

Climate change and migration: A review of the literature

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1. Introduction

Climate change is one of the greatest challenges humanity as a whole is facing now. The possible magnitude of its catastrophic effects, in combination with the uncertainties behind its nature and predictability, result in a complex process of global and regional negotiations, in serious need of research inputs to catalyse action. Among the first catastrophic effects foreseen by experts working on environmental change in the 1970s and 1980s, forced displacement played an important role raising the attention of the international community about the seriousness of the problem at stake. Thereafter, the body of literature on climate change and migration has been growing, although authors still typically remark that the subject is understudied, fragmented and in need of robust evidence (Raleigh et al., 2008, Bardsley and Hugo, 2010, Piguet et al., 2011, United Nations Task Team on Social Dimensions of Climate Change, 2011, Gray and Bilsborrow, 2013).

The present literature review aims to provide a panoramic view of the different ways the link between climate change and migration has been addressed in the existing scholarship, building on the recent non-annotated bibliography issued by the International Organization for Migration in December 2012. Given the interplay of countless factors behind both biophysical modification of the atmosphere chemistry and the movement of people, a proper understanding of the link is beyond any single discipline. Therefore, the literature presents a great variety of viewpoints and increasing degree of interbreeding, addressing one or more of the interfaces connecting climate change and migration.

This review consists of three major sections, one presenting the background of the discussions, then another covering major themes and debates, followed by a highlighting of some observed gaps and opportunities. It is followed by a select annotated bibliography. Since so far the main concern has been generating knowledge about the climate-change/migration link, the sub-sections in the first and second part follow the scientific process of defining the problem, choosing a methodology, describing mechanisms and proposing solutions. While this seems linear, each section tries to make explicit the steps that the detailed inquiries into the link have experimented with. The third part of the review is informed by the focus of

the larger project this work belongs to, mainly on South-to-South migration and the effects on gender and families. Finally, the review also follows the human security framework (O'Brien et al., 2008, Afifi and Warner, 2008, Brauch, 2010, McAdam and Saul, 2010, Boano et al., 2012), adopting it as an appealing guide to promote new insights in the study and action about climate change and migration, which has already produced important advances.

2. Background and methodological issues

2.1. Starting the conversation

From prehistoric times, humans have moved around the earth partly motivated by the changes in weather patterns (Gupta et al., 2006, McLeman, 2011). This has been a discussion topic during the nineteenth and early 20th century, which then somehow disappeared from the scope of conventional research during most of the twentieth century (Piguet et al., 2011). Among the reasons for the gap, Piguet et al. (2011) suggest that (1) environmental migration was seen as a “primitive” phenomenon, bound to decline as human beings gradually increased their control over the environment, (2) the topic was rejected and replaced with socio-cultural approaches, (3) migration theory became dominated by the economic paradigm—either neoclassical or Marxist—and (4) forced-migration studies were centred on the role of the State causing the phenomena. It is important to observe that the background of this academic detour is a new step in the consolidation of the Westphalian model of nation-states, which in the late twentieth century came to associate security with control of people's movements across boundaries (Gasper and Truong, 2013).

The rise of the environment as a theme for human concern came to reverse this trend. Initial references to the contemporary debate on the effects of the changing environment including on human mobility are found in the seventies and eighties in reports such as Brown (1976) and El-Hinnawi (1985). These initial suggestions of the link emphasized the possibility of large scale forced migration, mostly presented as a precautionary call for action on the driving forces behind environmental change. Such emphasis subsequently motivated experts from international relations and security studies to further elaborate on the consequences such displacements could have, and the importance of mainstreaming them on the changing security agenda (Ullman, 1983, Homer-Dixon, 1991). Moreover, from its first report, the IPCC (1990) warned about the impacts of climate change on human migration.

However, as Laczko and Aghazarm (2009) point out, the momentum of those discussions was not enough to generate research and actions by migration experts or policy makers. For example, in the Declaration on Environment and Development of the 1992 Earth Summit in Rio de Janeiro, there was no mention of “environmental migrants” and the word was only used one time in the frame of the sub-program for droughts and desertification of the Agenda 21 (Afifi and Warner, 2008). Most of the literature included in the present review was published later, in the first decade of the twenty-first century, which may be related to a revived attention to climate change in a broader perspective.

One common characteristic of the initial propositions of a link between climate change and migration is that they seemed to be deterministic—even as some of those authors clearly stated that is not their intention. The deterministic take on the link was enough while the motivation was to reduce growth of greenhouse gas emissions. It played two important roles in the narrative: allowing the production of rough estimates on the scale of the migration, and opening the discussion on possible countermeasures including via international law, as will be presented in sub-section 3.4.1 (Laczko and Aghazarm, 2009).

However, once adaptation enters into the picture and migration has to be assessed in itself, the challenges are different. It is then necessary to hypothesize the mechanisms through which climate change could result in migration, match them with the complexity underlying the occurrence of migration, and look for evidence that supports the initial assumptions.

2.2. Factors under consideration

A first step to grasp the major arguments under discussion is to identify some of the basic elements under consideration. That is, to identify the specific phenomena related to climate change that may result into migration, as well as the possible characteristics of the expected mobility.

2.2.1. Climate change and resulting environmental changes

In relation to climate change, an extensive list of possible disruptions is presented by the UK Government sponsored Foresight project (2011), namely:

- 1) sea level rise
- 2) changes in tropical storm and cyclone frequency or intensity

- 3) changes in rainfall regimes
- 4) increases in temperature
- 5) changes in atmospheric chemistry
- 6) melting of mountain glaciers.

Not all of them are addressed by all the authors. For instance, Piguet et al. (2011) only take 1, 2 and 3, observing that the changes in the water cycle are as likely to produce excesses on its flow, as to produce droughts and desertification.

Raleigh et al. (2008) observe that there are no cases of migration directly linked to (4), although it could certainly affect livelihoods and considerations for agriculture, in turn stressing the system. Therefore, increases in the temperature do not appear as direct drivers resulting in migration, but as slow onset factors which have indirect effects on the livelihoods. Something similar happens with disruption 6, while disruption 5 seems mainly absent from the literature.

2.2.2. About migration

The main question addressed by the literature is whether there is or is not migration related to climate change, about which there is general agreement on a positive answer (Barnett and Webber, 2009; Laczko and Aghazarm, 2009; Foresight Project and Government Office for Science, 2011). The IPCC states that “Climate variability will result in some movement of stressed people but there is *low confidence* in ability to assign direct causality to climatic impacts or to the numbers of people affected” (IPCC, 2012), which summarizes the challenge for researchers in the area. The following are some of the most important characteristics of the movements scrutinized.

The most common question is the *magnitude* of the movement, which is a critical question when attracting attention to the issue, although it might be impossible to resolve (ADB, 2012). Moreover, the initial framing of the phenomena in terms of refugees had at its centre the question of whether the displacement of people was *voluntary* or *forced*. This is a question that is not present in every one of the reviewed assessments, but since it is closely related to the more basic question of whether the effects on the migration are *direct* or *indirect/multi-causal*, it remains in the field of discussion. The latter question, in turn, lies at the heart of the increased

methodological sophistication that has been evident in the literature, as presented in the following sub-section.

Also deriving from the initial framing of the phenomena, the “*distance*” of the migration movement is under question, especially whether the movement is domestic or across borders. In relation to distance, studying the effect of climate change on rural-urban migration has also received increasing attention, both as a possible way in which causation can be discerned, as well as a way in which populations might in fact increase, rather than decrease, their vulnerability (Foresight Project and Government Office for Science, 2011).

Whether the movement is *temporary* or *permanent* has also received attention in the literature, mainly related to populations’ different reactions to disasters or slow-onset stress on livelihoods. Identifying factors behind moving permanently or temporarily or *not moving* has become important in order to construct migration narratives.

2.3. Methodologies for study of climate change and migration

Piguet (2010) advanced a classification of six different methodological approaches in the study of climate change, environmental degradation and migration¹ Each approach has strengths and weaknesses, and gives rise to different insights into the complexities of variables involved. Four of them are more frequently used, namely:

- ▶ Ecological inference based on area characteristics²: The approach consists in reconstructing the individual behaviour from group-level data, usually corresponding to a geographical area. It is an attractive approach because the data is easier to collect and it allows comparability. However, the environmental indicators used tend to be too basic—e.g., rainfall or natural disasters—foregoing the complex picture of climate change environmental impacts, and the approach makes it difficult to analyse at the personal, household or sub-group level, if specific data is not available.

¹ This typology does not include methodologies to forecast the impact of climate change on migration, which are introduced in section 3.1. Still, observe that the first of the listed methodologies is similar to approaches to forecasting.

² From Piguet (2010): “The word ‘ecological’ indicates that the unit of analysis is not an individual but a group of people, usually corresponding to a geographical area.”

- ▶ Individual sample surveys: This approach addresses the shortcomings at the micro level in the previous case, through large surveys. It is named individual in contrast to the group approach inherent to ecological inference. The analysis can vary from simple cross-tabulations to regression models. The surveys do not address the problem of the complex effects of climate change and the environment, and can also miss the larger picture of the context in which the populations sampled live. Bilsborrow and Henry (2012) present a review of specific case studies and ways to improve the methodology, suggestions that the authors have used for conducting research following the next methodological approach.

- ▶ Multilevel analysis: This approach involves combining the previous two approaches, and even including time series. It thus results in more elaborated models that allow for a significant expansion of the range of variables analysed, enhancing precision. Drawbacks include limitations in deriving the spatial units used in the model, which may not match with the scale of the environmental phenomenon at stake, and the difficulty in gathering contextual information. The works of Gray and his team (Gray and Bilsborrow, 2013, Gray and Mueller, 2012) are good examples of this methodology—see Box 1.

- ▶ Qualitative/ethnographic methods: this is the most common approach, consisting of interviews or small sample questionnaires covering populations under threat, privileged inhabitants and other local data. These studies tend to favour the multi-causal, complex view of migration; still both confirm and challenge the importance of environmental factors in migration. The obvious shortcoming is that the approach cannot provide quantitative outputs, but it is a vital input to generate better models. A large-scale example is the experience of the EACH-FOR project, a trans-continental effort to explore and describe the causes of forced migration in relation to environmental change and provide plausible future scenarios of environmentally-induced forced migration (Jäger et al., 2009). Despite being the most common approach, there are no reviews on the methodological challenges across the different tools included in this category. Warner (2011a) offers detailed insights on the methodological intricacies of the EACH-FOR project, which used all the traditional elements of primary data collection—i.e., the semi-structured expert interviews, semi-structured field interviews, migrant questionnaires, non-migrant questionnaires—as well as desk studies, for the 23 case-studies undertaken.

Some of the most interesting observations include: the difficulty to locate migrants reporting that a certain effect of environmental change is a problem, although through the interviews they recognize effects of the environment phenomena on their livelihoods—and this seem to happen even after adopting a non-probabilistic sampling, i.e., chain referral, in order to find interviewees; the timing of the interview in relation to the occurrence of the environmental disruption, changing the population awareness of the situation. Warner suggests that, besides parallel quantitative research, there is need for in-depth, comprehensive research, undertaken over a time horizon of several years. Focusing on representative hot spots would also be of help, for connecting prospective and analytic approaches to climate change and migration. One of the case-studies is described in Box 2.

Two other methods mentioned by Piguet are time series and agent-based models³, but they have not been used much in the literature so remain options for future work.

Box 1. Research examples: Drought and Population Mobility in Rural Ethiopia by C. Gray and V. Mueller

This paper presents a quantitatively elaborated analysis to investigate the effects of drought on mobility. It is an example of multivariate analysis: the authors use a data from an extensive household survey over a 15-year period undertaken by Oxford University and Addis Ababa University, which allows different degrees of disaggregation—i.e., person, household and community levels, gender, and characteristics of migration by distance (long or short) and motivation (work, marriage or other)—as well as the occurrence of the environmental shock as reported by the community. The authors' approach is event history analysis, consisting of multiple regressions of a person-year dataset, three different measures of drought and several control variables. Gender was of special interest for the authors, as a test of generalist narratives on environmentally-induced migration, so all the regressions were done separately for men and women. The results confirmed expected patterns such as extreme drought resulting in more migration and vulnerable men (by size of land plots) being more prone to long migration. However, the migration of women related to marriage appeared to be negatively affected by droughts. Authors cite ethnographic research in Ethiopia describing the marriage practices, to suggest that the result is related to the expenses associated to marriage. No additional qualitative research to verify this suggestion was undertaken.

³ ABM methodology consists in computer simulations of the behavior of individuals and households to the different variables relevant to climate change-induced migration, as well as the interactions between the social actors.

3. Main themes and debates

3.1. Scale and location

Publications on the link between climate change and migration are likely to advance a tentative estimate of migrants and to suggest the locations of the most vulnerable populations. This is an approach to the problem that diverges from the analytical efforts to understand the intricacies of the interaction that characterize the more recent literature, but since it plays an important role in advocacy and policy-making it deserves mention.

As for the numbers, the most quoted estimate is of 200 million people displaced by 2050, a number proposed by Myers (2002), based on different estimates of the effects of climate change in terms of poverty, food scarcity, sea level rise, floods and droughts. This figure was used by Stern (2007) in his famous review, and it is cited by the IOM, within a range that goes from 25 million to 1 billion people (Baird and Christian Aid, 2007, Brown, 2008). Besides, the time span of 50 years in order to produce scenarios has also been adopted by reports such as the Foresight Program (2011). This time frame is chosen since many population growth scenarios put the peak of global population around 2060 (New et al., 2011).

Once some of the mechanisms resulting in mobility are defined, the estimates of migrants are complemented with other numbers that are available in the literature. For example, the IDMC and NRC (2012) have started preparing annual reports on people displaced by natural hazard-induced disasters, partly motivated by the needs of deeper knowledge recognized by the international community. Other numbers that are used in order to inform scenarios are demographic data (Hugo, 2011), which is then matched with specially exposed settings. So for instance, the Foresight Project (2011) reports the number of people living in floodplains of urban areas in East Asia may rise from 18 million in 2000 to 45–67 million by 2060, from 4 million in 2000 to 35–59 million by 2060 in South-Central Asia; from 7 million in 2000 to 30–49 million by 2060 in South-Eastern Asia and from 2 million in 2000 to 26–36 million by 2060 in Africa, in order to give an idea of the possible consequences. Other numbers include the actual rates of *registered* internal and international migrants, approximately 740 million internal migrants in 2009 and approximately 210 million international migrants in 2010. Nonetheless, as more and more analytical information is made available and the complexity of migration acknowledged, specific numbers of climate change related migrants are not directly suggested. As posed by the Foresight Project (2011)

“A deterministic approach that assumes that all or a proportion of people living in an ‘at-risk’ zone in a low-income country will migrate neglects the pivotal role that humans take in dealing with environmental change, and also ignores other constraining factors which influence migration outcomes.”

The other component of scenario making is georeferencing the abovementioned data and identifying hotspots where the effects of climate change could be expected to be more extreme. Relevant examples include Ehrhart et al. (2008) and Warner et al. (2009). The former presents a more global perspective, focusing on cyclones, floods and droughts, mainly using environmental data. Areas identified include: (1) for flood-risk: the Sahel, the Horn of Africa, Great Lakes region, Central Africa and Southeast Africa; Central, South and Southeast Asia; and Central America and the western part of South America; (2) for drought-risk: sub-Saharan Africa; South Asia, particularly Afghanistan, Pakistan and parts of India; and South East Asia, particularly Myanmar, Vietnam and Indonesia; and (3) for cyclone-risk: Mozambique and Madagascar, Central America, Bangladesh, several parts of India, Vietnam and other Southeast Asian countries (Thow and de Blois, 2008).

The work of Warner et al. (2009) concentrates on hotspots, including some new places that become relevant when population density or the effect of sea level rising is introduced, such as the Nile Delta, Central America and Small Island States. Other related examples quoted by IOM include Ericksen et al. (2011), who focuses on food security, a secondary mechanism for possible migration⁴, although the authors themselves make no explicit connection.

3.2. Mechanisms behind migration

Within the diversity of impacts and their peculiarities, most of the analytical literature tends to address only a single mechanism, usually in a single location. There is no single typology, authors use different formulations, but the following list covers most of the existing research. One important point deserves mention in advance: in contrast to the previous section on future-oriented research, analytical research concentrates in finding evidence of the actual occurrence of displacement motivated

⁴ In principle, from the food security perspective, migration is a traditional way to deal with vulnerability, especially in rural settings. The suggestion in relation to Ericksen et al.’s (2011) research is whether the impacts of disaster and possible effects on crops yields might make this alternative unsustainable. Research on rural or rural-urban migration, such as the works of Gray et al., deal partly with this question.

by environmental phenomena. The rationale is that instead of focusing on the uncertain and barely predictable character of migration flows, it is more important establishing a more sophisticated understanding of how environmentally linked migration may appear as part of existing and emerging migration systems (Findlay, 2011).

Therefore, not all of the research does necessarily refer to climate change; researchers investigate migration connected to environmental factors in the past and in the present, no matter if they are presented as climate change. For example, in Hugo (2008) climate change is only one of the possible connections between environment and migration. As climate change receives increased attention, it could be expected that the relevant research would include the term inside the keywords, although other terms such as (global) environmental change are also common; therefore, future research about the linkage between the two should consider an expanded set of keywords to identify literature. Besides, one of the effects not initially included as relevant in the climate change discussion, i.e., development projects, has also started to receive attention, as mentioned below.

Box 2. Research examples: Women who go, women who stay: reactions to climate change, by Jenny Jungehülsing

This is a case study about migration and gender in the Chiapas region of Mexico between 2007 and 2008, part of the EACH-FOR project (Jäger et al., 2009); the research is qualitative and aims to present an initial look at the topic and identify lines of research for future study. The area covered by the research is traditionally affected by different types of extreme events, such as hurricanes and tropical storms, and also presents symptoms of slow-onset environmental effects because of deforestation; droughts and forest fires have been also reported. The Chiapas region was not famous for outmigration but in the last 15 years the trend has changed, evidenced by the growing flow of remittances. The study was divided in two stages, one of preliminary consultations with experts in the region mainly to fine-tune the strategy for the fieldwork undertaken during the second stage. The fieldwork included 77 semi-structured interviews with migrants, questionnaire surveys in three schools, plus additional interviews with key informants. The main topics were: background on roles and responsibilities of women and men; effects of climate change experienced; strategies for migration; and reasons for moving and for not moving. Research on migration from the starting point presents the problem of not reaching those who actually displaced, so the research tried to capture stories of migration of relatives. The author identifies the effect of the environment via its effect on the livelihoods, which impacts men and women differently given their traditional roles. Those roles condition their attitudes to migration, in relation to the distance and duration of the displacement.

3.2.1. Rapid-onset: Disasters

Tropical cyclones, storms, and floods are typical examples of rapid-onset phenomena impacting on population displacement. According to IDMC and NRC (2012) the estimated number of new displacements by weather related disasters in 2011 was 13.8 million people. This number also includes persons displaced by wildfires and extreme temperatures. Piguet et al. (2011) quote other historical sources that put the number of persons affected yearly by flooding around 99 million between 2000 and 2008, and by tropical cyclones and storms at 39 million. Nonetheless, the authors recognize estimation is extremely difficult, especially because it is not possible to predict beforehand whether densely populated areas would be affected.

About the characteristics of this migration, the evidence suggests that it is short-distance and temporary in nature (Laczko and Aghazarm, 2009). Paul (2005) presents the case of a tornado in north-central Bangladesh, close to the frontier with India, where fieldwork showed only occasional migration, linked to reconstruction efforts in other affected areas. The example of the 2004 Indian Ocean tsunami is also cited, after which movements were predominantly short distance with populations returning to their areas of origin as soon as they were allowed (Findlay, 2011); it is commented that the needs of reconstruction there too would result in an influx of workers, who may or may not stay (Bardsley and Hugo, 2010). However, research at the macro level finds that continued effects of disasters may motivate people to move from their own country, some of the studies suggesting that the resulting internal migration should be larger (Naudé, 2008, Afifi and Warner, 2008). The possibility of large-scale trans-boundary movements out of disaster areas is thus reported as limited, relative to the impact of socio-economic variables or disasters directly affecting densely populated frontiers (Piguet et al., 2011). This by no means implies that the challenges are small; it rather highlights the necessity of a people-centred approach that does not perceive migrants as a security threat—see 3.2.4 below. In fact, the most vulnerable people may be those who cannot move, either internally or abroad, which adds complexity to our understanding of climate change and migration patterns (Black et al., 2011).

3.2.2. Slow onset/multi-causal: livelihoods

Pressures from climate change included in this family of mechanisms include mainly drought and other degradations of the milieu following changes in environmental patterns, as well as melting of mountain glaciers. The evidence shows 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. In this case too the evidence is very contested, reports presenting different levels of influence of the environmental factors on the resulting migrations, larger as in Afifi and Warner (2008) or less so as in Henry et al. (2003) at the local level or Findley (1994) at the international level.

Studies in this field are the most fruitful sources of insights about the complexities of migration, giving way to new narratives. For instance, Gray and Mueller (2012) found in Ethiopia that droughts did motivate migration by men in order to supplement the household income, and that land-poor households were more vulnerable; however the result was not the same for women: marriage-related mobility was delayed because of high-expenses associated with marriage. In rural Ecuador, research shows that households respond to environmental factors in diverse ways, resulting in complex migratory responses (Gray and Bilsborrow, 2013). The authors highlight for both cases the need to generate hybrid narratives about environmental change and migration, recognizing not only the complexity of the phenomena but also the capacity of rural areas to cope with the effects.

The opposite phenomenon, not being able to move out of harm's way, is another emergent approach to migration and climate change effects. The finding of Findley (1994) about reduction of migration outside Mali in the eighties droughts was connected to the lack of resources to do so. Migrating is expensive and risky, thus when degraded environmental goods and services result in disrupted livelihoods, climate change may instead trap the most vulnerable (Black et al., 2011a), while inducing some better-off people to move. This observation is one of the main messages from the Foresight Project (2011) and it is in need of further investigation and mainstreaming among major stakeholders.

3.2.3. Sea level rise (SLR)

SLR is one of the most iconic effects related to climate change, and also the most straightforwardly connected to forced migration. Alas, it is rather a new phenomenon

and the number of studies is still very limited (Piguet et al., 2011). A good share of the literature is concentrated on simulating future scenarios, as those presented in section 2.4. Given that they only depend on geophysical information—i.e., configuration of the coastline, altitude and population—they are simple to put together and generate projections. Scenarios of the magnitude of the SLR are included in the IPCC reports, which are then used to generate the scenarios. There are analyses for scenarios between 1 and 5 meters rise (Dasgupta et al., 2007), up to 10 meters rise (McGranahan et al., 2007). The results usually stress the vulnerability of two types of populations: those living in cities and the small islands and small island states, or small islands developing states (SIDS) as they are called by the UN system.

About cities, one of the points that has received more attention recently is evidence that many people might be moving from less to more environmentally vulnerable settings (McGranahan et al., 2007; Foresight Project and Government Office for Science, 2011). This highlights the importance of promoting more research and action on cities' capabilities to adapt (El-Raey et al., 1999, Revi, 2008), as well as understanding the diverse patterns of migration associated with modern cities. This focus for research does in fact resonate with the trends on disasters, as supported by major international organizations (World Bank and United Nations, 2010), although it does tend to frame migration only as an impact.

The situation of SIDS raises more difficult questions, which go beyond the forecasting to the measures required if whole countries disappear. Documented examples of full relocation of islands exist inside nation-states, mainly Great Britain and New Guinea (McLeman, 2011, Boano et al., 2012), but the situation for the SIDS is expected to be different. The basic research in this setting has been more focused in understanding, top-down and bottom-up, the dynamics underlying the tangible menace of disappearance. Authors have noted that global discourses on climate change are instrumentalizing SIDS populations, to advance the case for climate change reaction (Farbotko and Lazrus, 2012), but that in fact these populations have traditional and new ways of coping with weather variability that is typical of their geographies (Campbell, 2006), although the diaspora remains an ambiguous source of support, positive in the networks and remittances they make available, but possibly weakening domestic institutions as the skilled populations leave (Julca and Paddison, 2010). Governments of the SIDS have expressed their willingness to avoid migration (Maas and Caius, 2011), although their ability remains in question. Some

of the literature dealing with the legal and policy countermeasures to the specific case of SIDS is introduced later in this review.

3.2.4. Conflict

As mentioned above, the possibility of conflict was one of the early arguments that fed into the emergence of environmental migration as a global concern. Homer-Dixon (1991) hypothesized that severe environmental degradation was going to produce three principal types of conflict: (1) simple scarcity conflicts, (2) group-identity conflicts and (3) relative deprivation conflicts. He was not deterministic about the outcomes, but presented existing examples that fitted his typology. He characterized each of the categories differently: (1) as being fundamentally international, (2) both internal and international, and (3) mainly internal but with repercussions beyond borders.

Thirty years later, the evidence of the actual occurrence remains contested. First of all, the instances of conflict advanced by Homer-Dixon respond to different orders of causality: in categories 1 and 3 it is mainly the environmental pressure that leads to conflict, which may result in migration, while in 2 the main mechanism is the opposite: environmentally-induced migration resulting in conflict. The two orders of causality could be illuminated by work on simpler research questions—i.e., the study of climate change and conflict (Smythe, 2010), as well as research on migration and conflict (NRC, 2008)—however in-depth review of those topics is beyond the scope of the present research.

Theoretically, there are attempts to propose more elaborated mechanisms on the links between the three phenomena (Raleigh, 2011), and even the UN Secretary General has suggested channels through which climate change could result in conflict (2009)—mainly increasing vulnerability, disrupting development, facilitating domestic conflict, producing statelessness or triggering international conflict. Others have questioned the very concept of environmentally induced conflict (Hagmann, 2005) although the environmental component of some conflicts is widely accepted (Boano et al., 2012; NRC, 2008).

Still, the evidence of conflict linked to environmentally motivated migration remains contested. Reuveny (2007) compiled a sample of 38 cases of recognized environmental migration episodes in order to confirm the occurrence or not of conflict. Half of the cases identified resulted in conflict, but the author recognizes

multi-causality in the ways violence sprouts, or fails to, which makes it difficult to present them as environmental conflicts (Boano et al., 2012). Evidence of the underlying complexity is also recognized elsewhere (Salehyan, 2008, Bernauer et al., 2012), although researchers have found correlation between environmental phenomena and conflict in some areas, like civil conflicts affected by El Niño/Southern Oscillation (ENSO) (Hsiang et al., 2011) and social conflicts in African countries because of deviations in the rainfall pattern (Hendrix and Salehyan, 2012).

Raleigh et al. (2008) recognize that rural and urban instability are related to the outbreak of conflict, but there is still much to be researched before a clear-causality from climate change to conflict could be asserted. The connection between climate change and migration is already complex enough to determine, making evidence very limited. Instead, authors recommend avoiding the securitization of issues of climate change and migration, especially because it stigmatizes migrants and undermines efforts to mobilise collaborative action. Human security approaches offer an alternative in this direction, as observed in section 4.

3.2.5. Other mechanisms: Mitigation and Adaptation, Health impacts

Some authors have also pointed out that, additional to the case of the small island states, strategies to mitigate and adapt to climate change would also result in migration, which in turn would require attention. Examples include changes in the land-use towards conservation purposes or other projects requiring relocation of populations (McDowell, 2011). There is little research about this, although the well-documented experience of development projects such as dams may be useful (Dams, 2000, UNEP, 2007, Barnett and Webber, 2009, Penz, 2010); lower scale ongoing examples include relocations of communities affected by floods, but more literature documenting these experiences is warranted (Dun, 2011). De Sherbinin et al. (2011) have called for use of this experience, and even a reframing has been suggested, presenting drastic measures as “transformational adaptation”, partly because the difficulty of its implementation requires a paradigm shift (Kates et al., 2012). Nonetheless, Barnett and Webber (2009) note that involuntary resettlement rarely leads to improvements in the quality of life of those who are moved. Other forms of destitution resulting in displacement can be the result of other types of driving forces, such as those described by Davis (2001), especially in relation to the economic paradigm in command and its interaction with physical environmental changes.

3.3. Migration: to be seen as an impact or as an adaptation strategy?

Moving into the policy arena, one of the main debates that has characterized most of the ongoing discussion on climate change and migration was to recognize (or not) migration as an adaptation strategy, instead of (or not only as) seeing it as an impact. This discussion derives from the initial framing of environmentally induced migration as resulting in refugees (El-Hinnawi, 1985). As was already explained, that was a favourite introduction of the theme by security scholars, and it is still used and discussed in the literature mainly to call for attention to climate change (Sachs, 2007; NRC, 2008), or to devise new international law tools—e.g., Biermann and Boas (2010) and McAdam and Saul (2010).

Opposition to the “refugee” framing emerged, both from actors representing the humanitarian sector and inside migration research. While the former may have benefitted from the appeal of the framing, as in the case of the IOM, the UNEP and IPCC, research for the UNHCR has argued that this strategy can undermine the existing legal regime for refugees (Kälin and Schrepfer, 2012). Black (2001), reviewing how the refugee framings fared against evidence, suggested that it was linked to particular agendas, and queried the use of the term because it was simplistic, not reflecting the complexity of the problem. Besides, It is not anymore necessary to posit nightmare scenarios of migration in order to make the case for the dangers of climate change.

There are multiple arguments defending migration as adaptation. The most basic ones are the pre-historic and contemporary evidence of that being the case, as presented in the mechanisms above. Findley (1994) very early suggested that the alternative to act against droughts was to find ways to encourage migration. However, alarmist predictions that aimed at sensitizing Governments and public opinions contributed rather to further stigmatise migrants from less developed States (Piguet et al., 2011).

There are many ways in which migration is or can be a promising adaptation strategy. Besides moving out of the way of the impending threat, migrants can help by transferring knowledge, technology, remittances, and other resources back to their places of origin, which according to Scheffran et al. (2012) goes even beyond migration-as-adaptation, offering a broader perspective of the positive impacts of

migration. “Migration may be the most effective way to allow people to diversify income and build resilience where environmental change threatens livelihoods.” (Black et al., 2011b)

The efforts of the scientific community in re-shaping the international view on migration reached a milestone in 2011. In that year, migration and displacement appeared for the first time in an agreed outcome of a Conference of the Parties (COP) in Cancun (Warner, 2011b). The COP, in its second section on “Enhanced action on adaptation,” invited the parties to undertake “14... (f) Measures to enhance understanding, coordination and cooperation with regard to climate change induced displacement, migration and planned relocation, where appropriate, at national, regional and international levels.”⁵ This recognition of migration’s role in adaptation is expected to give rise to different sorts of adaptation strategies, as briefly presented in the following sub-section.

3.4. Options for action

3.4.1. International law

The relevance of international law as an option for dealing with migration derives from the early presentation of the persons on the move as “refugees” (El-Hinnawi, 1985). Elsewhere inside international humanitarian law, the definition of who are refugees has been widely discussed and instruments for their protection have been at the forefront of humanitarian action. Precisely because of the incompatibilities between the new phenomenon and the existing regimes the need for new instruments has been voiced (Biermann and Boas, 2010, Kälin and Schrepfer, 2012, Lopez, 2007). Besides the legal void of statelessness ensuing from the disappearance of full states, some of the other arguments deserve mention.

The international law approach is one that could be designed notwithstanding the uncertainty on the numbers. Once the limitation of forecasting methods is acknowledged, proponents of new legal instruments do so in the recognition that lack of clarity on the magnitude of the phenomena cannot be used to delay preparations. In fact, most of the literature makes clear that migration would continue happening, and that the environmental factors would keep influencing the movements.

⁵ The full text is available at the Cancun Adaptation Framework home page http://unfccc.int/adaptation/cancun_adaptation_framework/items/5852.php (accessed April 15, 2013).

Another stalemate that international law approaches are trying to address is the narrow view on responsibility so far present in the climate change debate. Kälin and Schrepfer (2012) point out that there has been too much emphasis (judged in terms of the policy pay-off that has been and can be achieved) on historical greenhouse gases emissions and distributing the economic burden of the required mitigation and adaptation programs; in other words, holding developed countries responsible for climate change and thus expecting them to cover the measures necessary to deal with the impacts. The authors sustain that this focus is not deemed to be successful, and in the meantime the affected populations would remain unprotected. Therefore, a focus on the situation of these populations and how to cover their needs from a human rights perspective appear more appropriate.

Penz (2010) presents a more comprehensive panorama of the responsibilities at stake in the discussion of climate change refugees, which encompasses Kälin and Schrepfer on compensation and international responsibilities, and adds responsibilities in terms of free movement and insurance—in the sense of social security. He points out that a possible failing of the legal approach is that it is not preceded by an ethical study, which is his aim. He defends the use of the word refugee because it is productive, it keeps the focus on the people harmed, other formulations can be equally stigmatized, and that it is in fact such stigmatization and simplification of the phenomena what has to be challenged. He maintains that victimhood and agency are not mutually exclusive and prepares the way for both legal and policy-oriented solutions.

Kälin and Schrepfer (2012) maintain that there are three critical legal issues to be addressed: “(1) criteria to distinguish between voluntary and forced movements, though such distinction is necessary in light of the fact that international law treats them differently; (2) rights related to admittance and stay on foreign territory; (3) the legal situation and rights of persons on foreign territories, i.e. status rights.” They all make reference to the different ways in which the existing definition of refugee does (or does not) apply to climate change related migration.

Clarification on each of these issues would then be necessary to come up with definitions of environmental migration good enough to support a legal instrument. However, international organizations have opted to go in the opposite direction, suggesting all-embracing definitions that include the multiple ways in which the phenomena can emerge. The definition in question is IOM (2007, pp. 1-2):

Environmentally induced migrants are persons or groups of persons who, for compelling reasons of sudden or progressive changes in the environment 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.

The position of the IOM is presented as an alternative to the refugee framework, echoing the objections of the UNHCR. The comprehensiveness of the definition goes against the interest in a clear division for a legal instrument, instead preparing the way for general policies.

Behind this change of perspective, arguments refer to both the issues in need of clarification, as well as the appropriateness of the legal approach. Some authors have pointed out that recognizing the difference between voluntary and forced movement is not always straightforward, and favour thinking of a continuum (Hugo, 1996). In this sense, Penz's (2010) suggestion that the problem is in the way *forced* is understood deserves attention: not only threat and direct dispossession but also deprivation of necessities can coerce populations.

In general, the opposing opinions doubt whether the complexity of the phenomenon could be captured through the legislation (Hulme, 2008, Foresight Project and Government Office for Science, 2011).

The fact that most of the expected migrants would be internal, rather than international, suggests that the usefulness of a general treaty is very limited (Barnett and Webber, 2009). This view of the debate sustains that the cases or hot spots compromising borders could be better dealt with through bilateral arrangements. Moreover, existing legal instruments to protect IDPs already face serious problems in implementation because of the weakness of the institutions in the countries of the South, where the most vulnerable populations live (Laczko and Aghazarm, 2009). The legal approach accompanied by a new UN bureaucracy imposing top-down solutions is seen as paternalistic and as reinforcing the view that countries in the South are a threat for the North (Hulme, 2008).

The special case of SLR and small island states appears in principle to offer a better opportunity for a global framework. Yet, not only has qualitative research suggested that the adaptation capacity of these populations is better than usually stated

(Campbell, 2006, Farbotko and Lazrus, 2012), but also existing examples of cooperation have been mainly bilateral and required to be as low-key as possible in order to avoid politically backfiring in the recipient country (Boano et al., 2012). In sum, the possibility of international legislation has not been totally discarded, but there are many other means deserving attention, including the free movement and insurance approaches suggested by Penz (2010).

3.4.2. Policy options

Piguet et al. (2011) suggest a typology of policy options available and touched upon in the literature, namely development strategies, post-disaster interventions, humanitarian relief, and immigration and admission policies.

Development strategies are usually advanced by authors recognizing the complexity of the mechanisms linking climate change and migration. That is, these are interventions in order to deal with poverty and the larger picture of social vulnerability that has long been in the agendas. An example of initiatives coming from the international level to the national one is the National Adaptation Programmes of Action (NAPA), which “provide a process for Least Developed Countries (LDCs) to identify priority activities that respond to their urgent and immediate needs to adapt to climate change – those for which further delay would increase vulnerability and/or costs at a later stage.”⁶ Thus NAPAs offer the opportunity to tailor development plans to the newly identified needs. Nonetheless, other UN agencies observe that the NAPAs are still to be integrated to the more general strategies of poverty reduction (Laczko and Aghazarm, 2009).

Among development policies, resettlement is an option that generates special interest, because it is considered both a possible solution and an indirect way in which climate change results in migration (McDowell, 2011), which was already discussed. Attention to post-disasters interventions has kept pace at the international level, following recurrent tragedies related, or not, to changing environmental patterns. Action strategies include dedicated institutions and/or close partnership between the UN system, the World Bank, the International Monetary Fund, the

⁶ From the UNFCCC page: http://unfccc.int/national_reports/napa/items/2719.php (accessed April 14, 2013).

private sector and the civil society (World Bank and United Nations, 2010)⁷. These agreements combine also humanitarian measures, which are well established fields of effort—leaving aside the discussion on international law. Findings in relation to the link between climate change and natural disasters do indeed serve to highlight the urgency of risk reduction strategies. Still, similar to the case of development projects, international agreements, efforts on capacity building, projects and other initiatives related to disasters appear to advance without connection to the discussions on the climate change front.

That said, it is not clear how far migration is included inside the international agreements. The Hyogo Framework for Action, in force until 2015, only includes one item related to migration among the priorities for action, namely the endeavor to ensure, as appropriate, that programmes for displaced persons do not increase risk and vulnerability to hazards (World Conference on Disaster Reduction, 2005). The details in relation to migration or measures such as relocation are dealt with at the level of toolkits.

More direct action could be generated by addressing migration policy at the national level, so that the adaptation potentials offered by migration are realized. Obstructive and constructive measures towards migration (Newland, 2011) have to be analysed in context and sufficiently discussed in order to influence decision makers. These changes have been argued mainly at the level of migrant workers (UNDP, 2009), although it has been on the table after recent mega-disasters such as the earthquake in Haiti in 2010 (Bernstein Murray and Petrin Williamson, 2011). The main arena for action in this respect is the national level where each country's policies are decided, or even bilateral agreements when specific vulnerable groups are addressed—in contrast with a global approach. Of relevance for the debate on migration policies is the need and benefits of continued social protection through the process of migration (Gasper and Truong, 2013), about which international cooperation could offer a start (Johnson and Krishnamurthy, 2010).

⁷ There is an international institutional framework around disaster prevention and management working in parallel to that of climate change. Relevant actors include the Global Facility for Disaster Reduction and Recovery (GFDRR) and the UN International Strategy for Disaster Reduction (UNSDIR), who support bi-annual meetings of all the stakeholders in global platforms and world conferences.

4. Gaps and Opportunities

4.1. Gaps and opportunities in the analytical approach

The study of the link between climate change and migration is still in process of development and consolidation. Research using old and new methodologies in order to clarify the dynamics and mechanisms of the link is still highly necessary. One limitation is the amount and quality of the data, which need to be painstakingly compiled in the areas where populations are on the move. This could be done through advocacy and specific projects, but the lack reveals a more profound problem: it appears that *most of the knowledge on climate change and migration is not produced where these effects are going to take place*. This problem links to the lack of understanding on how vulnerable populations receive the discourse of climate change (Rudiak- Gould, 2011). It is also related to the problems on quality and paucity of data (Gray and Mueller, 2012). Yet successfully producing policies and other measures depends on both the soundness and legitimacy of the diagnoses.

In respect to the focus of the research, two current trends seem attractive options: *cities* and *immobility* (Foresight Project and Government Office for Science, 2011). More than half of the world population already lives in cities, and they have been heralded as viable ways to reduce poverty. Still, the Foresight Project showed that cities, particularly in LDCs, might be failing to protect the incoming populations, resulting in the paradoxical situation of populations migrating into *more* vulnerable areas—as far as climate change effects are considered.

The focus on immobility is a consequence of the paradigm shift towards seeing migration as adaptation. It implies that in focusing on the migrants, researchers could be missing the most vulnerable populations—those who cannot afford to adapt and/or move. Keeping track of both those who stay and those who leave will offer a better understanding of the effects of mobility on both vulnerability and resilience, as well as serving as a yardstick for the policies being devised.

For the two focuses, it is possible to foresee in the literature the importance of a *gendered approach* to the study of migration. Some of the alternative narratives in the literature on the dynamics of migration derive precisely from identifying different patterns for men and women. For instance, Gray and Mueller (2012) found that there are differential outcomes for men and women after droughts, with men in their case-study in Ethiopia more likely to move in order to find alternative sources of income,

while women's mobility decreases, mainly because during the drought it becomes necessary to limit the expenses associated with marriage. Still, Findley (1994) documented opposite dynamics of women's migration and marriage in Mali, with out-migration actually increasing as a strategy to reduce household consumption. Jungehülsing (2010) found even more complex patterns when studying women in the south of Mexico: women are less prone to migrate because of environmental pressures because they are not in charge of the agricultural livelihoods affected; single mothers are the most active migrants; women see migration more as a permanent solution, mainly because of the new roles they are allowed to play outside Chiapas; and women are less willing to go abroad, mainly because their main motivation is to work and that could be done more easily elsewhere in Mexico. A similar pattern is reported by Barbieri and Carr (2005) in Ecuador. Approaching the research through gender enriches the narrative, provides solid ground for better quantitative models, and also allows a contextualized introduction of the cultural component behind resilience (Wisner, 2010). The approach can as well help addressing concerns about the gendered nature of catastrophic events (Neumayer and Plümper, 2007, Penning-Rowsell et al., 2012).

Research complementary to the gendered approach in relation to children is also scarce in the literature. Preliminary works by UNICEF (2011a, 2011b) show through regional reports that such a focus would also illuminate impacts as well as the adaptation strategies in the long run. Following their life stories it is also possible to get insights of middle and long term strategies of adaptation.

Moreover, the gendered approach supported by a human security framework may facilitate displacing the nation as the main unit of analysis. Ecological inference methodologies manage to do this, because geophysical data does not distinguish political borders, but when the analysis moves to describe population groups it is still framed in terms of the nation-state those groups belong to. There are no, for instance, papers that present bottom-up movements across borders and the communities that coexist despite the borders. Focus on cities may also benefit from de-constructing the nation-states centrism, as the cities certainly reflect different networks for resilience that emerge in their context. The larger project this review is linked to has pointed out how borders have been changing (Donzelli, 2013) and how understanding the reach and effects of such transformation would benefit from methodologies showing their intricacies from the ground.

Finally, from a methodological perspective, the lack of detailed review of the qualitative research on climate change and migration is notorious. Even though this approach is the more frequent, discussion about research design, development of tools and issues of concern during data gathering activities has not been systematically undertaken, with the important exception of Warner (2011). Such an effort can be an appealing start for future projects with a field research component.

4.2. Gaps and opportunities in the future-oriented, advocacy approach

The recognition in the climate change debates of migration as an adaptation strategy is only the start for the necessary changes to actualize such a view of migration. The Cancun Adaptation Framework made clear this inclusion required enhancing understanding, coordination and cooperation. With respect to understanding, there is still much to do in terms of gaining recognition of migration as an adaptation strategy, even before agreements on action are produced. Coordination and cooperation would depend on the success in generating understanding and on how they are managed at the levels where they are relevant, i.e., local or regional. Future challenges are thus linked to these three tasks.

Part of the additional understanding needed would require motivating and engaging researchers and practitioners in the study of migration and the environment. The present review was focused on the climate change-migration link, but quite often inputs from other closely related fields appeared relevant and probably enriching for the arguments at stake. The idea of *human security* has been suggested inside and outside the reviewed literature as a way to offer a wider view of environmentally induced migration that is necessary to generate joined-up thinking.⁸ The human security framework also has the advantage of accommodating multiple issues for stakeholders' examination, so the priority of action can be decided later through their established processes. The multi-causality behind migration requires such flexibility in order to appropriately tailor policies. This is a strength that may also be useful in guiding the process to integrate the proposals arising from the climate change-

⁸ In fact, human security initiatives played an important role in the process resulting in Cancun's positive outcome, mainly through the continued inputs from the UN University Institute for Environment and Human Security, and the project Global Environmental Change and Human Security, members of both of which were interacting closely with the IPCC.

migration line of research into the existing poverty reduction plans and protocols for humanitarian action.

The human security framework would also help in avoiding stigmatizing migration through stressing the possibility of conflict. This is not to say that the occurrence of conflict connected to environmentally induced migration should not be explored. Such insights on the nature of global environmental change should be welcome and promote better policies. What needs to be avoided is simplifying once more the narrative, scapegoating migrants and precluding the possibility of policies for protecting people on the move.

5. Closing comment

The literature on climate change and migration shows a dynamic field of study in search of ever more robust findings, while it succeeds in influencing global agendas. While the occurrence of environmentally induced migration has been widely accepted, the initial apocalyptic depictions have given way to more nuanced presentations of the phenomena, which allow understanding migration not as a *threat* to human security but as *means* to achieve it. Equally important, may be in fact trying to stop—through forms of preemptive adaptation—migration that could exacerbate harm (Foresight Project and Government Office for Science, 2011).

The recognition of migration as adaptation has also permitted us to avoid preoccupation with only the unanswerable question of the magnitude of the future movements and to concentrate on better understanding the mechanisms behind migration. Here, most authors expect that future movements will resemble current ones. In that sense, migration linked to environmental change has been found to be mainly internal or between contiguous countries, mainly taking place in developing countries. Such dynamics warrant actively looking for ways to move the locus of knowledge production and discussion to the vulnerable societies and polities, so that locally relevant countermeasures enhancing resilience are in place before it is too late. This is not, of course, to dismiss action at the global level as irrelevant. Both climate change policies and migration policies depend on cooperation and coordination that go beyond bilateral or regional arrangements. Still, the value of the adaptation framework is to promote action without having to wait for agreements on mitigation to finally be reached and, given its inherent political implications, suitable local ownership of the full process of adaptation seems vital.

6. Annotated Bibliography

ADB, Asian Development Bank (2012) 'Addressing Climate Change and Migration in Asia and the Pacific'. Manila, Asian Development Bank. Available at: <http://www.adb.org/publications/addressing-climate-change-and-migration-asia-and-pacific>

The report examines the convergence of migration and climate change in the Asia Pacific region. The authors recognize the complexity of the phenomena and, thus, do not advance specific numbers on the magnitude of the phenomena. Then, the report also suggests that climate-induced migration should be seen not only as a threat to human well-being but also as a potential tool to promote human adaptation to climate change.

Afifi, T. and Warner, K. (2008) 'The impact of environmental degradation on migration flows across countries'. Working Paper No.5/2008, Bonn: UNU-EHS. Available at: <http://www.ehs.unu.edu/article:476>

General discussion followed by the introduction of a gravity model to investigate observed migration patterns across countries. The model is particularly useful to identify what part of the phenomena is not fully explained by established factors; variables such as GDP and distance between countries explain a large part, but not all, of the migration pattern. The authors find that after controlling for the most important factors other than environment, the latter has a positive significant impact on the migration flows across countries, which would suggest a similar relationship for migration across regions within one country.

Baird, R. and Christian Aid (2007) *Human tide: the real migration crisis: a Christian Aid report*, London: Christian Aid. Available at: <http://www.christianaid.org.uk/images/human-tide.pdf>

Origin of the "1 billion displaced people by 2050" figure.

Barbieri, A. F. and Carr, D. L. (2005) 'Gender-specific out-migration, deforestation and urbanization in the Ecuadorian Amazon', *Global and Planetary Change*, 47(2): 99-110.

This is a longitudinal analysis of migration in Ecuador rural areas. The authors identified a complex pattern of migration: men migrating across the rural areas in search of income, and women leaving to urban areas. This is presented as a vicious cycle that perpetuates pressure over forest resources.

Bardsley, D. K. and Hugo, G. J. (2010) 'Migration and climate change: examining thresholds of change to guide effective adaptation decision-making', *Population and Environment*, 32(2-3): 238-262.

Authors advance the case for reframing migration not only as an undesired outcome of climate change but also as an adaptation strategy. They discuss both theoretically from the literature, as well as briefly presenting case studies of Nepal and Thailand. Two interesting elements of the discussion are: considering linear and non-linear effects of climate change; and using an approach of thresholds after which migration is undertaken.

Barnett, J. and Webber, M. (2009) 'Accommodating migration to promote adaptation to climate change', *Commission on Climate Change and Development*, Stockholm: Commission on Climate Change and Development. Available at: <http://www.ccdcommission.org/File/documents/Accommodating%20Migration.pdfv>

This is a general review of the link climate change-migration. It is especially useful in making the case for considering migration an adaptation strategy and describing policies for so doing. These include: ensuring that migrants have the same rights and opportunities as their host communities; reducing the costs of moving money and people between areas of origin and destination; facilitating mutual understanding among migrants and host communities; clarifying property rights where they are contested; ensuring that efforts to assist migrants include host communities; and strengthening regional and international emergency response systems.

Bernauer, T., Böhmelt, T. and Koubi, V. (2012) 'Environmental changes and violent conflict', *Environmental Research Letters*, 7(1): 015601.

The authors show that available evidence from qualitative case studies indicates that environmental stress can contribute to violent conflict in some specific cases. Results from quantitative large-N studies, however, strongly suggest that we should be careful in drawing general conclusions. Those large-N studies that we regard as the most sophisticated ones obtain results that are not robust to alternative model specifications and, thus, have been debated. This suggests that environmental changes may, under specific circumstances, increase the risk of violent conflict, but not necessarily in a systematic way and unconditionally. Hence there is, to date, no scientific consensus on the impact of environmental changes on violent conflict. This letter also highlights the most important challenges for further research on the subject. One of the key issues is that the effects of environmental changes on violent conflict are likely to be contingent on a set of economic and political conditions that determine adaptation capacity. In the authors' view, the most important indirect effects are likely to lead from environmental changes via economic performance and migration to violent conflict.

Bernstein Murray, R. and Petrin Williamson, S. (2011) 'Migration as a Tool for Disaster Recovery: A Case Study on US Policy Options for Post-Earthquake

Haiti'. Washington, D.C.: Center for Global Development. Available at: http://www.cgdev.org/sites/default/files/1425143_file_Murray_Williamson_disaster_recovery_FINAL.pdf

Discusses the lessons of U.S. government decision to allow Haitians in after the 2010 disaster. Asks to change the focus in law from persecution to people in need of protection.

Biermann, F. and Boas, I. (2010) 'Preparing for a warmer world: Towards a global governance system to protect climate refugees', *Global Environmental Politics*, 10(1): 60-88.

The paper presents arguments encouraging the creation of an international law instrument addressing the problem of environmental refugees. The principles such an instrument should be based on are: (1) The Principle of Planned Re-location and Resettlement; (2) The Principle of Resettlement Instead of Temporary Asylum; (3) The Principle of Collective Rights for Local Populations; The Principle of International Assistance for Domestic Measures; and (5) The Principle of International Burden-sharing.

Bilsborrow, R. and Henry, S. F. (2012) 'The use of survey data to study migration–environment relationships in developing countries: alternative approaches to data collection', *Population and Environment*, 34(1): 113-141.

The paper presents a reflection on this particular methodology, comparing case studies in Burkina Faso, Guatemala and Ecuador. The review includes the intricacies of survey design and data collection, as well as the ways to complement the methodology with other approaches and improve the data/theoretical framework.

Black, R. (2001) *Environmental refugees: myth or reality?* New Issues in Refugee Research, working paper No. 34: United Nations High Commissioner for Refugees (UNHCR). Available at: <http://www.unhcr.org/3ae6a0d00.html>

The author offers one of the initial arguments against the use of 'refugees' as the way to frame migration related to environmental phenomena. He presents the different types of displacement documented in the literature, and links the way it is described with the agenda of those advancing the 'refugee' narrative.

Black, R., Adger, W. N., Arnell, N. W., Dercon, S., Geddes, A. and Thomas, D. (2011a) 'The effect of environmental change on human migration', *Global Environmental Change*, 21: S3-S11.

The paper presents the conceptual framework put forward through the Foresight Project. It describes the multi-causal approach to study migration, as well as emphasis on the importance of immobility as well as displacement.

Black, R., Bennett, S. R., Thomas, S. M. and Beddington, J. R. (2011b) 'Climate change: Migration as adaptation', *Nature*, 478(7370): 447-449.

This is a short presentation of some of the findings of the Foresight project, focused on paradigm shift about migration.

Boano, C., Zetter, R. and Morris, T. (2008) 'Environmentally displaced people: understanding the linkages between environmental change, livelihoods and forced migration', *Forced Migration Policy Briefings*, Refugee Studies Centre, Oxford University. Available at: <http://www.rsc.ox.ac.uk/publications/policy-briefings/RSCPB1-Environment.pdf>

Examines the larger picture of environmental effects, not limited to climate change. It focuses on forced migration, so it does not offer arguments about framing migration as an adaptation strategy, although the authors include that option among the possible ways ahead. The paper offers a good summary in relation to conflict and environmental stressors. The authors use the ideas of human security and human rights to guide the analysis.

Brauch, H. G. (2010) 'Climate Change and Mediterranean Security. International, National, Environmental and Human Security Impacts for the Euro-Mediterranean region During the 21st Century. Proposals and Perspectives ', Observatory of Euro-Mediterranean Policies, Barcelona: IE Med Obs. Available at: <http://www.iemed.org/observatori-en/arees-danalisi/documents/papers-iemed/climate-change-and-mediterranean-security.-international-national-environmental-and-human-security-impacts-for-the-euro-mediterranean-region-during-the-21st-century.-proposals-and-perspectives>

The report presents a complete summary of the institutional advances in human security application in the European Union, and how they could be connected to climate change-related initiatives.

Brown, L. R. (1976) *World population trends: signs of hope, signs of stress*, Washington, D. C.: World Watch Institute.

One of the first suggestions of the effects of environmental change on migration.

Brown, O. (2008) *Migration and climate change*, Geneva: IOM. Available at: http://publications.iom.int/bookstore/free/MRS-31_EN.pdf

General presentation on the topic, focusing on future scenarios.

Campbell, J. R. (2006) 'Traditional disaster reduction in Pacific Island communities', *GNS Science Report* 2006/38. Available at: <http://unpan1.un.org/intradoc/groups/public/documents/apcity/unpan029291.pdf>

The author documents traditional approaches to cope with disaster in small island states. The piece covers food security, cooperation and settlement factors, as well as a discussion on how some of those practices have disappeared.

Dasgupta, S., Laplante, B., Meisner, C., Wheeler, D. and Jianping Yan, D. (2007) 'The impact of sea level rise on developing countries: a comparative analysis', *World Bank policy research working paper*, (4136). Available at: <http://elibrary.worldbank.org/content/workingpaper/10.1596/1813-9450-4136>

This is a forecast report using scenarios from 1 to 5 meters Sea Level Rise. Countries more seriously exposed include Vietnam, Mauritania, Egypt and The Bahamas. China is also expected to suffer very large absolute magnitudes of potential impacts, and high relative impacts can be expected elsewhere in East Asia and in Middle East/North Africa.

Davis, M. (2001) *Late Victorian Holocausts: El Niño famines and the making of the Third World*, London: Verso.

A seminal political ecology study of the interaction of global environmental change, global politics and global markets in the late 19th century that, contributed to mega-famines in Brazil, China and India,

de Sherbinin, A., Castro, M., Gemenne, F., Cernea, M., Adamo, S., Fearnside, P., Krieger, G., Lahmani, S., Oliver-Smith, A. and Pankhurst, A. (2011) 'Preparing for resettlement associated with climate change', *Science*, 334(6055): 456-457.

Discussion of the implications of massive relocation in the context of global environmental change.

Donzelli, S. (2013) *Migration, the Global South, and Migrant Women Workers in the Field of Border Studies: Theoretical Approaches, Themes of Inquiry, and Suggestions for Future Work*. The Hague: Institute of Social Studies.

Review of the literature about the transformation of borders. A part of the project the present work belongs to.

Dun, O. (2011) 'Migration and Displacement Triggered by Floods in the Mekong Delta', *International Migration*, 49: e200-e223.

This article presents the case of flooding in the Mekong Delta as a push factor for migration. It is part of the EACH-FOR project. Five linkages between flooding and migration are identified: seasonal labour migration, permanent migration after repeated disruption, possible human trafficking into neighbouring areas as an extreme coping strategy, sending children to care shelters in Ho Chi Minh City after aid is exhausted, and government planned resettlement of people living in vulnerable zones along river banks. The author acknowledges that the socio-economic and political context in which environmental stressors occur is central in determining migration outcomes.

Ehrhart, C., Thow, A., Blois, M. d. and Warhurst, A. (2008) 'Humanitarian implications of climate change: mapping emerging trends and risk hotspots', *Humanitarian implications of climate change: mapping emerging trends and risk hotspots*, London: CARE, Climate Change Information Centre. Available at: <http://www.careclimatechange.org/publications/global-reports/42-%20humanitarian-implications-of-climate-change=42>

Global maps identifying hot spots for migration related to environmental stress. The scenario considers the next 20-30 years and focuses on floods, cyclones and droughts.

El-Hinnawi, E. (1985) *Environmental Refugees*, Nairobi: UNEP.

This booklet describes refugees who had to leave their habitat, temporarily or permanently, because of a potential environmental hazard or disruption in their life-supporting ecosystems.

El-Raey, M., Dewidar, K. and El-Hattab, M. (1999) 'Adaptation to the impacts of sea level rise in Egypt', *Mitigation and Adaptation Strategies for Global Change*, 4(3-4): 343-361.

Assesses the vulnerability of and expected socioeconomic losses over the Nile Delta coast due to the impact of Sea Level Rise. The authors then give a brief consideration of several countermeasures and test their feasibility through two case studies. Authors found that populations in areas at risk are unwilling to move, although they recognize the need of protection. Costs of physical protection are high, but the long-run effects are higher. Integrated coastal zone management seems the most feasible option.

Ericksen, P., Thornton, P., Notenbaert, A., Cramer, L., Jones, P. and Herrero, M. (2011) 'Mapping hotspots of climate change and food insecurity in the global tropics', *CCAFS Report*, 5, Copenhagen: CCAFS. Available at: <http://ccafs.cgiar.org/node/589>

This reports focuses on the effects of climate change on food security, in terms of availability, access and utilization. It recognises migration as a way to deal with vulnerability.

Farbotko, C. and Lazrus, H. (2012) 'The first climate refugees? Contesting global narratives of climate change in Tuvalu', *Global Environmental Change*, 22(2): 382-390.

The authors use a content analysis to show how the situation of small state islands is presented in climate change discourses. They found that the population is being problematically positioned to speak for an entire planet under threat. Tuvaluans are being used as the immediate evidence of displacement that a climate change crisis narrative seems to require. Those identified as imminent climate refugees are being held up like ventriloquists to present a particular (western) 'crisis of nature'. Yet Tuvaluan conceptions of climate challenges and mobility practices show that more inclusive sets of concepts and tools are needed to equitably and effectively approach and characterise population mobility.

Findlay, A. M. (2011) 'Migrant destinations in an era of environmental change', *Global Environmental Change*, 21: S50-S58.

The author offers a synthesis of research on migration linked to environmental change, focusing on destination places. The review shows no support for mass migrations, finding immobility and short distance relocation to be normal. The author suggests to give more attention to existing channels of migration, because the effects of environmental change would most likely modify them.

Findley, S. E. (1994) 'Does drought increase migration? A study of migration from rural Mali during the 1983-1985 drought', *International Migration Review*: 539-553.

Using data from a longitudinal panel study conducted in 1982 and 1989 in a region of Mali, this article demonstrates that the level of migration did not rise during the drought of 1983-1985. However, there was a dramatic increase in the share of women and children among migrants during those years. Along with this increase in migration by women and children, there was a shift to short-cycle circulation, with 64 per cent of the migrants adopting circular patterns. This finding is related to an increase in marriages, which the author frames as a strategy to address the scarcity of food by reducing consumption at home. The study describes the characteristics of these migrants and recommends changes to development and migration policies that will facilitate such migrations in subsequent droughts.

Foresight Project and Government Office for Science, G. B. (2011) *Migration and global environmental change: Future challenges and opportunities*, London: Government Office for Science.

The report presents a transdisciplinary overview, consolidating the findings of the Foresight papers on climate change and migration, some of them included in this bibliography. Some of the more important findings are: (1) environmental change is probably more important as an indirect migration

mechanism and, thus, (2) is difficult to isolate from other forms of migration; (3) the analysis supports the prominence of internal migration, (4) as well as the perils of immobility; (5) the study promotes migration as adaptation and also (6) more attention to cities.

Gaspar, D. and Truong, T.-D. (2013) 'Women in motion' in a world of nation-states, market forces, and gender power relations', in Truong, T.-D., Gaspar, D., Handmaker, J. and Bergh, S. (eds) *Migration, Gender and Social Justice: Perspectives on human insecurity*, pp. 367-386. Heidelberg, Springer.

Concluding chapter of the book collecting the findings of the project this report belongs to.

Gray, C. and Bilsborrow, R. (2013) 'Environmental Influences on Human Migration in Rural Ecuador', *Demography*: 1-25.

The results indicate that adverse environmental conditions do not consistently increase rural out-migration and can, in some cases, reduce migration. Instead, households respond to environmental factors in diverse ways, resulting in complex migratory responses. Overall, the results support an alternative narrative of environmentally induced migration that recognizes the adaptability of rural households in responding to environmental change.

Gray, C. and Mueller, V. (2012) 'Drought and population mobility in rural Ethiopia', *World Development*, 40(1): 134-145.

The results indicate that men's labour migration increases with drought and that land-poor households are the most vulnerable. However, marriage-related moves by women also decrease with drought. These findings suggest a hybrid narrative of environmentally-induced migration that recognizes multiple dimensions of adaptation to environmental change.

Gupta, A. K., Anderson, D. M., Pandey, D. N. and Singhvi, A. K. (2006) 'Adaptation and human migration, and evidence of agriculture coincident with changes in the Indian summer monsoon during the Holocene', *CURRENT SCIENCE-BANGALORE*-, 90(8): 1082.

Evidence on prehistoric movements of populations linked to changing weather patterns.

Hagmann, T. (2005) 'Confronting the concept of environmentally induced conflict', *Peace, Conflict and Development*, 6(6): 1-22.

The author argues that the concept of environmental conflict is fundamentally flawed, as it relies on preconceived causalities, intermingles eco-centric with

anthropocentric philosophies, and neglects the motivations and subjective perceptions of local actors. The article concludes with a plea for peace and conflict researchers to call into question the concept of environmental conflict, as it represents an inappropriate research strategy in the quest to understand human-nature interactions.

Hendrix, C. S. and Salehyan, I. (2012) 'Climate change, rainfall, and social conflict in Africa', *Journal of Peace Research*, 49(1): 35-50.

Extreme deviations in rainfall – particularly dry and wet years – are associated positively with all types of political conflict, though the relationship is strongest with respect to violent events, which are more responsive to abundant than scarce rainfall. The authors suggest this is related to the dependence on agriculture. By looking at a broader spectrum of social conflict, rather than limiting the analysis to civil war, they demonstrate a robust relationship between environmental shocks and unrest.

Henry, S., Boyle, P. and Lambin, E. F. (2003) 'Modelling inter-provincial migration in Burkina Faso, West Africa: the role of socio-demographic and environmental factors', *Applied Geography*, 23(2): 115-136.

This study quantifies the relative importance of the environment on migration in Burkina Faso in the 1980s. The results do not support claims that environmental change alone is causing massive movements of so-called environmental refugees. Rather, the results show that it is the combination of socio-demographic factors and, to a lesser extent, environmental variables that explain inter-provincial migrations in Burkina Faso.

Homer-Dixon, T. F. (1991) 'On the threshold: Environmental changes as causes of acute conflict', *International Security*, 16(2): 76-116.

This is one of the first studies on the possibility of environmental stresses resulting in conflict. After mapping different possible effects, the author hypothesizes that severe environmental degradation will produce three principal types of conflict: (1) simple scarcity conflicts, (2) group-identity conflicts and (3) relative deprivation conflicts. The author discusses each of them in detail, offering real examples that could fit the categorization.

Hsiang, S. M., Meng, K. C. and Cane, M. A. (2011) 'Civil conflicts are associated with the global climate', *Nature*, 476(7361): 438-441.

The authors find that the changes in the global climate driven by ENSO are associated with global patterns of conflict, but the results might not generalize to gradual trends in average temperature or particular characteristics of anthropogenic climate change. This is so because the mechanisms linking environment and conflict are not clear.

Hugo, G. (1996) 'Environmental concerns and international migration', *International Migration Review*: 105-131.

General review of environmental influences in migration, not restricted to climate change impacts. Offers a detailed argument on the difficulty of distinguishing voluntary from forced migration.

Hugo, G. (2008) *Migration, development and environment*, Geneva: IOM. Available at:

http://www.iom.int/jahia/webdav/site/myjahiasite/shared/shared/mainsite/publicshed_docs/serial_publications/MRS35_updated.pdf

General presentation of environmental effects on migration, not limited to climate change. It offers preliminary views on the effects of large projects, as well as the effect of migration on the environment.

Hugo, G. (2011) 'Future demographic change and its interactions with migration and climate change', *Global Environmental Change*, 21: S21-S33.

The author presents a revision on the interactions between migration, demographics and environmental change, endorsing a complex model of interactions. The analysis is done at the macro level and includes a description of hotspots and discussion over the future agenda. The unit of analysis is mainly the country, although comments on internal mobility are provided.

Hulme, M. (2008) 'Climate Refugees: Cause for a New Agreement?', *Environment: Science and Policy for Sustainable Development*, 50(6): 50-54.

Critical view on the proposition of an international instrument to cover environmental refugees made by Biermann and Boas in 2010.

IDMC, Internal Displacement Monitoring Centre and NRC, Norwegian Refugee Council (2012) *Global estimates 2011: People displaced by natural hazard-induced disasters*, Geneva: IDMC. Available at: [http://www.internal-displacement.org/8025708F004BE3B1/\(httpInfoFiles\)/1280B6A95F452E9BC1257A22002DAC12/\\$file/global-estimates-2011-natural-disasters-jun2012.pdf](http://www.internal-displacement.org/8025708F004BE3B1/(httpInfoFiles)/1280B6A95F452E9BC1257A22002DAC12/$file/global-estimates-2011-natural-disasters-jun2012.pdf)

Basic data and maps. Most of the displacement takes place in Asia. Analysis units are countries.

IOM, International Organization for Migration (2007) 'Discussion note: migration and the environment', *MC/INF/288*, Geneva: IOM. Available at:

http://www.iom.int/jahia/webdav/shared/shared/mainsite/about_iom/en/council/94/MC_INF_288.pdf

Origin of the IOM definition of environmental migrants. Important synthesis of work on existing migration patterns and challenges.

IOM, International Organization for Migration (2012) 'People on the Move in a Changing Climate: A Bibliography', Geneva: IOM. Available at: http://publications.iom.int/bookstore/index.php?main_page=product_info&cPath=41_7&products_id=895

This bibliography is the first comprehensive collection of resources which specifically concentrates on migration, the environment and climate change. Books, journals, scientific papers, case studies and reports are all included, which are useful for those who want an introduction to this topic and also for those requiring more detailed resources in specific areas of the migration–environment nexus. The bibliography has various subheadings to make it user-friendly.

IPCC, Intergovernmental Panel on Climate Change (1990) *Climate change : the IPCC scientific assessment*, Cambridge: Cambridge University Press.

First report of the IPCC, includes a warning on the effects of climate change on migration.

IPCC, Intergovernmental Panel on Climate Change (2012) *Managing the risks of extreme events and disasters to advance climate change adaptation : special report of the Intergovernmental Panel on Climate Change*, Cambridge: Cambridge University Press.

Major report of the IPCC about extreme events. It recognizes migration both as an impact and as adaptation strategy. The authors concede there is low confidence about attributing direct causality from climate change to migration. The report also comments on how rural to urban migration is resulting in greater vulnerability.

Jäger, J., Frühmann, J., Grünberger, S. and Vag, A. (2009) 'EACH-FOR—Environmental Change and Forced Migration Scenarios: Synthesis Report'. Available at: <http://www.each-for.eu/index.php?module=main>

The EACH-FOR synthesis report presents the results of 23 case study areas and scenarios for 6 of them. The different cases offer additional evidence about the multiple variables involved in migration, from which climate change is not the only one even among environmental factors. The occurrence of migration is more frequent and is becoming a permanent option, especially for youth. Migration is an option for those who have certain access to networks and resources, not for the most vulnerable. Recommendations

address both mitigation of environmental effects and acknowledgement of migration as an adaptation strategy.

Johnson, C. A. and Krishnamurthy, K. (2010) 'Dealing with displacement: Can “social protection” facilitate long-term adaptation to climate change?', *Global Environmental Change*, 20(4): 648-655.

The authors summarise the discussion about climate change and displacement and suggest the ways in which cash transfers, asset transfers and other forms of social protection may be used to support economic migration, distinguishing specifically between policies that may be used to manage rapid-onset disasters and ones managing processes of long-term environmental change. The focus is thus on international cooperation.

Julca, A. and Paddison, O. (2010) 'Vulnerabilities and migration in Small Island Developing States in the context of climate change', *Natural Hazards*, 55(3): 717-728.

The authors present a discussion of the evidence on migration and coping with climate change. The security referent is the state, and thus the analysis revolves around the local institutions of Small Island Developing States and the ambiguous balance of remittances versus brain drain.

Jungehülsing, J. (2010) *Women who go, women who stay: reactions to climate change: A case study on migration and gender in Chiapas*, Heinrich Böll Stiftung. At: http://www.boell.org/downloads/MIGRACION_Gender_Climate_Mexico_ingles.pdf

The study presents a detailed account of migration motivations and patterns in the Mexican region of Chiapas. While environmental influence is detected, it happens mostly through the economic consequences of environmental disruption. Among the specific characteristics of women's migration, the author finds that: women are less prone to leave because of environmental pressures, single mothers are the most active migrants, women see migration more as a permanent step, especially because of the new roles they are allowed to play outside Chiapas, and women are less willing to go abroad, mainly because their main motivation is to work and that could be done elsewhere in Mexico.

Kälin, W. and Schrepfer, N. (2012) 'Protecting People Crossing Borders in the Context of Climate Change: Normative Gaps and Possible Approaches', *Legal and Protection Policy Research Series*, Geneva: UNHCR. Available at: <http://www.refworld.org/pdfid/4f38a9422.pdf>

The authors describe the context for normative investigation as: (1) requiring a change of the focus of responsibility from that of the greenhouse gases

emitters to the satisfaction of migrants' human rights, (2) requiring also a plan in spite of the quantities of migrants expected, and in need of (3) considering five scenarios of migration. Major gaps are identified in regard to: (1) distinguishing whether migration is voluntary or forced, (2) rights related to admittance and stay on foreign territory, (3) the legal situation and rights of persons on foreign territories, i.e. status rights. The author advance multi-level action to address these gaps.

Kates, R. W., Travis, W. R. and Wilbanks, T. J. (2012) 'Transformational adaptation when incremental adaptations to climate change are insufficient', *Proceedings of the National Academy of Sciences*, 109(19): 7156-7161.

The authors frame forced relocation and resettlements as "transformational adaptation," and explain the needs for it, as well as the difficulties to implement it, which include: (i) uncertainties about climate change risks and adaptation benefits, including the unimaginable nature of possible extreme vulnerabilities and impacts; (ii) the perceived costs of transformational actions; and (iii) a suite of institutional and behavioural barriers that tend to maintain existing resource systems and policies. Measures to make possible transformational adaptation in the future include its recognition as a possibility and innovative approaches.

Laczko, F. and Aghazarm, C. (eds) (2009) *Migration, environment and climate change: Assessing the evidence*, Geneva: IOM. Available at: http://publications.iom.int/bookstore/free/migration_and_environment.pdf

This is the result of an expert workshop held by the IOM, UNU-EHS, Munich Re Foundation and UNEP in 2008. The first chapter presents a forty-page summary, followed by seven thematic contributions. The re-emergence of concern on migration linked to the environment is located in the early nineties, in both Climate Change discourse and new security discourses. The report favours the adaptation framing of migration, and acknowledging the great difficulty of differentiating voluntary and forced migration. The authors point out the lack of capacity of the most vulnerable States to generate knowledge and implement existing policy frameworks.

Lopez, A. (2007) 'The Protection of Environmentally-Displaced Persons in International Law', *Environmental Law*, 37: 365-409.

Extensive review on the proposition of a new instrument to address environmentally-induced migration.

Maas, A. and Carius, A. (2011) 'Creating space for action: options for small island states to cope with global environmental change'. London: Foresight Project. Available at: <http://www.bis.gov.uk/foresight/our-work/projects/published-projects/global-migration/reports-publications>

Complete review of the different options available for Small Island Developing States mitigation and adaptation to climate change. Three approaches are described, namely the treaty approach, the acquisition approach and the pull-factor approach. Recommendations include: local adaptation, trans-boundary migration, international recognition, improving access to financial resources, pooling financial resources, fixing islands' maritime territory, reducing political and legal uncertainties and investing in people and knowledge.

McAdam, J. and Saul, B. (2010) 'An Insecure Climate for Human Security? Climate-Induced Displacement and International Law', in Edwards, A. and Ferstman, C. (eds) *Human Security and Non-Citizens*, pp. 357-403. Cambridge, Cambridge: Cambridge University Press.

The authors examine both the pros and cons about using human security to address climate change-induced migration vis-à-vis human rights. While they give priority to human rights, they recognize a complementarity justifying the use also of the former. It is worth noting that they do not take into consideration the re-framing of migration from threat to adaptation strategy as an outcome of application of human security thinking.

McDowell, C. (2011) 'Climate change adaptation and mitigation: implications for land acquisition and population relocation'. London: Foresight Project. Available at: <http://www.bis.gov.uk/foresight/our-work/projects/published-projects/global-migration/reports-publications>

The author presents a review of existing countries and organizations considering resettlement and land-use changes in order to confront climate change effects, either because of mitigation or as adaptation strategies.

McGranahan, G., Balk, D. and Anderson, B. (2007) 'The rising tide: assessing the risks of climate change and human settlements in low elevation coastal zones', *Environment and Urbanization*, 19(1): 17-37.

Authors quantify the population and land at risk because of Sea Level Rise, using a 10 meters scenario. By total population the most important are China, India, Bangladesh, Vietnam and Indonesia; by share of the population, Bahamas, Suriname, Netherlands, Vietnam and Guyana. Countries smaller than 1,000 square kilometres or under 100,000 people are not included—if included, the top 5 would be Maldives, Marshall Islands, Tuvalu, Cayman Islands, Turks and Caicos Islands. The authors present evidence that populations are migrating to more vulnerable places, using China and Bangladesh as examples.

McLeman, R. A. (2011) 'Settlement abandonment in the context of global environmental change', *Global Environmental Change*, 21: S108-S120.

The author shows settlement abandonment is a possible result of population decline but is not inevitable. Through a modified systematic review of scholarly literature, he finds that abandonments are preceded by rising vulnerability and in situ adaptation. Highlights of the paper include: dynamic interactions between multiple drivers create the risk of abandonment; organized abandonments are expensive and place great pressure on institutions; and future abandonment risks grow with failure to mitigate global environmental change.

Myers, N. (2002) 'Environmental refugees: a growing phenomenon of the 21st century', *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences*, 357(1420): 609-613.

The most frequently quoted figure of environmental migrants, based on different estimates of the effects of climate change in terms of poverty, food scarcity, sea level rise, floods and droughts.

Naudé, W. (2008) *Conflict, disasters and no jobs: Reasons for international migration from Sub-Saharan Africa*. Research paper 2008/85, Helsinki: UNU-WIDER. Available at: http://www.wider.unu.edu/publications/working-papers/research-papers/2008/en_GB/rp2008-85/

The paper presents panel data on 45 countries spanning the period 1965 to 2005, through which the author identifies a connection between natural disasters and out-migration. Still, the occurrence of conflict generates more displacement, while economic growth too reduces emigration more forcefully.

Neumayer, E. and Plümper, T. (2007) 'The gendered nature of natural disasters: The impact of catastrophic events on the gender gap in life expectancy, 1981–2002', *Annals of the Association of American Geographers*, 97(3): 551-566.

Authors present a quantitative analysis on the outcomes of natural disasters disaggregated by gender, finding that: (1) natural disasters lower the life expectancy of women more than that of men, (2) the stronger the disaster, the stronger this effect on the gender gap in life expectancy, and (3) the higher women's socioeconomic status, the weaker is this effect on the gender gap in life expectancy.

Newland, K. (2011) *Climate change and migration dynamics*: Migration Policy Institute Washington, DC.

This report presents migration from the point of view of US and EU immigration systems. It describes the existence of obstructive and constructive measures towards migration. The author recognises these measures are not unique to developed countries, mentioning experiences of developing countries also undertaking grand-scale projects to deal with environmental harms and accommodate migration needs.

New, M., Kevin, A., Fung, F. and Thornton, P. (2011) 'The possible impacts of high levels of climate change in 2060 and implications for migration'. London: Foresight Project. Available at: <http://www.bis.gov.uk/foresight/our-work/projects/published-projects/global-migration/reports-publications>

This documents presents the prospective component of the Foresight Project on "Migration and Global Environmental Change".

NRC, Norwegian Refugee Council (2008) *Future floods of refugees: A comment on climate change, conflict and forced migration*, Oslo: NRC. Available at: <http://www.nrc.no/?did=9268973>

O'Brien, K., Sygna, L., Leichenko, R., Adger, W. N., Barnett, J., Mitchell, T., Schipper, L., Tanner, T., Vogel, C. and Mortreux, C. (2008) 'Disaster risk reduction, climate change adaptation and human security', *Report prepared for the Royal Norwegian Ministry of Foreign Affairs by the Global Environmental Change and Human Security Project, GECHS Report*. Available at: http://www.adpc.net/DDRCCA/GECHS-08/GECHS_Report_3-2008.pdf

The authors present a general outlook on the theme, specially illustrating the implications of a human security focus. Human security is closely linked to the development of human capabilities in the face of change and uncertainty. Individuals and communities faced with both rapid change and increasing uncertainty are challenged to respond in new ways that protect their social, environmental, and human rights. Considering human security as a rationale for disaster risk reduction and climate change adaptation in the face of climate change emphasizes both equity issues and the growing connections among people and places in coupled social-ecological systems. While the authors support framing migration as adaptation, they point out that it also implies a loss of culture, livelihood, place and the right to a home.

Paul, B. K. (2005) 'Evidence against disaster- induced migration: the 2004 tornado in north-central Bangladesh', *Disasters*, 29(4): 370-385.

Three important findings: disasters do not always create out-migration; emergency aid can compensate in monetary terms for damage caused by disasters; and some of the arguments made in the literature against the provision of emergency relief for disaster victims are not always valid for all countries.

Penning-Rowsell, E. C., Sultana, P. and Thompson, P. M. (2012) 'The 'last resort'? Population movement in response to climate-related hazards in Bangladesh', *Environmental Science & Policy*, 27(S1): S44-S59.

The report synthesizes existing literature on the effects of hazards in Bangladesh and evacuation and migration as a response to environmental hazards, which is informed with new fieldwork. The research is done through focus group discussions in areas affected by hydrological disasters—i.e., floods or cyclones. Authors find that migration is small-scale, short lived, and usually only when there is simply no safe alternative. They suggest that promoting migration as adaptation in these communities can do more harm than good. Authors also mention females faring worse in disasters than men, but the latter migrating more. No discussion on the limitations of the research and possible biases. The research was part of the Foresight project. A larger version is available at: <http://www.bis.gov.uk/foresight/our-work/projects/published-projects/global-migration/reports-publications>

Penz, P. (2010) 'International Ethical Responsibilities to 'Climate Change Refugees'', in McAdam, J. (ed) *Climate Change and Displacement: Multidisciplinary Perspectives*, pp. 151-173. Oxford, Hart Publishing.

The author defends the use of the refugee framing in terms of: (1) its usefulness, (2) its focus on the people harmed, (3) other terms could be easily stigmatized, and (4) thus challenging such stigmatization is the main aim. Penz argues the crux of the question is that 'refugees' implies forced migration, and that even slow-onset effects of climate change can be considered as forcing the displacement. Thereon, the author exposes four kinds of responsibility that are relevant for the case, namely international ethical responsibilities, free movement responsibilities, compensation responsibilities and insurance responsibilities.

Piguet, E. (2010) 'Linking climate change, environmental degradation, and migration: a methodological overview', *Wiley Interdisciplinary Reviews: Climate Change*, 1(4): 517-524.

The paper describes and cites examples of six methodological approaches to the question of climate change and migration link. Those are: (1) ecological inference based on area characteristics, (2) individual sample surveys, (3) time series, (4) multilevel analysis, (5) agent-based modelling and (6) qualitative/ethnographic methods.

Piguet, E., Pécoud, Antoine and de Guchteneire, P. (2011) 'Migration and Climate Change: An Overview', *Refugee Survey Quarterly*, 30(3): 1-23.

The article presents a very complete summary of major themes and debates around the problematic. It considers that knowledge in this field remains limited and fragmented. It presents an alternative view on the historical background of the debate, offering some theories about its silencing in the early twentieth century and later re-emergence. The authors favour non-apocalyptic reference to migration related to climate change. The paper presents a detailed review of direct effects of climate change on migration, while indirect effects are described in less detail. The last sections of the paper include a synthesis on typologies of migration, methodologies,

conceptual issues, legal protection and policy options. Important observations: (1) including perception of environmental threats in the study of migration; (2) putting aside semantic discussions in relation to the definition of the phenomena; and (3) acknowledgement of the difficulties of generating specific legal frameworks.

Raleigh, C. (2011) 'The search for safety: The effects of conflict, poverty and ecological influences on migration in the developing world', *Global Environmental Change*, 21: S82-S93.

General discussion on the ways conflict affects migration in the background of environmental change. The author recognises the multi-causality of the phenomena, discussing several elements related to conflict and poverty.

Raleigh, C., Jordan, L. and Salehyan, I. (2008) 'Assessing the impact of climate change on migration and conflict', *World Bank Seminar on Exploring the Social Dimensions of Climate Change*, Washington D.C.: The World Bank. Available at: http://siteresources.worldbank.org/EXTSOCIALDEVELOPMENT/Resources/SDCCWorkingPaper_MigrationandConflict.pdf

The study makes a general review of the evidence about climate change and migration, concluding that the likelihood of large-scale movements of people is low. The authors embrace a multi-causal framework of analysis in order to assess possible contribution of environmental stresses to urban and rural instability, which is related to the outbreak of conflict. Three different scenarios of migration suggested for analysis are labour migration, distress migration and relocation. One of the authors' aims is to dismiss the securitization of climate change, and to instead use human security ideas.

Reuveny, R. (2007) 'Climate change-induced migration and violent conflict', *Political Geography*, 26(6): 656-673.

Compilation of cases of conflict related to environmental migration, the latter being the criterion of selection. Half of the sample (N=38) did not result in conflict. The author favours a complex view of the ways in which climate change results in conflict, that includes migration as one of the stressors.

Revi, A. (2008) 'Climate change risk: an adaptation and mitigation agenda for Indian cities', *Environment and Urbanization*, 20(1): 207-229.

Presents a general panorama of the vulnerability of cities to climate change effects. The author puts emphasis on infrastructure and institutional capacity.

Rudiak-Gould, P. (2011) 'Climate change and anthropology: The importance of reception studies', *Anthropology Today*, 27(2): 9-12.

The article is an appeal for changing the focus of anthropological research on climate change from observation to reception. In other words, studying how societies receive, interpret, understand, adopt, reject and utilize the scientific discourse of global anthropogenic climate change, that is, the climate-altering production of greenhouse gases by human activity.

Sachs, J. D. (2007) 'Climate change refugees', *Scientific American*, 296(6): 43-43.

Salehyan, I. (2008) 'From climate change to conflict? No consensus yet', *Journal of Peace Research*, 45(3): 315-326.

The author offers methodological advice to improve research in this area, namely: (1) develop better measures of political institutions, (2) develop exogenous measures of environmental stress, (3) model endogenous relationships and (4) look for interactive, contingent effects. The military preparation is dismissed as wasteful.

Scheffran, J., Marmer, E. and Sow, P. (2012) 'Migration as a contribution to resilience and innovation in climate adaptation: Social networks and co-development in Northwest Africa', *Applied Geography*, 33: 119-127.

The authors present concrete ways in which migration works as a climate change adaptation strategy, in contrast with views of migration as something to be prevented. The authors use cases Mauritania, Senegal and Mali to support their arguments, mainly using secondary data.

Smythe, L. (2010) 'Annotated bibliography of research on climate change and security', Vancouver: The University of British Columbia. Available at: <http://www.library.ubc.ca/?p2=modules/liu/publications/view.jsp&id=2271>

This is an annotated bibliography about climate change and security, with emphasis on state documents and defence issues. It is followed by an annotated bibliography of research focusing on the world-wide implications of climate change for a broad range of security concerns, available at <http://www.library.ubc.ca/?p2=modules/liu/publications/view.jsp&id=2281>

Stern, N. (2007) *The economics of climate change: the Stern review*, Cambridge: Cambridge University Press.

Well-known review on climate change. Includes/cites alarming and perhaps alarmist predictions of numbers of migrants.

Thow, A. and de Blois, M. (2008) 'Climate change and human vulnerability: Mapping emerging trends and risk hotspots for humanitarian actors', *Report to the UN office for coordination of humanitarian affairs (OCHA)*. Geneva: Maplecroft, OCHA, CARE. Available at: http://reliefweb.int/sites/reliefweb.int/files/resources/E5549F80673D1E38C12574B0004B698F-care_mar2008.pdf

Ullman, R. H. (1983) 'Redefining Security', *International Security*, 8(1): 129-153.

One of the initial examples of inclusion of environmentally motivated migration as one of the new challenges in security studies.

UN Secretary-General (2009) 'Climate change and its possible security implications: report of the Secretary-General, 11 September 2009', A/64/350. Available at: http://www.un.org/ga/search/view_doc.asp?symbol=A/64/350

The report considers five channels through which climate change could affect security, namely: (a) vulnerability, (b) development, (c) coping and security, (d) statelessness and (e) international conflict. Climate change is presented as a threat multiplier, i.e., exacerbating existing problems and pressures for vulnerable populations. The report frames migration as climate change related-threat and calls for international community attention.

UNDP (2009) 'Human Development Report 2009. Overcoming barriers: Human mobility and development', *Human Development Report*. New York: UNDP. Available at: <http://hdr.undp.org/en/reports/global/hdr2009/>

Global Human Development Report on migration.

UNEP, (2007) 'Dams and Development: Relevant practices for improved decision-making'. Nairobi, UNEP. Available at: http://www.unep.org/publications/search/pub_details_s.asp?ID=3924

A compendium of relevant practices for improved decision-making on dams and their alternatives.

UNICEF (2011a) 'Children's Vulnerability to Climate Change and Disaster Impacts in East Asia and the Pacific', Bangkok: UNICEF East Asia and Pacific Regional Office. Available at: http://www.unicef.org/media/files/Climate_Change_Regional_Report_14_Nov_final.pdf

The report enumerates some of the ways in which migration can affect the lives of children, both positively and negatively, depending on how the experience is managed—e.g., the impact of parental absence vis-à-vis remittances, or adaptation from rural to urban environments. Emphasis is given to disaster migration and Sea Level Rise. The report urges further analysis on the relationship between climate change and migration.

UNICEF (2011b) 'Exploring the Impact of Climate Change on Children in South Africa', Pretoria: UNICEF South Africa. Available at: http://www.unicef.org/southafrica/SAF_resources_climatechange.pdf

The report presents migration as an adaptation strategy with mixed effects on children. Migration that implies separation of the parents, or both of them leaving, can generate emotional stress on children, but remittances are deemed to improve their wellbeing. Children who migrate can improve their conditions too; yet get exposed to additional risks, such as harmful work.

United Nations Task Team on Social Dimensions of Climate Change (2011) 'The Social Dimensions of Climate Change', International Labour Organization. Available at: http://www.ilo.org/empent/units/green-jobs-programme/facet/WCMS_169567/lang--en/index.htm

The authors, who are a group of 20 Agencies, present a general overview of the social side of climate change, which includes comments on migration—although it is not a major theme. The paper addresses the social dimensions of climate change from a sustainable, equitable development perspective. It aims to broaden and deepen policy-makers' understanding of the benefits of addressing and incorporating the social dimensions of climate change into climate policies.

Warner, K. (2011a) 'Environmental change and migration: methodological considerations from a ground-breaking global survey', *Population and Environment*, 33(1): 3-27.

This paper describes the experience behind the EACH-FOR project, a wide-ranging effort to assess the impact of environmental change on migration at the local, national, regional, and international levels. The paper endorses a complex view on migration, and an approach through identifying and studying hotspots. It contains multiple insights on the intricacies of undertaking such research, at levels of: theoretical framework, hypothesis formulation, fieldwork method design, and analysis of findings.

Warner, K. (2011b) 'Migration and displacement in the context of adaptation to climate change: developments in the UNFCCC climate negotiations and potential for future action'. London: Foresight Project. Available at: <http://www.bis.gov.uk/foresight/our-work/projects/published-projects/global-migration/reports-publications>

The paper is a detailed account of the process behind the inclusion of migration in the UN Framework Convention on Climate Change (UNFCCC) as a legitimate part of a wider adaptation framework. In order to take this inclusion into practice, the author favours a focus on dialogue, building regional understanding and cooperation, and helping States understand potential impacts of migration and displacement on their current institutional frameworks.

Warner, K., Ehrhart, C., Sherbinin, A. d., Adamo, S. and Chai-Onn, T. (2009) *In search of shelter: mapping the effects of climate change on human migration and displacement*, UN University, CARE International, Columbia University, UNHCR and The World Bank. Available at: http://www.ciesin.columbia.edu/documents/clim-migr-report-june09_media.pdf

Hot-spot location research, following the work presented Ehrhat et al. in 2008. The report embraces the view of migration as both an impact and an adaptation strategy. It presents a focus on selected areas and discussion of different impacts of climate change.

Wisner, B. (2010) 'Climate change and cultural diversity', *International social science journal*, 61(199): 131-140.

The paper highlights the inputs that local knowledge can offer to the discussion on climate change, as well as some of the obstacles. The inputs refer to the traditional ways of coping with stresses, while the obstacles include culture wars and Euro-centric scientism. The paper embraces the human security concept in order to present a wider perspective on the issues at stake.

World Bank and United Nations (2010) *Natural Hazards, Unnatural Disasters: The Economics of Effective Prevention*: World Bank.

General review on Disaster Risk Reduction, focused on the impact on cities.

World Commission on Dams (2000) *Dams and Development: A New Framework for Decision-making: the Report of the World Commission on Dams*, November 2000, London: Earthscan. Available at: http://www.internationalrivers.org/files/attached-files/world_commission_on_dams_final_report.pdf

World Conference on Disaster Reduction (2005) 'Hyogo framework for action 2005–2015: Building the resilience of nations and communities to disasters', pp. 18-22.

Internationally agreed framework for action in force until 2015. No major reference to migration.