep lack of political willingness, but also more structural obstacles. In particular, the categories of ‘environmental migrants’ may be too vague and ill-defined to justify a new treaty, which would risk being politically visible but legally useless. Moreover, the collective dimension of migration in the case of environmental change, along with the absence of a clearly-defined persecutor, makes the analogy with refugees problematic.<sup>14</sup>

Indeed, the establishment of a new treaty faces several challenges. Not only will it be hard to reach an international agreement on the definitions of the people concerned and the criteria to grant protection, but negotiations are likely to bump into highly sensitive issues surrounding the responsibilities of industrialised nations – an obstacle that has proven very prominent in international discussions pertaining to climate change. In addition, there is the risk of exercising a downward pressure on existing treaties like the Geneva Convention. In this context, and regardless of the different perceptions that exist, it seems likely that environmental factors will increasingly fuel migration, but without a specific legal framework (at least at the international level). Yet, this does not prevent an examination of the policy orientations relevant to situations of environmental migration.

### **Possible policy orientations**

What are the policies that have been elaborated to respond to environmentally-induced migration? And what are the policy orientations that could be envisaged to address the challenges raised by the movement of people in a context of environmental change? Given the heterogeneity in the types of climate stress that can foster migration, it is worth distinguishing between different kinds of policy options.

First, there is the case of disasters and sudden climatic events. There have always been typhoons, floods or other natural catastrophes and most, if not all, regions of the world have experienced the challenge of addressing the situations of the persons concerned. The problem lies in the efficiency of the already existing mechanisms, especially if one assumes that climate change will increase the frequency and/or intensity of some kinds of disasters – thus putting humanitarian efforts under further stress. This calls for reinforcing rescue mechanisms and, in the case of less developed countries, for greater international solidarity, not least in making the necessary funds available. This is one of the *raison d’être*, at the international level, of the United Nations Disaster Assessment and

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<sup>14</sup> Another legal issue connected to climate change and migration regards statelessness. In the case of sinking island states, not only would inhabitants need to leave their home, but entire countries could disappear. Migrants from these states would then risk becoming stateless, which calls for innovative legal and policy approaches (see UNHCR 2009 and Piguet 2010 for a discussion).

Coordination (UNDAC) teams, managed by the UN Office for the Coordination of Humanitarian Affairs (OCHA). Overall, the main objective should therefore be to make a more extensive use of existing policy mechanisms and to adapt them to the specific challenges raised by climate change.

Yet, one should keep in mind that the impact of climate change on migration will also manifest itself through much less sudden events. All too often, governments and policy-makers seem to react above all to disasters that force people to leave over night; this applies to some of the most documented cases of environmental migration, like the 2004 Asian Tsunami and the 2005 Hurricane Katrina in New Orleans. By contrast, the 'silent crisis' fuelled by progressive environmental change, while affecting potentially very high numbers of people, is the object of much less policy attention. In some extreme cases, resettlement may constitute the appropriate policy, in order to enable large numbers of people to leave their home on a permanent basis. But these are not new policies either as resettlement has regularly been implemented in other contexts, especially in relation to large scale infrastructure projects like dams. Again therefore, the relevant policy approach would be to improve existing policy options, through increased funding and international cooperation.

This being said, resettlement is not an option for all the people concerned by progressive manifestations of climate change. There is therefore a need to envisage a much broader range of responses, to address the multifaceted challenges raised by slow environmental deterioration. At the local level, this could for example include measures to diversify economic activities in order to enable people to better adapt to climate change. More broadly, this would call for incorporating the migration–climate change relationship in existing fields of policy that have so far not only tended to ignore migration, but have also remained quite separate from each other. These notably include development strategies and humanitarian interventions, two well established fields of efforts at all levels (national, regional and international), but that have so far dedicated little energy to climate change, and even less to migration.

In the same vein, one should note that environmental migration is also a matter for migration policy at large. If, as argued, environmental factors exacerbate already existing push factors in less developed countries, more appropriate migration policies could probably accommodate part of 'environmental migration' through classical schemes such as economic migration programmes. IOM thus notes that 'the international community is, in fact, ignoring labour mobility as a coping strategy for climate stress' (International Organization for Migration (IOM) 2008: 399). This echoes the numerous calls for more realistic and flexible approaches to migration that have been launched in recent years (UNDP 2009, see also Pécoud and de Guchteneire 2007). This also implies strengthening the legal framework in which international migration takes place, possibly through existing norms such as the UN Convention on Migrant Workers' Rights (Cholewinski et al. 2009).

This discussion highlights the fact that, even if environmental migration is regularly presented as a 'new' challenge requiring 'new' responses, there is actually a number of existing policy fields that

can be relied upon to address the challenges it raises, including development strategy, humanitarian affairs, post-disaster interventions, or immigration and admission policies. This is not to say that new normative or policy instruments are irrelevant; rather, it means that new instruments may not be a prior necessity to address the needs of the populations at risk and that an absence of consensus on the desirability of such new standards does not imply that nothing can be done.

## **Conclusion**

Climate change does have consequences in terms of human migration and mobility, and its impact can be expected to increase. But, given the complexity of the relationship between environmental change and migration, it is worth recalling that climatic or natural hazards do not automatically lead to displacements. Another core argument of this paper is that migration is an adaptation strategy in itself; it is not necessarily the worst scenario and should not be seen as an intrinsically negative outcome to be avoided. Finally, climate change will be experienced very differently around the world and across countries, as the vulnerability to nature is ultimately a product of the socio-economic forces that shape all societies.

The social dimension of vulnerability should be interpreted as an opportunity to increase people's ability to resist to climate change. Indeed, if human beings were completely helpless in the face of nature and climate change, very little could be done. But they are not and this opens opportunities for local and international efforts in gathering knowledge, drafting measures and increasing protection. Provided that the necessary financial means are made available, even such an apparently unavoidable threat like rising sea levels could be partially counteracted. It also follows that, if environmental migration is fundamentally a political process, the actual number of people who will move cannot be predicted, but depends upon current and future efforts.

This approach also implies going beyond the traditional 'alarmist vs. sceptics' debate and recognising that, while there are no reasons to exaggerate the threats and inspire an ungrounded panic, there are nevertheless good reasons to take the problem seriously. This particularly concerns data gathering. More knowledge is required to address the situation of people affected by environmental change and it is paramount to understand better the kind of patterns that develop out of it in order to envisage potentially successful policies. In addition, research on these issues requires increased cooperation between social and natural sciences, for instance in the elaboration of complete and comparable databases.

All in all, climate change is a process that exacerbates some of the most pressing issues of our time. It does not take place in a vacuum but is closely associated with underdevelopment, inequalities within and between countries, global justice and the lack of solidarity between states, human rights or human security. Climate change as a policy area may be relatively recent, but most of these issues represent long-standing challenges for states and the international community. It

follows that policies that focus on the climate change – migration nexus must be accompanied by renewed efforts to combat the very context that make people vulnerable in the first place.

## Bibliography

- Affi, T. and J. Jäger, Eds. (Forthcoming). Environment, Forced Migration and Social Vulnerability (Conf. proceedings EFSMV - Bonn 9-11 October 2008). Bonn: , Springer Verlag - United Nations University - Institute for Environment and Human Security.
- Affi, T. and K. Warner (2008). "The Impact of Environmental Degradation on Migrations Flows across Countries." United Nations University - EHS - Working Paper(5).
- Anthoff, D., P. Nicholls, et al. (2006). "Global and regional exposure to large rises in sea-level: a sensitivity analysis." Tyndall centre for climate change research - Working Paper(96).
- Arenstam Gibbons, S. J. and R. J. Nicholls (2006). "Island abandonment and sea-level rise: An historical analog from the Chesapeake Bay, USA." Global Environmental Change **16**(1): 40-47.
- Barnett, J. and M. Webber (2009). Accommodating migration to promote adaptation to climate change. Stockholm, Commission on Climate Change and Development.
- Barrios, S., L. Bertinelli, et al. (2006). "Climatic change and rural–urban migration: The case of sub-Saharan Africa." Journal of Urban Economics **60**(3): 357-371.
- Biermann, F. and I. Boas (2010). "Preparing for a Warmer World Towards a Global Governance System to Protect Climate Refugees." Global Environmental Politics **10**: forthcoming.
- Bilsborrow, R. E. (2009). Collecting data on the migration-environment nexus. Migration, Environment and Climate Change: Assessing the Evidence F. Laczko and C. Aghazarm. Geneva, International Organization for Migration (IOM): 115-196.
- Black, R. (2001). "Environmental refugees: myth or reality ?" New Issues in Refugee Research - UNHCR Research Paper(34).
- Black, R. and V. Robinson (1993). Geography and Refugees. London, Belhaven.
- Brettell, C.B. and Hollifield, J.F., editors (2007) Migration Theory - Talking across Disciplines. London: Routledge.
- Brown, O. (2008) Migration and Climate Change. Geneva: IOM International Organization for Migration
- Burton, I., R. W. Kates, et al. (1993). The Environment as hazard. New-York, Guilford Press.
- Cambrézy, L. (2001). Réfugiés et exilés - crise des sociétés - crise des territoires. Paris, Editions des Archives Contemporaines.
- CARE/CIESIN/UNHCR/UNU-EHS/World Bank (2009). In Search of Shelter - Mapping the Effects of Climate Change on Human Migration and Displacement.
- Castles, S. (2002). "Environmental change and forced migration: making sense of the debate." New Issues in Refugee Research - UNHCR Research Paper(70).

- Castles, S. and G. Kosack (1973). Immigrant Workers and Class Structure in Western Europe. Oxford, Oxford University Press.
- Cholewinski, R., P. de Guchteneire and A. Pecoud (eds.) (2009) Migration and Human Rights. The United Nations Convention on Migrant Workers' Rights, Cambridge: Cambridge University Press and Paris: UNESCO Publishing.
- Christian Aid (2007). Human Tide: The real migration crisis, Christian Aid.
- Cohen, R. (1995) The Cambridge survey of world migration. Cambridge: University Press.
- Collectif Argos (2010). Climate Refugees. Boston, MIT Press.
- De Haan, A., K. Brock, et al. (2002). "Migration, livelihoods and institutions: contrasting patterns of migration in Mali." The Journal of Development Studies **38**(5): 37-58.
- El-Hinnawi, E. (1985). Environmental Refugees. Nairobi, United Nations Environmental Program.
- Findley, S. E. (1994). "Does drought increase migration ? A study of migration from rural Mali during the 1983-85 drought." International Migration Review **28**(3): 539-553.
- Gregory, J. W. (1928). Human Migration and the Future - A Study of the Causes, Effects & Control of Emigration. London, Seeley, Service & Co.
- Hamza, M. A., B. E. Faskaoui, et al. (2008). Migration and environmental change in Morocco: The case of rural oasis villages in the Middle Drâa Valley, United Nations University EHS - Case study Report
- Harris, J. and M. P. Todaro (1970). "Migration, Unemployment and Development: A Two-Sector Analysis." American Economic Review **60**(1): 126-142.
- Henry, S., P. Boyle, et al. (2003). "Modelling inter-provincial migration in Burkina Faso: the role of socio-demographic and environmental factors." Applied Geography **23**(2-3): 115-136.
- Hugo, G. (2008). Migration, Development and Environment. Geneva, IOM International Organization for Migration
- Hulme, M. (2008). "Geographical work at the boundaries of climate change." Transactions of the Institute of British Geographers **33**(1): 5-11.
- Hunter, L. M., M. J. White, et al. (2003). "Environmental hazards, migration, and race." Population & Environment **25**(1): 23-29.
- Intergovernmental Panel on Climate Change (2007). Climate Change 2007: The Physical Science Basis - Summary for Policymakers. Geneva, IPCC - Secretariat.
- Intergovernmental Panel on Climate Change (IPCC-I) (1990). Policymakers' summary of the potential impacts of climate change (Report from Working Groupe II to IPCC), [www.ipcc.ch](http://www.ipcc.ch).
- International Organization for Migration (2009). "Migration, Climate Change and the Environment." IOM Policy Brief.
- International Organization for Migration (IOM) (2008). World Migration Report 2008. Geneva, IOM.

- International Organization for Migration (IOM) and UNFPA (2008). Expert Seminar: migration and the environment. International Dialogue on Migration.  
<http://www.reliefweb.int/rw/lib.nsf/db900SID/PANA-7FNH38?OpenDocument>
- Isaac, J. (1947). Economics of migration. New-York, Oxford University Press.
- Jacobson, J. (1988). "Environmental Refugees: A Yardstick for Habitability." Worldwatch Paper - Washington DC(86).
- Jäger, J., J. Frühmann, et al. (2009). EACH-FOR - Environmental Change and Forced Migration Scenarios: Synthesis Report.
- Jonsson, G. (2010). The environmental factor in migration dynamics – a review of African case studies. Working Paper - International Migration Institute, University of Oxford.
- Kabat, P., L. O. Fresco, et al. (2009). "Dutch coasts in transition." Nature Geoscience(2): 450 - 452.
- Kaelin, W. (2008). "The Climate Change - Displacement Nexus." ECOSOC Panel on Disaster Risk Reduction and Preparedness: Addressing the Humanitarian Consequences of Natural Disasters.
- Kliot, N. (2004). Environmentally Induced Population Movements: Their Complex Sources and Consequences - A Critical Review. Environmental Change and Its Implications for Population Migration. J. D. Unruh, M. S. Krol and N. Kliot. Dordrecht, Kluwer.
- Kniveton, D., K. Schmidt-Verkerk, et al. (2008). Climate Change and Migration: Improving Methodologies to Estimate Flows. Geneva, International Organization for Migration - Migration Research Series 33.
- Kniveton, D., C. Smith, et al. (2009). Challenges and approaches to measuring the migration-environment nexus. Migration, Environment and Climate Change: Assessing the Evidence F. Laczko and C. Aghazarm. Geneva, International Organization for Migration (IOM): 41-111.
- Leighton, M. (2006). Desertification and Migration. Governing Global Desertification. P. M. Johnson, K. Mayrand and M. Paquin. London, Ashgate: 43-58.
- Loneragan, S. (1998). "The Role of Environmental Degradation in Population Displacement." Environmental Change and Security Project Report(4): 5-15.
- MacGranahan, G., D. Balk, et al. (2007). "The rising tide: assessing the risks of climate change and human settlements in low elevation coastal zones." Environment and Urbanization 19(17): 17-37.
- Marx, E. (1990). "The Social World of Refugees: A Conceptual Framework." Journal of Refugee Studies 3(3): 189-203.
- Massey, D.S., Arango, J., Hugo, G., Kouaouci, A., Pellegrino, A. and Taylor, J.E. (1998) Worlds in Motion : Understanding International Migration at the End of the Millennium. Oxford: Clarendon Press.

- McGregor, J. (1993). Refugees and the environment. Geography and Refugees. Patterns and processes of change. R. Black and V. Robinson. London, Belhaven: 157-170.
- McLeman, R., D. Mayo, et al. (2008). "Drought adaptation in rural eastern Oklahoma in the 1930s: lessons for climate change adaptation research." Mitigation and Adaptation Strategies for Global Change **13**(4): 379-400.
- Meze-Hausken, E. (2004). "Migration caused by climate change: How vulnerable are people in dryland areas?" Mitigation and Adaptation Strategies for Global Change **5**(4): 379-406.
- Morrissey, J. (2009). Environmental Change and Forced Migration: A state of the Art review. Oxford, Refugee Studies Center, Oxford Department of International Development.
- Mortreux, C. and J. Barnett (2009). "Climate change, migration and adaptation in Funafuti, Tuvalu." Global Environmental Change **19**(1): 105-112.
- Munshi, K. (2003). "Networks in the modern economy: Mexican migrants in the U.S. labor market" Quarterly Journal of Economics **118**(2): 549-599.
- Myers, N. (1993). "Environmental refugees in a globally warmed world." Bioscience(43): 752-761.
- Naik, A., E. Stigter, et al. (2007). Migration, development and natural disasters: insights from the Indian tsunami. Geneva, IOM.
- Naudé, W. (2008). "Conflict, Disasters and No Jobs - Reasons for International Migration from Sub-Saharan Africa." United Nations University - WIDER - Research Paper(85).
- Olsson, G. (1965). "Distance and Human Interaction. A Migration Study." Geografiska Annaler. Series B, Human Geography **47**(1): 3-43.
- Pais, J. F. and J. R. Elliott (2008). "Places as Recovery Machines: Vulnerability and Neighborhood Change After Major Hurricanes." Social Forces **86**(4).
- Paul, B. K. (2005). "Evidence against disaster-induced migration: the 2004 tornado in north-central Bangladesh." Disasters **29**(4): 370-385.
- Pécoud, Antoine and Paul de Guchteneire (2007) Migration without Borders. Essays on the Free Movement of People, Oxford:Berghahn and Paris: UNESCO Publishing.
- Pedersen, J. (1995). "Drought, Migration and Population Growth in the Sahel: The Case of the Malian Gourma: 1900-1991." Population Studies **49**: 111-126.
- Perch-Nielsen, S., M. B. Bättig, et al. (2008). "Exploring the link between climate change and migration." Climatic Change **91**(3-4): 375-393.
- Petersen, W. (1958). "A General Typology of Migration." American Sociological Review **23**(3): 256-266.
- Piguet, E. (2008). "Climate change and forced migration." New Issues in Refugee Research - United Nations High Commissioner for Refugees Research Paper(153).
- Piguet, E. (2010). Les apatrides du climat. [www.fondationmemoireAlbertCohen.ch](http://www.fondationmemoireAlbertCohen.ch), Fondation "Mémoire Albert Cohen" - E-colloque 2010 "L'état de droit".

- Piguet, E. (2010). "Linking Climate Change, Environmental Degradation and Migration: a Methodological Overview." Wiley Interdisciplinary Reviews: Climate Change(Accepted).
- Portes, A. and Böröcz, J. (1996) Contemporary immigration : theoretical perspectives on its determinants and modes of incorporation. International Migration Review XXIII, 606-630.
- Ravenstein, E. G. (1889). "The Laws of Migration." Journal of the Royal Statistical Society **52**(2): 241-305.
- Reuveny, R. (2008). "Ecomigration and Violent Conflict: Case Studies and Public Policy Implications Contact Information." Human Ecology **36**(1): 1-13.
- Reuveny, R. and W. H. Moore (2009). "Does Environmental Degradation Influence Migration? Emigration to Developed Countries in the Late 1980s and 1990s." Social Science Quarterly **90**: 461-479.
- Richmond, A. H. (1994). Global Apartheid. Refugees, Racism, and the New World Order. Toronto, Oxford University Press.
- Rodriguez, J., F. Vos, et al. (2009). Annual Disaster Statistical Review 2008 The numbers and trends. Brussels, Centre for Research on the Epidemiology of Disasters ([www.emdat.be](http://www.emdat.be)).
- Saldaña-Zorrilla, S. and K. Sandberg (2009). "Impact of climate-related disasters on human migration in Mexico: a spatial model." Climatic Change **96**(1): 97-118.
- Scally, R. (1995). The Irish and the "Famine exodus" of 1847. The Cambridge survey of world migration. R. Cohen. Cambridge, Cambridge University Press: 80-85.
- Semple, E. C. (1911). Influences of Geographic Environment. New York, Henry Holt and Company.
- Sen, A. K. (1981). Poverty and famines: an essay on entitlement and deprivation. Oxford, Clarendon Press.
- Sly, D. F. and J. Tayman (1977). "Ecological Approach to Migration Reexamined." American Sociological Review **42**(5): 783-795.
- Smith, K. (2001). Environmental Hazards, assessing the risk and reducing disaster. London, Routledge.
- Stark, O. and Bloom, D.E. 1985: The New Economics of Labor Migration. American Economic Review **75**, 175-1789.
- Stern, N. (2007). The Economics of Climate Change. Cambridge, Cambridge University Press
- Stouffer, S. (1940). "Intervening opportunities : a theory relating mobility and distance." American Sociological Review **5**(6): 845-867.
- Tacoli, C. (2009). "Crisis or adaptation? Migration and climate change in a context of high mobility." Environment and Urbanization **21**(2): 513-525.
- Taft, D. J. (1936). Human Migration: A Study of International Movements. New-York, The Ronald Press Company.
- United Nations High Commissioner for Refugees (2009). Climate change, natural disasters and human displacement: a UNHCR perspective. Geneva, UNHCR.

United Nations Development Program (2009) Human Development Report 2009. Overcoming Barriers: Human Mobility and Development, New York: UNDP.

Van der Geest, K. (2008). "North-South migration in Ghana: what role for the environment?" Paper presented at the International Conference on Environment, Forced Migration and Social Vulnerability, Bonn, 9-11 October.

Zelinsky, W. (1971). "The hypothesis of the mobility transition." Geographical Review **61**: 219-249.

Zetter, R. (2009). The role of legal and normative frameworks for the protection of environmentally displaced people. Migration, Environment and Climate Change: Assessing the Evidence. F. Laczko and C. Aghazarm. Geneva, International Organization for Migration: 385-442.