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Environmentally Induced Population Displacements

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This article examines population displacements related to environmental events, addressing conceptual, methodological and security and policy issues. It also explores potential future population displacements as a result of climate change.



Keywords: population mobility; migration; environment; climate change

Environmentally induced population displacement is a hot topic. Concerns about the consequences of climate change for human populations, the recognition that migration may be one of the most viable adaptation strategies, and the view that such population movements would present security challenges fuel this increasing interest, which has materialised in a number of recent conferences (IOM & UNFPA 2008; UNU-EHS, IOM & UNEP 2008; EFMSV 2008; PERN 2008; RSC & IMI 2009).

Still, the debate on what constitutes an environmentally induced move continues, and the general agreement that environmental factors contribute to population mobility translates into a modest consensus about the mecha-

nisms, character and extent of that contribution (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, KROL & KIOT 2004; HUNTER 2005, 2007; IOM 2007; RENAUD ET AL. 2007; KNIVETON ET AL. 2008A; WARNER ET AL. 2008; ADAMO 2008A).

There has been progress, however,. The International Organisation for Migration has proposed a new working definition of environmental migrants, which identifies trigger events, types of movement and also hints at the mechanisms linking environmental change and population mobility.

To capture the several possible combinations, particularly for policymaking and development planning, the IOM (2007) has also suggested different scenarios (TABLE 1).

1. The propensity to migrate in relation to environmental change	2. The impact of migration on the environment	3. 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		

Table 1: IOM's Migration-Environment Scenarios. Source: IOM 2007

Of interest here are columns 1 and 3. Column 1 highlights the heterogeneity of trigger events in terms of intensity, predictability, and scale or magnitude, which results in critical differences in terms of people displaced, area affected and duration of the event (IOM/RPG 1992; IOM/UNHCR 1996; LONGERGAN 1998; WOOD 2001; BATES 2002; BIERMANN & BOAS 2007; RENAUD ET AL. 2007). Column 3 characterises the interactions of environmentally induced displacement with human security and conflict, topics that have also been on the rise.

The movements

Depending on the intensity of the hazard, the vulnerability of the exposed population, and the availability of assistance, environmentally induced mobility may be arranged in a continuum ranging from forced to compelled to voluntary (HUGO 1996; RENAUD ET AL. 2007; BATES 2002). Overall, a certain amount of coercion is implicit in the fact that push factors in the origin area are more important than pull factors in destinations (SUHRKE 1993; HUGO 1996; RICHMOND 1995; STILES 1997; BATES 2002). Frequently, environmental 'push' factors are intertwined with economic issues, but they may also be linked to concerns about the deterioration of local environmental conditions and of quality of life in general (IZAZOLA, MARTÍNEZ & MARQUETTE 1998; HUNTER 2005).

By far, most of the environmentally induced mobility has been internal and short-term (HUGO 1996; MYERS 2002; HUGO 2006; MASSEY, AXINN & GHIMIRE 2007). Some evidence shows that the spatial distribution of pre-existing migrant networks and other forms of social capital are relevant to estimate the probability of local or long-distance moves as well

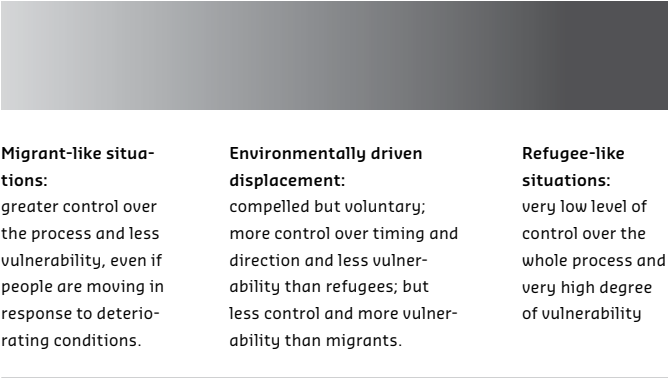


Figure 1: The continuum of environmentally induced population displacements
Source: Based on Hugo 1996; Bates 2002 ; Renaud et al. 2007

as the probability of return (HUGO 1996; MCLEMAN & SMIT 2006). In the case of natural disasters, the most common and fastest response is evacuation (HUNTER 2005, P.283), generally occurring over a short distance and only temporary in duration, although some evacuees may choose to relocate, as happened with evacuees from New Orleans following Hurricane Katrina. In the aftermath, an option is the permanent relocation of entire communities to less dangerous places. In developing regions, permanent environmentally induced displacement tends to occur in a less organised way, and is usually local, consisting of simply moving to less dangerous places nearby, for example, to higher ground if available (HUNTER 2005). However, local, spontaneous relocation may not be possible if the surrounding area is densely populated or if land owners refuse to allow resettlement (ADAMO & DESHERBININ FORTHCOMING).

The movers

Environmentally induced flows may differ from 'normal' flows. Research on migration and drought in the Sahel found a diversification of migration patterns during drought periods. Although the flows did not intensify, their composition changed, including a higher number of women and children likely to reduce household consumption. Shifts to circular and short-cycle labour migration as well as changes in destinations and in the number of moves were also verified. Remittances from long-term migrants were still essential to their families, but households also put more workers in the local labour market, which included the temporary migration of young male members to increase income and

reduce consumption (FINDLEY 1994; HENRY, SCHOU-MAKER AND BEAUCHEMIN 2004; BROWN 2007).

Selectivity by socioeconomic status of individuals and households, a key determinant of the degree of vulnerability, has been also registered. Research in Nepal (MASSEY, AXINN & GHIMIRE. 2007) found that local environmental deterioration was associated with short-distance movements of males and females, but that this only applied to lower castes and that the effect on long-distance moves was weaker. In the Sahel, good or bad harvests, an indicator of wealth, determine household choice of long or short-distance moves of workers (BROWN 2007). Studies in the US found that lower socioeconomic status was linked to a higher probability of relocation after a hazard event (HUNTER 2005), suggesting that better-off households had more resources to afford rebuilding, had insurance, or suffered less damage because of their ability to meet the expense of mitigation measures. Yet, Izazola, Martínez & Marquette (1998, p.114) found that middle and upper-class households in Mexico City were more likely to leave the city because of air quality concerns.

Data issues

In general, data on environmentally induced migration are scarce, and 'creative' calculation methods for the magnitude of past, current and future environmentally induced displacement are generally controversial (LONERGAN 1998; BLACK 2001; CASTLES 2002, p.2; BIERMAN & BOAS 2007, p.9; BLACK ET AL. 2008). This lack of adequate data, particularly in terms of time series of environment and demographic variables, is still a constraint for methodological innovation, and conclusive results are still absent (PERCH-NILSEN 2004; KNIVETON ET AL. 2008B).

Some authors have suggested the use of population censuses (LE BLANC 2008, p.42; SEE ALSO POSTINGS TO PERN 2008), relying on base-area information and focusing on flows of migrants from areas of environmental change and degradation. While it could be enough for a number of policy needs, this could not be adequate for understanding how and why environmental change can trigger population mobility.



Internally displaced refugees outside of Goma, Democratic Republic of Congo.
Photo: Endre Vestvik

The linking mechanisms

A more precise measurement and potential forecasting of environmentally induced displacement would require a better understanding of the mechanisms linking environmental stressors and demographic behaviour. The identification of these mechanisms entails considering different factors and levels of determination, as well as temporal and spatial scales.

A critical understanding is that (a) multiple factors influence migration decisions, (b) environmental factors rarely act alone and they cannot be easily disentangled from the rest of the factors and processes leading to migration; and (c) cause-effect relationships are hard to quantify and tied to the rest of these factors (LONERGAN 1998, pp. 10; WOOD 2001, p.44; MEYERSON, MERINO AND DURAND 2007; KNIVETON ET AL., 2008A, p. 37). It is also important to remember that, except in cases of sudden environmental disasters, mobility is just one among several possible responses and adaptations to environmental change (BILSBORROW 1992; BLACK 2001; TACOLI 2007; ADGER ET AL. 2007, p.736).

Patterns of vulnerability and their determinants, for example, individual demographic characteristics and household livelihood composition (BLAIKIE ET AL. 1994; KASPERSON ET AL. 1995; MACÍAS 1992; CARDONA 2001; DE SHERBININ, SCHILLER & PULSIPHER 2007; ADGER ET AL. 2007), are key factors for understanding population mobility as a response to environmental risks, or the absence thereof. People's subjective view and perception of the hazard and of their own vulnerability, based on past personal experience as well as present and past individual, household and community characteristics and the socio-economic, political and historical context in which they are embedded, are also relevant factors (IZAZOLA 1997; HUNTER 2005; HEATHCOTE 1980; DAY 1995; HOGAN 1995; MEZE-HAUSKEN 2000, 2008).

Finally, population mobility as a response to environmental impacts is embedded in socio-economic, cultural and institutional contexts, and influenced by the historical local development of the interactions between a population and its environment (BLAIKIE & BROOKFIELD 1987; LITTLE 1994; SCHMINK 1994; GUTMANN ET AL. 1996). Consequently, it is spatially differentiated, as environmental hazards, population exposure and vulnerabilities and risks, including security risks, are not uniformly distributed across the globe. Levels of development, living conditions, livelihoods, institutional capacities and the strength of States can be quite diverse, and regional diversity is the rule in migration patterns and systems. This uneven distribution would require regional, national and sub-national approaches to understanding and addressing environmentally-induced displacements.

Agent-based models (ABMs) appear well-suited to modeling the links between environmental change and migration (ENTWISLE ET AL. 2008; KNIVETON ET AL. 2008A) by simulating responses from individuals, households or communities to environmental events. These models are based on the assumption that the results of individual actions may differ from the sum of their parts in a system characterised by interacting agents or autonomous decision-making entities, emergent properties arising from agents' interactions with each other and a set of rules that govern these interactions that take into account people's perceptions and experiences (KNIVETON ET AL. 2008A, P.47).

Methodological developments in migration research can also be applied to the study of environmental displacement, including multilevel models (BILSBORROW ET AL. 1987; ZHU 1998; EZRA 2001); even history analysis techniques (MULDER 1993; LIANG & WHITE 1996; PARRADO & CERRUTTI 2003); the combination of both techniques (EZRA & KIROS 2001; HENRY, SCHOUMAKER & BEAUCHENTIN 2004; KULU & BILLARI 2004); and the use of network analysis (KORINEK ET

AL. 2005). Statistical analysis can be combined with Geographic Information System techniques to determine spatial patterns of environmental change impacts and migration, also integrating data from a variety of sources (KNIVETON ET AL. 2008A; ALSO SEE MCGRANAHAN, BALK & ANDERSON 2007).

Potential effects of climate change

The IPCC's First Assessment Report warned that the greatest effect of climate change on society could be human migration, i.e. involuntary forms of displacement and relocation (OSCE 2005). This seems to point to population mobility as a less desirable form of adapting to climate change- a last resort coping strategy when other adaptation possibilities are unavailable or have failed. Later, it was recognised that there are situations in which population mobility constitutes a powerful adaptive strategy. The IPCC's Fourth Assessment Report stressed the significance of established migrant networks and patterns as part of the inventory of the adaptation practices, options and capacities available to face climate change impacts (ADGER ET AL. 2007, P.736).

The effects of climate change are likely to present regional variations in their potential to trigger population displacements depending on the place and time of the impact, the affected population's degree of vulnerability, and the availability of alternative responses. In terms of international displacements, the percentage of the population affected may be a better predictor than the absolute numbers. The reasoning is that the higher the percentage affected, the more likely the national coping capacities will be overwhelmed. Some combination of relocation in advance of events and short-term displacements in the aftermath is likely (ADAMO & DE SHERBININ FORTHCOMING).

Socioeconomic status may become an important predictor since population mobility as response requires resources. Overall, in situ adaptation may be more likely in developed regions while displacement may be more likely in developing areas. However, it could be the case that a household or individual is too poor to "invest" in migration, being obligated to stay put and hope that the situation improves. The poorest populations, often living in the most vulnerable locations (BLAIKIE ET AL. 1994), are likely to be those with the fewest resources to permanently relocate. On the other hand, relatively better off land owners are those with greater incentives to remain on their land, so it is not easy to predict who will move (ADAMO & DE SHERBININ FORTHCOMING).

Sea-level rise appears to be the impact most certain result in displacement and resettlement (HUGO 1996; BLACK 2001; MCGRANAHAN, BALK & ANDERSON 2007; DE SHERBININ, SCHILLER & PULSIPHER 2007) as a relatively gradual, slow onset event leading to relocation to higher ground nearby if land resources are available. Coastal areas and Small Island States (SIS) are particularly threatened by sea-level rise and extreme weather events (BIJLSMA 1996; HUGO 2006; NURSE, MCLEAN & SUAREZ 1997). Migration may be the only adaptive response, particularly if sea-levels rise faster than predicted. In the case of SIS in particular, relocation and resettlement policies have been discussed (ADGER ET AL. 2007). However, the need for avoiding simplistic assumptions remains (MORTREUX & BARNETT 2008).

Coastal flooding from storm surges and excess precipitation, by contrast, is generally a less predictable and sudden onset event. Extreme weather events are likely to trigger local sudden and massive displacements from affected areas. The key factors here are the predictability of the event and the government and civil capacity to face it. This type of movement will probably occur over short distances and be temporary in nature (ADAMO & DE SHERBININ FORTHCOMING).



Seeking for drinking water in Rajasthan, India. Photo: Marcus Fornell

Climate change impacts on freshwater resources such as droughts, water scarcity and glacial melting are typically slow onset events. Worsening dry conditions in semi-arid and sub-humid areas may render such areas unfit for rain-fed agriculture and led to their abandonment unless irrigation infrastructure is available. Population numbers and densities in these regions, however, are already low, and numbers of the displaced would thus be low. Environmental changes related to large-scale adaptation works such as water transfer schemes and flood defenses could be another source of population displacement (ADAMO & DE SHERBININ FORTHCOMING). Migration as an adaptive response to declining freshwater resources is likely to rest on already established patterns of population mobility (HUGO 1996; ADAMO 2003), and labour related circular migration of some household members, generally young adults, may be expected (BROWN 2007). Depending on the severity of the impact, however, these long-time adaptations may not be enough (TACOLI 2007) and more permanent migrations would then be possible.

The determination of the magnitude of climate change-related displacement is a contentious matter (SEE BIERMAN & BOAS 2007 AND CASTLES 2002 FOR A DETAILED DISCUSSION) and available estimates show a large diversity of possibilities, as illustrated in Box 1. Environmental impacts have been calculated from climate change projections assuming a linear and causal relationship between the environmental event and population displacement and location specific socio-economic responses have been generalised. General numbers tend to reflect populations at risk “a long way from predicting mass flight of a ‘refugee’ nature” (BLACK 2001, p.9).

Security concerns

Potential climate change-related displacement has triggered different security concerns, which IOM (2007) groups into two scenarios:

Scenario (G) relates to concerns about human security challenges, including the security of individuals, households and communities, and about their coping and adaptation capabilities (BOGARDI 2004; RENAUD ET AL. 2007; IOM 2007). The more sudden, involuntary or forced the displacement, the more likely it is to disrupt livelihoods and to deteriorate quality of life, 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 vulner-

ability (BOHLE 2007; WARNER ET AL. 2008). It favors the concept of adaptation in- situ, including risk management and vulnerability reduction through 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.

Scenario (H) relates to concerns about the conflict potential of environmentally induced displacements. 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 also shows that these are usually non-violent (CASTLES 2002, P.6; STERN 2006; GLEDITSCH ET AL. 2007; WOODROW WILSON CENTER ENVIRONMENTAL CHANGE AND SECURITY PROGRAM). These situations pose potential threats to global and national security, and could eventually increase in the presence of climate change. Scenarios describing massive environmentally induced displacements often accompany these scenarios, capturing some of the issues found in the literature on environmental refugees (I.E. MYERS 2001, 2002; REUVENY 2005; CASTLES 2002; WBGU 2007; CAMPBELL ET AL. 2007; URDAL 2005).

Policy issues

Policy issues related to environmentally induced displacement include their implications 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).

The IOM (2007, P.5) has suggested tailoring policy interventions to the stage of environmental degradation, for example, by facilitating migration in the early stages of the deterioration process, and mitigating forced displacement at irreversible stages or anticipating the problem 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, P.102).

Finally, although studies have shown that environmental displacements take place mostly within national boundaries and are consequently a national matter, the crossing of international boundaries would need to be an-

Selected 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).

anticipated for both the nations most likely to be affected such as for Small Island States as well as for the less likely nations, since such displacement with require international cooperation (HUGO 1996; BROWN 2007).

Final remarks

This brief article should be concluded with a note of caution and a call to action, restating some of the conclusions of PERN 2008 seminar (ADAMO 2008B). The attribution of population displacement to environmental stressors is a delicate task, as many and very diverse scientific disciplines are involved. Agreement in this field seems to be limited to the acknowledgement that a relationship exists. The topic of environmentally induced displacement still requires the careful weighing of theory, data and methods in the determination and evaluation of magnitudes, flows, selectivity and even naming terms. Ideally, the understanding of how populations respond to climate-based uncertainty and di-

Susana Adamo on participating in the IHDP Open Meeting 2009



"After waiting for it since the end of the 6th Open Meeting, I finally learnt about the IHDP Open Meeting 2009 sometime during 2007, through a combination of checking IHDP website, PERN announcement, emailing to the organizers and comments from colleagues. I had decided to participate long before knowing the date and venue, because I am convinced that the Open Meetings are the very few (if not the only) true interdisciplinary forums for population-environment issues, combining science and policy, and gathering the most diverse audiences.

For different reasons, I had not been able of participating in previous Open Meetings; this will be my first one, and I am certainly looking forward to being in Bonn in April. My expectations for the Open meeting include to receive constructive comments about my papers; to meet and interchange experiences with colleagues working in similar topics, as well as with colleagues working on other aspects of the field; and to participate as much as possible of all the activities planned for the Conference".

saster would be part of talks about ways to avoid exposure to or mitigate the effects of catastrophic events.

At the same time, the mounting policy issues and human security concerns that emerge from accelerated global climate change demand attention. Interdisciplinary research and communication between researchers and policymakers must be enhanced. Scenarios of adaptive capacity and its multiple factors must consider both flows of movers and groups of stayers, lending greater attention to those contextual factors, including level and style of development, which could be most affected by climate change events.

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