ADDRESSING ENVIRONMENTALLY INDUCED POPULATION DISPLACEMENTS: A DELICATE TASK[1]

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1. Presentation

Interactions between environmental change and population mobility are at the core of the population-environment research agenda, and current concerns about the consequences of global climate change for human populations have reinforced that position. Three examples help to illustrate this point.

In 2007, the International Organization for Migration (IOM) and the United Nations Population Fund (UNFPA) held an expert seminar on migration and environment. Its objectives were to explore the association between migration and environment and their interaction with security concerns; and to contribute to the research and policy agenda (IOM and UNFPA 2008:20). A working definition of 'environmental migrants' was developed during the meeting (IOM 2007).

In 2008, the IOM together with the Institute for Environment and Human Security of the United Nations University (UNU-EHS) and the United Nations Environmental Program organized a research workshop focused on understanding the links and implications of climate change and environmental degradation for migration and policy, and to help develop strategies and tools to produce evidence-based research on migration and environment (UNU-EHS, IOM and UNEP 2008:8)

The impetus for these workshops stemmed from a recognition that migration may be one of the most viable adaptation strategies as climatic changes begin to be felt, on the one hand, but that such population movements will undoubtedly have security implications, on the other. Indeed, the IPCC's Fourth Assessment Report highlighted the significance of already established migrant networks and patterns as part of the inventory of adaptation practices, options and capacities available to face climate change impacts (Adger *et al.* 2007:736). Yet others see a potential for uncontrolled and potentially destabilizing migration streams as a result of climatic and other environmental changes in the 21st century (WBGU 2007; Campbell *et al.* 2007).

[1] This background paper is largely based on Chapter IV of a forthcoming report commissioned by the UN Population Division by S. Adamo and A. de Sherbinin.

The growing concern over climate change vulnerability and adaptation has resulted in a welcome increase in studies related to environmentally induced displacements and in a concomitant expansion of the literature. This background paper aims to present a concise review of relevant topics related to the cyberseminar theme, serving as a "navigation" tool and attempting to build a common ground to foster brainstorming and discussion during the seminar.

The paper first addresses the lack of consensus on definitional issues, then, in Section 3, proposes some working definitions. Section 4 addresses key measurement issues – what are the flows, and how do we measure them? Section 5 touches on the mechanisms linking environmental change and mobility, while Section 6 describes methods for disentangling environment-migration interactions. Finally, Section 7 covers security concerns and policy issues in the context of global climate change, and Section 8 introduces regional variations and the role of place in environmental migration discussions.

2. A lack of consensus

Population mobility is probably the demographic process that has received more attention within the field of population-environment studies, and the increasing concerns about the consequences of climate change for human populations have further fueled the interest on the topic.

However, this interest has not resolved the debate on exactly what constitutes an environmentally induced move, how to explain it, or what is the magnitude. The current general agreement that environmental factors contribute to population mobility translates into only modest consensus about the mechanisms, character, and extent of that contribution (see for example IOM 1992; Suhrke 1993; Little 1994; UNHCR/IOM 1996; Richmond 1995; Hugo 1996; Swain 1996; Lonergan 1998; Wood 2001; Black 2001; Castles 2002; Bilsborrow 2002; Unruh *et al.* 2004; Hunter 2005, 2007; IOM 2007).

Furthermore, according to the agenda of the recent research workshop on migration and environment (UNU-EHS, IOM and UNFPA 2008), the analysis of the migration-environment nexus still presents these too-familiar challenges: definition issues; measurement of environmental impacts and displacement flows; and mechanisms that link environmental change and migration. There are, however, some emerging topics, such as the exploration of the relationships between environmentally induced displacements and security issues in the framework of global climate change.

3. Definitions: who and what are we talking about?

The identification and classification of environment-related mobility as migration, internal or international displacement or refugee situations has been an ongoing discussion for a long

time (Jacobson 1988; Suhrke 1993; Richmond 1995; Hugo 1996; Swain 1996; Renaud et al. 2007; Kniveton et al. 2008a). Box 1 lists the definitions of different terms in order to show the differences among them.

Box 1. Definitions

The following definitions illustrate some of the conceptual fuzziness regarding environmentally displaced peoples and refugees.

Refugees: The 1951 Convention relating to the Status of Refugees defines a refugee as a person who owing to a well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of his nationality and is unable, or, owing to such fear, is unwilling to avail himself of the protection of that country (UNHCR, RPG and IOM 1996).

Environmentally Displaced Persons: Persons who are displaced within their country of habitual residence or who have crossed an international border and for whom environmental degradation, deterioration or destruction is a major cause of their displacement, although not the sole one (UNHCR/IOM 1996).

Internally Displaced Persons: Persons or group of persons who have been forced to flee or to leave their homes or places of habitual residence, in particular, as a result of, or in order to avoid the effects of, armed conflict, internal strife, systematic violations of human rights, or natural or man-made disasters, and who have not crossed an internationally recognized State border (OCHA 2004).

Source: compiled by A. de Sherbinin

But is it possible that this discussion is reaching an end? Building on its 1996 definition and based on the 2007 expert seminar (IOM and UNFPA 2008), the International Organization for Migration has proposed a new and quite broad working definition of 'environmental migrants', which is likely to be adopted for other institutions and the research and policy communities (see for example Kniveton et al. 2008a:31):

> *Environmental migrants* are persons or group 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 (IOM 2007:1).

It is relevant to note that one of the reasons for putting together this definition was to offer an alternative to the use of the term 'environmental refugees', which is considered to be legally meaningless (particularly for UNHCR officials).[2]

The new definition encompasses different trigger events and different types of movements. Based on this, the IOM (2007) also suggests eight migration-environment scenarios for policymaking and development arranged in three groups: (1) influence of environmental factors on the propensity to migrate; (2) impact of migration on the environment; and (3)

[2] Hugo (1996:108) already proposed the term "environmental migrants" to group migrants forced to live their homes due to natural disaster, those displaced by external compulsions such as physical dangers and economic insufficiency, and those victims of the 'silent violence' (drought, famine and severe food shortage associated with the deterioration of the environment)

interactions with human security and conflict. These scenarios, which capture different aspects of the environment-population mobility interaction, are summarized in Table 1. Note that scenarios A, B, C, G and H are specifically included among the cyberseminar topics.[3]

Table 1: Migration-Environment Scenarios

The propensity to migrate in relation to environmental change	The impact of migration on the environment	Interactions between migration, environmental change, human security and conflict
A. Migration at less advanced stages of gradual environmental change	E. Migration's impact on the environment in areas of destination	G. Human security challenges of environmental change and migration
B. Migration at advanced stages of gradual environmental change	F. Migration's impact on the environment in areas of origin	H. Conflict potential of environmental change and migration
C. Migration due to extreme environmental events		
D. Migration due to large-scale development and land conservation		

Source: IOM 2007

Scenarios A to C recognize the heterogeneity of the trigger events, and the critical differences between acute or sudden events, and slow-onset or gradual processes in terms of intensity, predictability, and scale or magnitude (as measured by people displaced, area affected, or duration of the event) (IOM/RPG 1992; IOM/UNHCR 1996; Lonergan 1998; Wood 2001; Bates 2002; Biermann and Boas 2007; Renaud *et al.* 2007)

Environmentally induced mobility can be considered a type of forced migration: the move is involuntary, and a certain amount of coercion is implicit in the fact that push factors in the origin area could be more important that pull factors in destinations (Suhrke 1993; Hugo 1996; Richmond 1995; Stiles 1997; Bates 2002). Although frequently these environmental push factors are related to economic factors, they may also be linked to other types of concerns, for example about the deterioration of local environmental conditions and quality of life in general (Izazola *et al.* 1998; Hunter 2005).

The array of situations can be located in a continuum from forced to voluntary mobility (Hugo 1996). At one end of the spectrum there would be refugee-like situations (low level of control over the whole process and high degree of vulnerability). At the other end, migrant-like situations would be characterized by greater control over the process and less vulnerability even if people are moving in response to deteriorating conditions. Between these extremes, environmentally driven mobility or displacement would be characterized as voluntary, with more control over timing and direction and less vulnerability than refugees have, but less control and more vulnerability than migrants.[4]

[3] PERN plans to host cyberseminars on the impact of migration on the environment, and on displacement due to large-scale development projects during 2009-2010.

[4] As other example, Renaud *et al*. (2007:31) propose to identify three categories – environmental refugees, environmentally forced migrants, and environmentally motivated migrants – according to the nature or intensity

The type of response is also diverse: it could be over short or long distances, internal or international, permanent or temporary. For example, Hunter (2005:283) identifies a number of possible responses to sudden environmental hazards. In the case of natural disasters, the most common and faster response is evacuation, which is generally short distance and temporary although some evacuees may choose to relocate (as has happened with some evacuees from New Orleans following Hurricane Katrina). Another response is the relocation of entire communities to less dangerous places, which is generally a permanent move.

These different responses would indicate that the occurrence of environmentally induced displacements is shaped by other factors in addition to the characteristics of the particular environmental event, in particular in the case of cumulative changes and slow-onset disruptions (IOM/RPE 1992:12). In developing regions, permanent environmentally induced displacement happens in a less organized way, and generally following already established migrations trends (for example, rural-urban migration flows). Permanent displacement is usually local and not international, moving to less dangerous places nearby (for example higher ground if available) (Hunter 2005). However, locally spontaneous relocation may not be possible if the surrounding area is densely populated or land owners refuse to allow resettlement.

4. Key measurement issues

The determination of the magnitude of environmentally induced displacements is probably the most contentious issue in environment-migration matters. Measurement problems may arise from different sources, among them:

- lack of a clear definition of environmentally induced displacements;
- the use of broad concepts of climate migrants;
- the complexity of linking migration responses to environmental events;
- assessments build on general assumptions on human behavior;
- lack of consideration of changes in human behavior leading to different adaptive practices;
- lack of recognition that climate change may be one reason to migrate, but not the only one and often not the most important;
- the general scarcity of migration data, particularly longitudinal data and data from developing regions;
- the use of different information sources (broad-ranging global prognosis on population growth, climate change and resource constraints, or national or local studies of specific situations)

As a result, the figures available to assess the magnitude of the phenomenon show a large diversity or are directly absent. In addition, it is also difficult to estimate future trends. And

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of the hazard, the type of assistance available for the displaced population, and the inherent vulnerability of the affected community. Similarly, Bates (2002:468) suggests also three categories – environmental refugee, environmental migrant and migrant – in a continuum from involuntary, to compelled to voluntary decision to move.

regarding the methods, on occasion these appear to be little more than back-of-the-envelope calculations (Lonergan 1998; Black 2001; Castles 2002:2; Bierman and Boas 2007:9; Black et al. 2008)

Estimates of the potential magnitude of climate change-related displacement differ broadly depending on sources and methods, as is shown in Box 2. In general, the numbers tend to reflect populations at risk (even UNHCR (2006) cites population at risk as a surrogate for population displaced). However, as Black (2001:9) points out, "calculating the population 'at risk' from sea level rise is a long way from predicting mass flight of a 'refugee' nature." The consideration of different time ranges also makes comparisons difficult.

Box 2. Some estimates of environmentally-displaced population due to climate change impacts

- People at risk of sea-level rise by 2050: 162 million (Myers 2002).
- People at risk of droughts and other climate change events by 2050: 50 million (Myers 2002).
- People potentially at-risk of being displaced because of desertification: 135 million (Almería Statement 1994)
- Number of people who have fled because of floods, famine and other environmental disasters: approximately 24 million (UNHCR 2002:12)
- Environmentally displaced people by 2010: 50 million (UNFCCC 2007).
- Refugees due to by climate change by 2050: 250 millions (Christian Aid cited in Bierman and Boas 2007).
- People estimated to become permanently displaced "climate refugees" by 2050: 200 millions (Stern 2006).

Giving these difficulties in identifying environmentally-driven migrants, Le Blanc (2008:42) has suggested concentrating on measuring flows of migrants from areas of environmental change and degradation, including their composition by age and sex. This area-base information –frequently available from disaggregated census data-- could be sufficient for a number of policy issues, particularly in the receiving areas, for example urban settlements in developing countries. The author acknowledges, however, that this kind of information may not be adequate for understanding how and why environmental change can trigger population mobility.

5. Mechanisms linking environmental change and population mobility

A more precise measurement and eventually forecasting of environmentally induced displacement would require a better understanding of the mechanisms linking environment stress and demographic behavior. The identification of these mechanisms entails considering different factors, levels of determination, and temporal and spatial scales (see for example Massey et al. 2007).

For example, prolonged droughts may result in disruption of livelihoods, progressive impoverishment, and general deterioration of population's living conditions. Over time, vulnerable households in drought-prone regions like the Sahel, North East Brazil or South America's Arid Diagonal have developed a number of coping strategies in the face of prolonged drought, including (but not limited to) different forms of mobility of the household

members. Previous research on drought and migration has found that significant factors associated with departures were the severity of the climatic event, human vulnerability to the event, and the type and degree of diversification of local survival strategies. Timing is also of the essence. Initial differences among households and individuals in their tendency to drought-induced migration – based on prior socio-economic and demographic household conditions – disappear over time as an absolute limit is reached in terms of water and food availability, and the *in situ* coping mechanisms fail (Caldwell 1976; Faulkingham and Thorbahn 1975; Monimart 1989; Findley 1994; Middleton and Thomas 1997; Ezra 2001; Ezra and Kiros 2001; Meze-Hausken 2000; Henry *et al.* 2003; Henry *et al.* 2004a; Henry *et al.* 2004b; Carvalho 2002; Adamo 2003; Brauch 2006).

This example shows that a critical understanding is that *environmental factors rarely act alone*. Ten years ago Lonergan (1998:10) affirmed that environmental factors cannot be easily disentangled from the rest of the social, economic and political factors and processes leading to out-migration. More recently, Kniveton et al. (2008a:37) insisted once again on the relevance of considering the multiplicity of factors influencing migration decisions. Also, populations' responses to risks and uncertainties are usually multifaceted. Except in cases of sudden environmental disasters, migration is just one among several possible responses and adaptations to environmental change (Bilsborrow 1992; Black 2001; Tacoli 2007; Adger *et al.* 2007:736). As people are more likely to migrate toward opportunities than away from problems (Meyerson *et al.* 2007:188), environmental deterioration may count among the factors, but it is not usually the main reason for leaving.

Figure 1 suggests some factors to be considered when analyzing population mobility as response to environmental impacts. In addition to the characteristics of the environmental hazard (already mentioned in Section 3), the different layers of vulnerability and their determinants are key components in the construction of the particular risk.[5] The availability of other type of responses (which in turn is related to, for example, livelihoods diversity) could also influence the recurrence to migration.

People's subjective view and perception of the hazard and of their own vulnerability is emerging as yet another important factor (Izazola 1998; Hunter 2005). Individuals visualize and live risk according to past personal experience; present and past individual, household and community characteristics, and the socio-economic, political and historical context in which they are embedded (Heathcote 1980; Day 1995; Hogan 1995; Izazola 1997; Meze-Hausken 2000, 2008). This particular aspect is in the base of the construction of agent-based models (Kniveton et al. 2008a)

[5] Two aspects or dimensions are at the core of the differences in population's vulnerability to environmental change: (a) an internal dimension, represented by the idea of *defenselessness* in facing the stress, and (b) an external dimension, represented by the *exposure* to hazards or risk (Chambers 1989; Kasperson and Kasperson 2001). Differences in vulnerability also reveal the relative influence and combination of a number of factors, from individual demographic characteristics to macro-level indicators such as level of development, and economic and social contexts (Blaikie *et al.* 1994; Kasperson *et al.* 1995; Macías 1992; Cardona 2001; Marandola and Hogan 2006; de Sherbinin *et al.* 2007; IPCC 2007). All these different factors combine to shape the patterns of vulnerability.

Finally, population mobility as response to environmental impacts is influenced by the socio-economic, cultural and institutional contexts, and by the historical development of the interactions between population and environment, in addition to be spatially differentiated (Blaikie and Brookfield 1987; Little 1994; Schmink 1994; Gutmann *et al.* 1996).

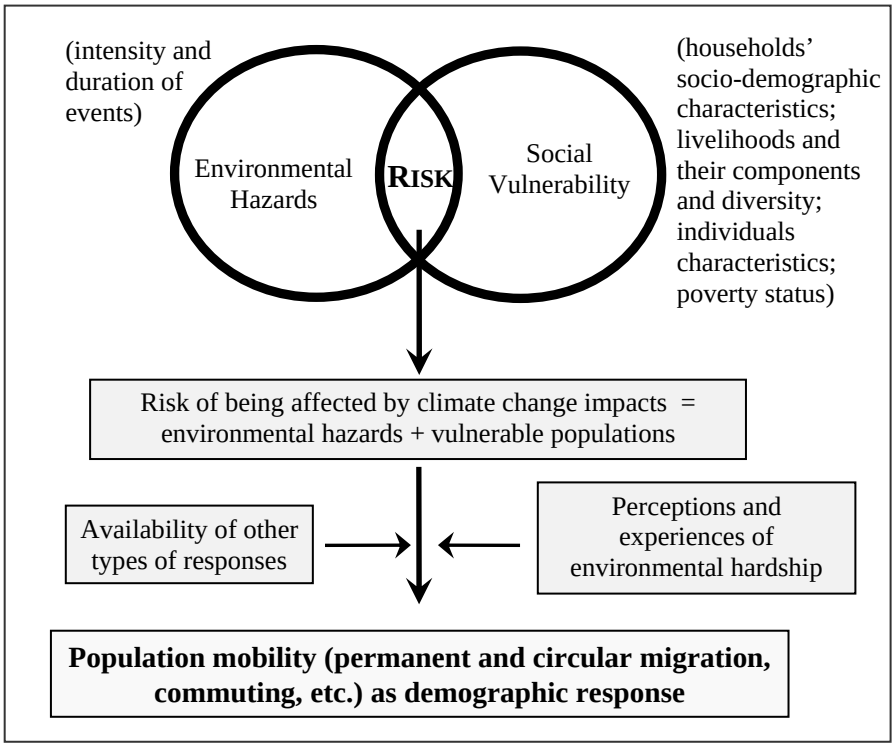


Figure 1: Factors in population mobility as demographic response to environmental change

Source: based on Hewitt (1997), Blaikie et al. *(1994), Meze-Hausken (2000), Adamo (2003)*

6. Methods for disentangling environment-migration interactions

In order to take advantage of the scarce specific empirical evidence available, different approaches has been used in the analysis of the population mobility-environment nexus. Conceptual perspectives on the role of environmental factors in migration decision-making have considered them as: (a) direct or proximate causes of migration channelizing the influence of underlying factors, or (b) indirect, contextual or underlying factors or variables, acting through other direct determinants (Bilsborrow 1992; Suhrke 1993; Adamo 2001). Also, impacts have been calculated from climate change projections assuming a linear causal relationship between the environmental event and population displacement; or location-specific socio-economic responses have been generalized.

However, conclusive results are still lacking (Kniveton et al. 2008b:33). Wood (2001:44) already warned that "…modeling complex ecosystems and mobile populations is difficult: cause and effect relationships between environmental variables and migration are hard to quantify and are tied to economic, political, and cultural factors…"

Methodological developments in migration research (following the evolution of the different conceptual perspectives as well as the modest increase availability of migration data) offer tools that can be applied to the study of environmentally displacement. [6] This includes: multilevel models including individual characteristics, and household and community effects (Bilsborrow et al. 1987; Zhu 1998; Ezra 2001); even history analysis techniques (Mulder 1993; Liang and White 1996; Parrado and Cerrutti 2003); the combination of both techniques by extending the event history analysis to include a multilevel framework (Ezra 2001; Kulu and Billari 2004); and the use of networks analysis (Korinek et al. 2005). These and other statistical analysis can be combined with Geographic Information System techniques to determine spatial patterns of migration and impacts of environmental change, and to combine spatial and non spatial data from a variety of sources (Kniveton et al. 2008a; also see McGranahan et al. 2007 for an example of integrating environment and population data in a spatial framework)

Agent-based models (ABMs) appear well suited for modeling the links between environment change and migration (Entwisle et al. 2008; Kniveton et al. 2008a). ABMs can be used to simulate the responses of individuals, households or communities to climate change or other environmental events. These models are based on the assumption that the results of individual actions may be different to the sum of the parts in a system characterized by interacting agents (autonomous decision-making entities) and emergent properties arising from agents' interactions with each other (Kniveton et al. 2008a:47). In addition to agents, simulations also require a set of rules that govern these interactions. These rules take into account people's perception and experiences.

However, the lack of adequate data for the study of environmental displacement and migrants, particularly in terms of time series data of environment and demographic variables, is still a constraint for methodological innovation (Perch-Nilsen 2004; Kniveton et al. 2008b).

7. Security concerns and policy issues in the context of global climate change

In 1990, the IPCC's First Assessment Report suggested that the greatest effect of climate change on society could be human migration, meaning involuntary forms of displacement and relocation (OSCE 2005). The general notion seems to be that temporary and permanent displacement and migration are less desirable forms of adapting to climate change. They are portrayed, in conjunction with relocation and resettlement, as a last-resort coping strategy when other adaptation possibilities are unavailable or fail.

[6] Developments in migration theory have responded to the multidimensional and multifaceted quality of migration behavior and decision-making. These developments include microeconomic individual perspectives (Harris and Todaro 1970; DaVanzo 1981); the new economics of labor migration with its focus on the household (Stark and Bloom 1985; Stark 1991; Massey et al. 1993); the social organization of migration and the neighborhood, community and contextual effects (Hugo 1981, 1985; Bilsborrow et al. 1987; Findley 1987; Massey 1990a, 1990b; Massey, Goldring and Durand 1994; Liang and White 1996; Ezra 2001; Parrado and Cerrutti 2003); life history approaches (Elder 1978, 1994, 1995; Courgeau 1985); and migration as part of households' livelihood strategies (Pessar 1982; Wood 1982; Hugo 1998; Guilmoto 1998; de Haan 1999; Waddington 2003).

As was mentioned in Section (3), it is possible to delineate different scenarios and degrees of freedom in relation to environmentally induced displacements. Following IOM (2007), interactions between migration, environmental change, human security and conflict can be grouped into scenario (G) human security challenges of environmental change and migration, and scenario (H) conflict potential of environmental change and migration.

Regarding (G), studies of impacts of climate change on vulnerable populations have focused on concerns about the security of individuals, households and communities, and about their coping and adaptation capabilities (Bogardi 2004; Renaud *et al.* 2007). The more sudden and involuntary or forced the displacement, the more likely it is of disrupting livelihoods and of deteriorating the quality of life of the affected populations (in both areas of origin and destination), in many cases leading to the further impoverishment of already vulnerable people (Vine 2005).

This approach to human security rests on human agency, rights and sustainable livelihoods as means to face vulnerability (Bohle 2007).[7] In relation to climate change, this approach favors the concept of *in situ* adaptation, including risk management and vulnerability reduction, mainly though poverty reduction and good governance (IUCN *et al.* 2004). The aim is to increase the resilience of households, communities, and nations, thereby reducing vulnerability, livelihood disruption, involuntary displacements, and relocation.[8]

Regarding (H), and from a different perspective, climate change, environmental degradation, and growing resource scarcity have been identified as triggers or concomitant factors in the emergence or aggravation of conflict situations, although the evidence shows that these are usually not violent ones (Castles 2002:6; Stern 2006; Gleditsch *et al.* 2007). These situations pose potential threats to global and national security, and they may eventually increase under the foreseen of climate change.[9] Scenarios describing massive environmentally induced displacements often accompany these sober "prognoses," capturing some of the issues found in the literature on environmental refugees (i.e. Myers 1995, 2002; Reuveny 2005; Castles 2002; WBGU 2007; Campbell *et al.* 2007; Urdal 2005).

In contrast with these rather somber views, it is also recognized that there are situations in which population mobility constitutes a powerful adaptive strategy. The IPCC's Fourth Assessment Report reaffirms the importance of focusing on already established migrant networks and patterns as part of the inventory of adaptation practices, options and capacities (Adger *et al.* 2007, see particularly page 736, Box 17.8). The report takes into consideration

[7]Concerns about security are of course present at the core of the perceptions of individuals' own vulnerability and in the choice of response. For example, in relation to farmers' perceptions of soil degradation, Blaikie (1994:75) suggested that "any changes in both the natural and socio-economic environment are interpreted in terms of its effect upon the security of livelihoods".

[8] The Institute for Environment and Human Security of the University of the United Nations addresses these issues in its project "Environmental Change and Forced Migration Scenarios (EACH-FOR) (http://www.each-for.eu/index.php?module=main)

[9] For a comprehensive approach to these issues see the "Environmental Change and Security Program" of the Woodrow Wilson International Center for Scholars, particularly the *ECSP Reports* (http://www.wilsoncenter.org/index.cfm?fuseaction=topics.home&topic_id=1413)

many of the issues already mentioned here, for example the existence of multiple determinants of migration, the different forms of population mobility, the selectivity issues, as well as the co-existence of migration with other possible responses to climate change impacts.

Turning now to policy issues, these need to consider the implications of environmentally induced displacement for the origin and receiving communities as well as the consequences for the displaced population, particularly in the cases of sudden displacement and displacements located toward the 'forced' end of the involuntary/voluntary continuum (Oliver-Smith 2008).

IOM (2007:5) suggests tailoring policy interventions to the stage of environmental degradation, for example by

- facilitating migration in the early stages of the deterioration process,
- mitigating forced displacement at irreversible stages, or
- anticipating the issue by promoting sustainable development.

This tailoring would of course imply a clear understanding of the nexus between environmental change and population mobility, which in turn requires a "redirection of research toward clarifying conceptual approaches and answering basic questions" (Oliver-Smith 2008:102)

Finally, although studies have shown that environmental displacements take place mostly within national boundaries –being consequently a national matter-- the crossing of international boundaries should also be anticipated for both the nations more likely to be affected (for example Small Island States), as well as for the less likely ones (Hugo 1996; Brown 2007).

8. Regional variation: place matters

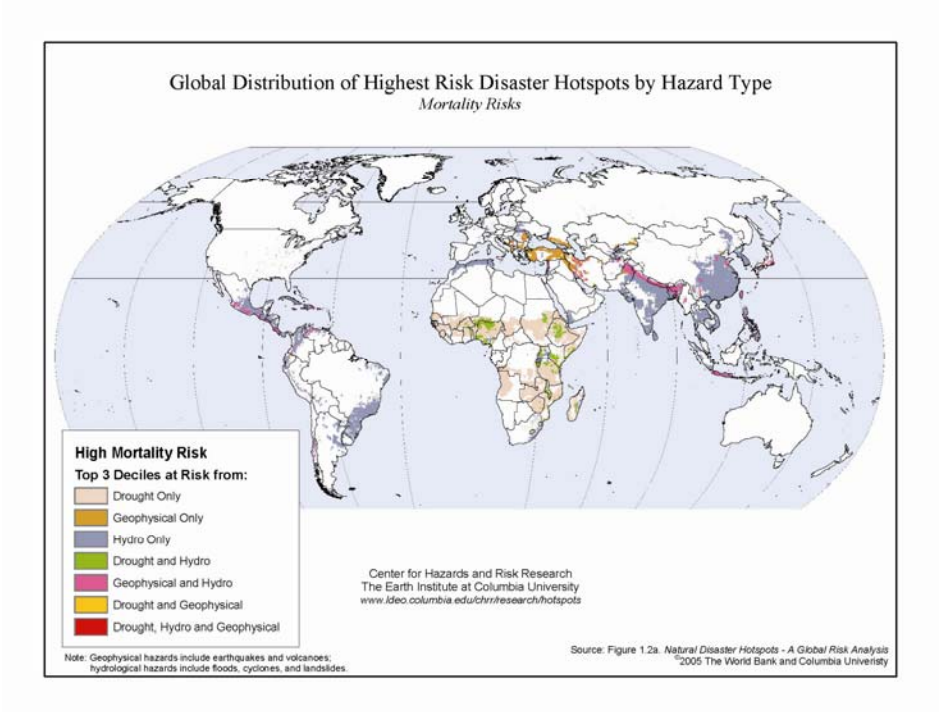
Environmental hazards, population, vulnerabilities and risks are not uniformly distributed across the globe. Level of development, living conditions, livelihoods, institutional capacity, and States' strength are also quite diverse. Because of this, the IPCC's Fourth Assessment Report has cautioned that "adaptive capacities are unevenly distributed, both across countries and within societies" (Adger *et al.* 2007:720).

Regional diversity is equally clear in the mechanisms that link environment and migration dynamics, and it is also evident in terms of data availability and accuracy of estimates of environmentally induced displacements. This uneven distribution requires regional, national and subnational approaches to understanding and addressing environmentally induced displacements in order to take into account the local dynamics in policy developments. Three examples help to illustrate these points.

A first example is related to exposure to environmental hazards, and is presented in Figure 2. It displays the regional patterns of high mortality risks associated with natural disasters

(classified as drought, geophysical and hydro). As can be observed, drought-associated risk is widespread in Africa, while hydro-associate risk is dominant in Asia and parts of Latin America. Within Africa, drought risks are concentrated in the Sahel, while hydro risk in South America is concentrated in coastal zones.

Figure 2: Example of regional variations: mortality risks associated with natural disasters

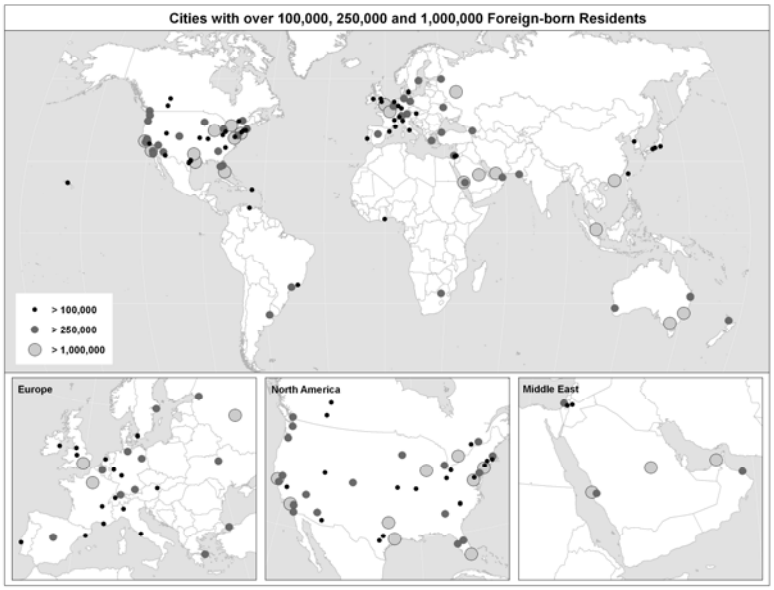


Source: Figure 1.2a. Natural Disaster Hotspots - A Global Risk Analysis. 2005 The World Bank and Columbia University

A second example is related to migration dynamics. The characteristics of regional migration systems introduce another source of variation, since displacement in response to gradual environmental events are likely to follow already established internal and international migration patterns (although most environmentally induced displacements occur within countries). Movements may then include different flows (rural-to-urban, rural-to-rural, urban-to-urban flows, or a combination of them), and they could be temporary or permanent, and over short- or long-distance. Important factors are stage of the urban transition, and level and type of development. They introduce differences between developed and developing regions, but also among developing countries (for example between Latin America and Africa).

An example of regional variation in international migration flows to large cities (measured through the number of foreign-born) is shown in figure 3.

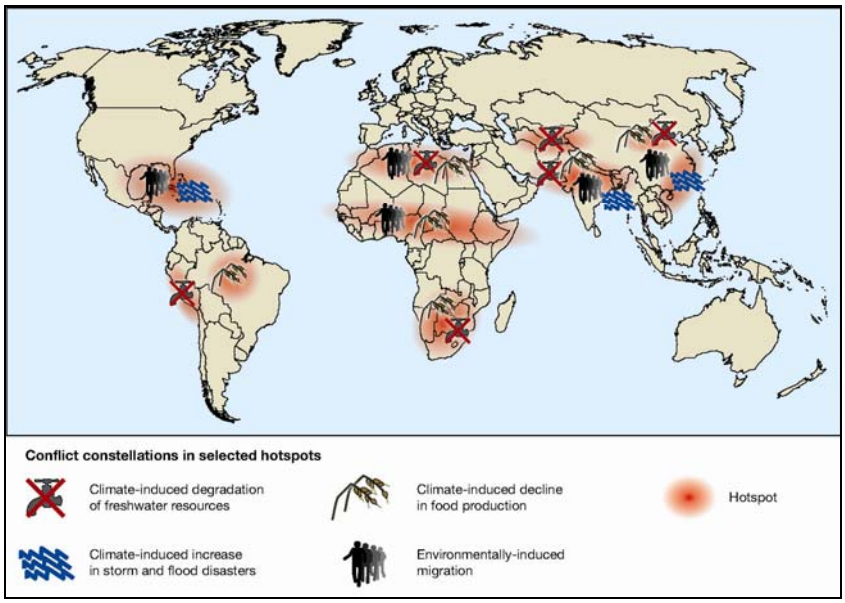
Figure 3: Example of regional variations: foreign-born residents in cities around the World



Source: http://gstudynet.org/gum/Maps/GUM_AllGUMCities_BW.jpg

The third and last example is related to spatial variation in security concerns, and is displayed in Figure 4. The German Advisory Council on Global Change (WBGU)'s identifies 'conflict constellations' in selected hotspots of the developing world, including their potential association with environmentally-induced migration. The constellations include: climate-induced degradation of freshwater resources, climate-induced decline in food production, climate-induced increase in storm and flood disasters.

Figure 4: Example of regional variations: security risks associated with climate change



Source: Figure 1. WBGU (2007)

9. Final Remarks

As the title indicates, the attribution of population displacement to environmental stressors is a delicate task, as many and very diverse scientific disciplines are involved, and ample agreement seems to be limited to the acknowledgement that a relationship exits.

This background paper presented a concise review of topics considered relevant for the discussion of this subject, including definitions, types of displacement, magnitude of the flows, linking mechanisms, methods, policy issues, security concerns, and a first glimpse at regional variations.

The topic of environmentally induced displacement still requires the careful weighting of theory, data and methods in the determination and evaluation of magnitudes, flows, selectivity and even naming terms. But at the same time, it demands immediate attention to the mounting policy issues and human security concerns that emerge from accelerate global climate change.

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