

NEW ISSUES IN REFUGEE RESEARCH

Research Paper No. 153

Climate change and forced migration

Etienne Piguet

Professor of Human Geography
Institute of Geography
University of Neuchâtel
Switzerland

E-mail: Etienne.Piguet@unine.ch

January 2008



UNHCR

The UN Refugee Agency

Policy Development and Evaluation Service

**Policy Development and Evaluation Service
United Nations High Commissioner for Refugees
P.O. Box 2500, 1211 Geneva 2
Switzerland**

**E-mail: hqpd00@unhcr.org
Web Site: www.unhcr.org**

These papers provide a means for UNHCR staff, consultants, interns and associates, as well as external researchers, to publish the preliminary results of their research on refugee-related issues. The papers do not represent the official views of UNHCR. They are also available online under 'publications' at <www.unhcr.org>.

ISSN 1020-7473

Introduction

The term "environmental refugees" was first coined in 1985 as a report title for the United Nations Environment Programme (El-Hinnawi 1985). It has since been widely diffused in both political and academic circles (Castles 2002). This growing concern of the international community about the consequences of migration resulting from environmental deterioration was reinforced in 1990 by the publication of the first UN intergovernmental report on climate change which stated that "The gravest effects of climate change may be those on human migration as millions will be displaced" (Intergovernmental Panel on Climate Change 1990, 20).

In 1993, the prediction that there would be 150 million environmental refugees by the end of the 21st century, as forecast by Norman Myers, further fuelled the fear of mass migrations (Myers 2003). In the review "Population and Environment" this respected environmentalist wrote, four years later, " the issue of environmental refugees (...) promises to rank as one of the foremost human crises of our times" (Myers 1997, p. 175).

Filmmaker Roland Emmerich dramatized this fear in 2004, in a scene from the film "The Day After Tomorrow" where American citizens flee en masse from lightning and a terrible climatic disturbance from the north only to find themselves – and here is the irony – running up against the fences of the American-Mexican frontier. Today, for the Israeli geographer Nurit Kliot, who has led a synthetic overview on the subject, "the fear of mass migration of environmental refugees has become a major issue in the international community" (Kliot 2004, 69).

With the increasing certainty of global warming, the more precise term of "climate refugee" has been swiftly diffused in public discourse. This is exemplified by the "Citizen's guide to climate refugees" found on the website of the Australian NGO, Friends of the Earth (Friends of the Earth Australia 2007). Other instances include the recent series of reports entitled "Avec les réfugiés climatiques" by the French photographic collective Argos (<http://www.collectifargos.com/> - visited 21 July 2007).

The links between climate and human migration are not new (Beniston 2004). Thus, the droughts of the 1930s in the plains of the American Dust Bowl forced hundreds of thousands of migrants towards California, and those that struck the Sahel between 1969 and 1974 displaced millions of farmers and nomads towards the cities. Notwithstanding the present media focus, the amount of systematic research on environment and migration remains quite limited.

There is much vagueness surrounding the concepts employed, the underlying mechanisms involved, the number of persons affected and the geographical zones concerned. The use by numerous authors of the term " refugee " has also led to certain confusion because it evokes the juridical status recognized by UN Convention of 1951 referring to any person having a "well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion". Although it is clear that environmental reasons are absent from this list, if environmental deteriorations due to human influence on the climate generate forced

migration flows, then the question of the rights of victims to a form of protection will become unavoidable.

In this article we will first try to understand why the environmental aspect of the study of migration and refugees has, up until now, been neglected. We will then propose a definition of population movements induced by environmental factors, before concentrating on climate aspects by providing a synthesis of results put forward by researchers. Finally, we will examine forecasts for future developments.

A neglected topic

For many years, population geography has, of course, acknowledged the role played by environmental factors in explaining the history of population and the emergence of cities. Thus, for mankind, the passage across the Bering Straits from America 13,000 years ago was possible due to the low sea levels of the ice Age, while the Medieval Climate Optimum which lasted between 8th and 13th centuries AD seems to have stimulated the population of Polynesia by making navigation relatively easy thanks to regular winds and clear skies (Perch-Nielsen 2004, 39).

Paradoxically, it also appears that the desertification of the Sahara and the Arabian peninsula has played an important part in the densification of the population on the banks of the Nile, and has consequently contributed to the birth of ancient Egyptian civilization (Hammer 2004, 238). Fifty years ago, the strong link between pluviometry and population density has been shown, for example, in the American Great Plains (Robinson, Lindbergh, and Brinkman 1961).

With industrialization, however, the importance of the role given by population geographers to the environment declined progressively. Already at the end of the 19th century, the famous "migration laws" of E. G. Ravenstein held that economic factors were of prime importance. Their pre-eminence was almost exclusive in the theorization of migration flows during the second half of the 20th century (Massey and al. 1993).

While certain environmental characteristics of areas studied were taken into consideration, generally only the positive factors received any serious attention. Greenwood (1969) highlights in this respect the favourable effect of high average temperatures on internal migration on the US mainland, while Graves measures the effect of climate mildness in general on migration (1980).

Up until recently, the environment, especially when considered as a negative factor inducing forced displacements, has been absent from the study of migrations on account of the dominance of what we can call an "Economic Paradigm". One can add that migrations linked to the environment are frequently internal and affect Southern countries. It is noteworthy that these two aspects of migration have been neglected by researchers to the advantage of studies in international and North-South migrations.

A similar result stems from the "Political Paradigm" that characterizes the specific study of refugees (*Refugee studies*). The latter give only limited attention to the link between environment and migration and often reduce the object of enquiry to political

refugees, as defined under the 1951 UN Convention. It is consequently not surprising that surveys of refugee studies only give very limited attention to environmental aspects, except for the degradation that refugees might cause themselves (Black and Robinson 1993; Richmond 1988; Zolberg, Suhrke, and Arguayo 1986).

A problematic concept

One last element that may have curbed the study of links between environment and migration is that several researchers have rejected the very concept of environmental refugees (Black 2001). Rightly highlighting the shaky empirical character and sloppy nature of most work on the subject, they have brought to the fore problems arising from a unidirectional link between environmental changes and migrations in the face of well-established results from research on population flows. For Castles, "the term environmental refugee is simplistic, one-sided and misleading. It implies a monocausality which very rarely exists in practice (...) [Environmental and natural factors] are part of a complex pattern of multiple causality, in which [they] are closely linked to economic, social and political ones." (Castles 2002, 5).

Numerous works confirm this: when environmental deteriorations cause displacements, they are often the by-product of economic, demographic or political factors (Hugo 1996). Moreover, vicious circle phenomena are very frequent and it is not easy to isolate primary causes. Hence, population displacements will induce environmental problems that will have an effect on conflicts which themselves risk to exacerbate environmental deterioration (Hagmann 2005).

There is agreement today that natural factors are not the sole cause of migration and that the economic, social and political situation of the zone under threat can, depending on the case, increase or decrease the flow of migrants. Apart from the scientific error of oversimplifying the processes taking place, the danger here is also one of "evacuating political responsibility by overplaying the hand of nature" (Cambrézy 2001, 48).

Another serious criticism has been addressed to the advocates of the environmental refugee concept and, in particular, to Norman Myers and his estimation of a potential 150 million refugees. They are accused of brandishing the spectre of a flood of migrants towards rich countries, thus reinforcing the position of governments that have policies of closed borders and are hostile to refugees. For MacGregor: "In so far as the term environmental refugee conflates the idea of disaster victim and refugee, its use brings with it the danger that the key features of refugee protection could be undermined and the lowest common denominator adopted.

Because environmental can imply a sphere outside politics, use of the term environmental refugee may encourage receiving states to treat the term in the same way as economic migrants to reduce their responsibility to protect and assist" (1993, 162). The High Commissioner for Refugees, being very aware of this risk of confusion between political and non political refugees, has always treated with the upmost prudence the idea of including environmental motivations in the international definition of refugees, even if he also deems this category of the population as a possible part of his protective mandate toward displaced persons within states (IDPs) (see number 127, vol. 2, 2002 of the review "Refugees Magazine").

Even if they have dampened the enthusiasm of certain researchers, reservations regarding the concept of environmental refugees seem to be fully justified. They have obliged the scientific community to be mindful of the consequences of their terminological choices and point to the need for clear definitions of the different aspects of the phenomenon.

Indeed, a considerable number of terminological variants have been used by researchers to refer to persons fleeing climate hazards, and more generally, environmental disturbances. While the term environmental refugees (sometimes ecological refugees) was more frequent in the English language (El-Hinnawi 1985; Jacobson 1988; Myers 1993; Myers 1997; Westing 1992) during the 1990s as well as in German (*Umweltflüchtling* (Bächler 1994; Richter 1998)) and French (réfugiés de l'environnement (Gonin and Lassailly-Jacob 2002)), more neutral terminology has emerged vis-à-vis the 1951 Convention, such as environmental or ecological migrants, ecomigrants or ecomigrations (Wood 2001). As time has passed, the number of push factors included under this terminology has become greater. While El Hinnawi in 1985 focussed on deterioration of soils and rural exodus, Jacobson broadened the definition to include persons displaced by development projects (The Three Gorges Dam...) or industrial accidents (Bhopal, Chernobyl...) (Jacobson 1988). Today, the acronyms EIPM (Environmentally Induced Population Movements) and EDP (Environmentally displaced person) are well suited to describe a general category of migration movements where the environmental factor is decisive, but not necessarily unique. As Lonergan notes (1998), five groups of factors can be singled out as environmental push elements that might lead to migration:

1. Natural disasters;
2. Development projects that involve changes in the environment;
3. Progressive evolution of the environment;
4. Industrial accidents; and
5. Environmental consequences due to conflicts.

In the following part of the paper we are going to concentrate on factors 1 and 3, which concern environmental changes that are relatively independent of short-term human activity and that might be linked to climate change. Migrations linked to development projects, industrial accidents or conflicts are, on the other hand, singular events directly linked to human activities and as such not easy to anticipate or summarize.

Past experiences and the consequences of global warming

"Greater resource scarcity, desertification, risks of droughts and floods, and rising sea levels could drive many millions of people to migrate". This alarming prediction appears in the review of the economic consequences of global warming delivered to the British government by Sir Nicholas Stern at the end of November 2006 (Stern 2006, 111). One year earlier, the authorities of Papua New Guinea appeared on the

front page of the British newspaper *The Guardian* in a leading article entitled "The First Refugees of Global Warming," announcing their decision to progressively evacuate all one thousand inhabitants of the small atoll of Carteret (Kilinailau) which is being slowly submerged by rising seas.

While it is extremely difficult to elaborate scientific predictions by combining climate and migration models (Perch-Nielsen 2004), the expected consequences of climate change can be enumerated and compared to past experiences so as to establish a list of the populations most at risk and the possible resulting emigration flows. Three consequences of climate warming, as forecast in the latest report of the IPCC for the end of the 21st century, appear to be the most threatening potential causes of migrations (Intergovernmental Panel on Climate Change 2007b):

- The increase in the strength of tropical hurricanes and the frequency of heavy rains and flooding, due to the rise in evaporation with increased temperatures.
- The growth in the number of droughts, with evaporation contributing to a decrease in soil humidity, often associated with food shortages.
- The increase in sea levels resulting from both water expansion and melting ice.

While the first two consequences are the direct result of sudden natural disasters, the third is a long-term process, which, as we will see, has very different possible implications in terms of migrations. We leave aside other effects of global warming on health or the viability of certain economic activities that may have additional consequences for migrations but which remain subject to speculation.

Hurricanes, torrential rains and floods

The impact of hurricanes and floods on population displacement is among the easiest to identify, as they manifest themselves in a brutal and direct manner. Particularly well publicised, the flooding due to Hurricane Katrina, in August 2005, necessitated the evacuation of hundreds of thousands inhabitants of New Orleans while tens of thousands of others, primarily Afro-Americans, remained trapped in the city due to a lack of transport amenities (Cresswell 2006).

While we know approximately the number of persons affected by flooding worldwide (106 million, on average, between 2000 and 2005 according to the *International Disaster Database*), and by hurricanes (38 million), the total number of people threatened by an eventual increase of this kind of disaster is, however, very difficult to estimate (EM-DAT). No climate model is able to predict with accuracy whether or not the affected zones will be densely populated and whether the damage will have tragic consequences.

Apart from this difficulty of forecasting, the studies carried out after such events tend to relativize their effects in terms of migration in general, and long-term migration in particular. Living mainly in poor countries, the victims have little mobility (Lonergan

1998) and the majority of the displaced return as soon as possible to reconstruct their homes in the disaster zone (Kliot 2004; Naik, Stigter, and Laczko 2007). The results from numerous research projects conducted worldwide on the subject tend to confirm this point with remarkable regularity. Thus, a synthesis of results on migration choices of victims of natural disasters displaced in eighteen sites confirms, with rare exceptions, the strong propensity to return (Burton, Kates, and White 1993).

In a much more indirect and incomplete fashion, studies on persons seeking asylum in Europe indicate no correlation between asylum applications and natural disasters recorded in the zones of departure. On the contrary, a significant link is confirmed regarding the political situation in these same zones (Neumayer 2005).

According to some authors, the case of Bangladesh nevertheless remains an important counter example where, in contrast with the image portrayed in most literature on the subject, natural disasters would be the major cause of forced migration (Haque 1997). On a global level however, the general conclusion is that the potential of hurricanes and torrential rains to provoke long-term and long-distance migrations remains limited.

Drought and desertification

In the recent past, the number of persons affected by drought has been comparable to that of victims of hurricanes and floods (146 million, on average, between 2000 and 2005 according to the EM-DAT). The latest report of the IPCC predicts increased water shortages in Africa (74 to 250 million people affected in 2020) and Asia: "Freshwater availability in Central, South, East and Southeast Asia particularly in large river basins is projected to decrease due to climate change which, along with population growth and increasing demand arising from higher standards of living, could adversely affect more than a billion people by the 2050s." (Intergovernmental Panel on Climate Change 2007a, 10). Case studies, however, paint a contrasting picture. The effect of a lack of drinking and irrigation water on migration is actually less sudden than that of the meteorological events mentioned in the previous chapter, and only generates progressive departures.

On one hand, there are many well-known cases of mass population departures, in particular in Africa (Sahel, Ethiopia) but also in South America (Argentina, Brazil), in the Middle East (Syria, Iran), in Central Asia and in Southern Asia. Hammer presents an impressive table of forced migration due to droughts and floods during the period 1973 – 1999 in the Sahel with a maximum figure of one million displaced persons during the drought in Niger in 1985 (Hammer 2004, 232).

He affirms, "It seems very likely that hundreds of thousands of people from rural Sahel regions are displaced every year as a consequence of environmental change and desertification" (234). Likewise, for Leighton, "The periodic drought and desertification plaguing northeast Brazil contributed to factors causing 3.4 million people to emigrate between 1960 and 1980" (2006, 47).

On the other hand, many researchers strongly relativize the possible direct link existing between drought and emigration by highlighting the fact that the latter, in general, is the last resort when all other survival strategies have been exhausted.

Consequently, during the 1994 drought in Bangladesh, only 0.4 per cent of households had to resort to emigration (Smith 2001). Other researchers hold similar views to the Nobel Prize winner for Economics, Amartya Sen, in remarking that famines are, in general, only marginally the direct result of environmental factors, but much rather political ones (Sen 1981) and add that this also holds for migrations.

A multivariate analysis on interprovincial migrations in Burkina-Faso thus shows that environmental variables, in general, only explain 5 per cent of migrations and drought itself only 0.8 per cent (Henry, Boyle, and Lambin 2003). In certain contexts, the effect can even be inverted. This was the case in Mali during the drought of the mid 1980's: a reduction in international emigration was observed due to the lack of available means to finance the journey (Findley 1994).

The general conclusion to be drawn here is that forecasts of increased migrations linked to drought related phenomena remain hazardous. Consequently, it would be difficult to put a figure on the magnitude of populations at risk and the eventual migrations arising from global warming induced droughts.

Rising sea levels

While the first two climatic hazards mentioned do not foreshadow massive population displacements due to climate change, the potential for migration when linked to an increase in sea level is considerable. Contrarily to hurricanes, rains and droughts, this phenomenon is virtually irreversible and manifests itself over a long period of time. This could make migration the only possible option for the population affected.

The localization of the consequences of rising sea levels is a relatively easy task because the configuration of coastlines, their altitude and population are well known and thus easy to integrate into geographical information systems (GIS) that permit simulations and forecasts. Hence, it is possible to calculate, on a global scale, the number of persons living in low elevation coastal zones and threatened by either rising water levels, higher tides or further-reaching waves. McGranahan, Balk and Anderson define "Low elevation coastal zones" as those situated at an altitude of less than 10 metres (2007).

Even though these zones only account for 2.2 per cent of dry land, they currently are a home for 10.5 per cent of the world population, some 602 million people, of whom 438 live in Asia and 246 in the poorest countries of the world (other authors furnish slightly lower figures totalling 397 million persons, but these, nevertheless, remain impressive (Anthoff, Nicholls, Tol, and Vafeidis 2006)).

It would certainly be an exaggeration, however, to consider that these hundreds of millions of people are all potential migrants in a near future. The latest report of the IPCC describes, of course, the possible melting of Greenland ice cover and the consequent 7-metre rise in sea level, but this would occur over several thousand years. Of more concern to us here is the scenario of thermic expansion of the oceans. According to a future CO₂ emission estimate based on continuing economic growth but with a moderation of fossil fuel use (scenario A1B of the IPCC) one could witness an increase of 0.3 to 0.8 metres of the oceans by 2300 (Intergovernmental Panel on Climate Change 2007b).

On this basis it seems reasonable to consider populations living at an altitude of less than 1 metre as being directly vulnerable by the next century. A study commissioned within the framework of the Stern report estimates that this group would comprise a considerable 146 million people (Anthoff, Nicholls, Tol, and Vafeidis 2006). Mainly situated in the major rivers, deltas and estuaries, the flood zones are particularly populated in South Asia (Indus, Ganges-Brahmaputra etc.) and East Asia (Mekong, Yangtze, Pearl River, etc.). These two regions account for 75 per cent of the population at risk. Certain Pacific states such as Tuvalu or Kiribati are, in the short-term, among the most threatened, as they are situated only centimetres above water. Although far less populated, they nevertheless have several thousand inhabitants.

The increase in sea levels appears to be the aspect of global warming that represents the greatest direct threat for numerous populations. Contrary to hurricanes and droughts, the localization of potential victims is ascertainable. If no measure of moderation is taken and if no effort is made to protect the groups at risk, then they will have no alternative but to emigrate.

Conclusion

Our summary clearly shows that environmental degradation can generate migration flows. Global warming could, in particular, lead to major forced displacements. This will result principally from rising sea levels, but will only progressively manifest itself over the coming centuries, with the exception of the flooding of certain islands. The increase in droughts and meteorological disasters predicted by climatic models will also have impacts in terms of migrations, but these will remain regional and short-term, and are at present difficult to estimate.

Existing research shows that due to the number of factors involved, no climatic or environmental hazards inevitably result in migrations. Many authors note that even if disasters become more frequent in the future, political efforts and measures of protection will be able to lessen the need to emigrate provided that the necessary financial means are made available. Even rising sea levels could be partially counteracted by the erection of dykes or the filling in of threatened zones. The Stern report is clear in this respect and states that "the exact number who will actually be displaced or forced to migrate will depend on the level of investment, planning and resources" (112), before estimating the cost of mitigation to be several billion dollars.

The overview we have carried out also shows that the very concept of climate or environmental refugees, because of its connotations of urgency and unavoidability, is to be handled with care. It actually evokes fantasies of uncontrollable waves of migration that run the risk of stoking xenophobic reactions or serving as justification for generalized policies of restriction for people seeking asylum.

The question of what the international system of protection should put in place to face these challenges remains unanswered, and is all the more important because of the clear responsibility of rich countries for global warming. Simply including environmental motives in the 1951 definition of refugees seems politically unfeasible due to the very likely opposition of receiving countries. It would probably not achieve its objective of protection as the majority of displacements take place in the interior of the countries affected. It would also risk threatening the coherence of an international

framework of refugee protection that already has difficulty in obliging states to respect their commitments. As stated in 2005 by the then Under Secretary General of the UN, Hans van Ginkel "This is a highly complex issue, with global organizations already overwhelmed by the demands of the conventionally-recognized refugees as originally defined in 1951. We should prepare now, however, to define, accept and accommodate this new breed of refugee within international framework" (United Nations University 2005).

It seems that two possibilities can be envisaged with regard to this: on one hand, an increased international cooperation with a view to collective burden sharing of assistance and prevention in countries confronted with disasters, and on the other, the opening of emigration channels with the recognition of environmental push factors in subsidiary international instruments of protection such as temporary protection schemes. This second option seems more viable for urgent cases but brings with it numerous problems, in particular the question of responsibility for the displacement of the person from the disaster zone to the receiving zone.

The discussion of these possible solutions is largely beyond the scope of this article but it is evident that without firm preventative action, global warming could have serious consequences in terms of forced migrations. This must be more widely recognized and stimulate scientific and political awareness.

REFERENCES

- Anthoff, David, Peter Nicholls, Richard S. Tol, and Athanasios Vafeidis** 2006 Global and regional exposure to large rises in sea-level: a sensitivity analysis *Tyndall centre for climate change research - Working Paper* 96
- Bächler, Günther**. 1994. "Umweltflüchtlinge : das Konfliktpotential von morgen ? = Environmental refugees : a potential of future conflicts ?" Münster: Agenda Verl.
- Beniston, Martin** 2004 Issues Relating to Environmental Change and Population Migrations. A Climatologist's Perspective in **J. D. Unruh, M. S. Krol, and N. Kliot** eds *Environmental Change and Its Implications for Population Migration*, Kluwer, Dordrecht 1-24
- Black, Richard** 2001 Environmental refugees: myth or reality ? *New Issues in Refugee Research New Issues in Refugee Research - UNHCR Working Paper* 34
- Black, Richard and Vaughan Robinson** 1993 *Geography and Refugees* Belhaven, London
- Burton, I., R. W. Kates, and G. F. White** 1993 *The Environment as hazard* Guilford Press, New-York
- Cambrézy, Luc** 2001 *Réfugiés et exilés - crise des sociétés - crise des territoires* Editions des Archives Contemporaines, Paris
- Castles, Stephen** 2002 Environmental change and forced migration: making sense of the debate *New Issues in Refugee Research - UNHCR Working Paper* 70
- Cresswell, Tim** 2006 *On the Move - Mobility in the Modern Western World* Routledge, London
- El-Hinnawi, Essam** 1985 *Environmental Refugees* United Nations Environmental Program, Nairobi
- EM-DAT** International Disaster Database www.em-dat.net - visited 21 July 2007
- Findley, S. E.** 1994 Does drought increase migration ? A study of migration from rural Mali during the 1983-85 drought *International Migration Review* 28 3 539-553
- Friends of the Earth Australia** 2007 Citizen's guide to climate refugees [online] Retrieved on 27 July 2007 from: <http://www.foe.org.au/resources/publications/climate-justice/CitizensGuide.pdf>
- Gonin, Patrick and Véronique Lassailly-Jacob** 2002 Les réfugiés de l'environnement. Une nouvelle catégorie de migrants forcés? *Revue Européenne des Migrations Internationales* 18 2 139-160
- Graves, Philip E.** 1980 Migration and Climate *Journal of Regional Science* 20 2 227-237
- Greenwood, M.J.** 1969 An Analysis of the Determinants of Geographic Labor Mobility in the United States *Review of Economics and Statistics* 51 189-194
- Hagmann, Tobias** 2005 Confronting the Concept of Environmentally Induced Conflict *Peace, Conflict and Development* 6 6 1-22
- Hammer, Thomas** 2004 Desertification and Migration in **J. D. Unruh, M. S. Krol, and N. Kliot** eds *Environmental Change and Its Implications for Population Migration*, Kluwer, Dordrecht
- Haque, C. E.** 1997 *Hazards in a fickle environment: Bangladesh* Kluwer Academic Publisher, Dordrecht
- Henry, S., P. Boyle, and E.F. Lambin** 2003 Modelling inter-provincial migration in Burkina Faso: the role of socio-demographic and environmental factors *Applied Geography* 23 2-3 115-136

- Hugo, Graeme** 1996 Environmental Concerns and International Migration
International Migration Review 30 1 105-131
- Intergovernmental Panel on Climate Change** 1990 *Policymakers' summary of the potential impacts of climate change (Report from Working Group II to IPCC)*
IPCC - Secretariat, Geneva
- 2007a *Climate Change 2007: Impacts, Adaptation and Vulnerability - Summary for Policymakers* IPCC - Secretariat, Geneva
- 2007b *Climate Change 2007: The Physical Science Basis - Summary for Policymakers* IPCC - Secretariat, Geneva
- Jacobson, J.** 1988 Environmental Refugees: A Yardstick for Habitability *Worldwatch Paper - Washington DC* 86
- Kliot, Nurit** 2004 Environmentally Induced Population Movements: Their Complex Sources and Consequences - A Critical Review in **J. D. Unruh, M. S. Krol, and N. Kliot** eds *Environmental Change and Its Implications for Population Migration*, Kluwer, Dordrecht
- Leighton, Michelle** 2006 Desertification and Migration in **P. M. Johnson, K. Mayrand, and M. Paquin** eds *Governing Global Desertification*, Ashgate, London 43-58
- Lonergan, Steve** 1998 The Role of Environmental Degradation in Population Displacement *Environmental Change and Security Project Report* 4 5-15
- Mac Gregor, JoAnn** 1993 Refugees and the environment in **R. Black and V. Robinson** eds *Geography and Refugees. Patterns and processes of change*, Belhaven, London 157-170
- MacGranahan, Gordon, Deborah Balk, and Bridget Anderson** 2007 The rising tide: assessing the risks of climate change and human settlements in low elevation coastal zones *Environment and Urbanization* 19 17 17-37
- Massey, Douglas S. and al.** 1993 Theories of International Migration: a Review and Appraisal *Population and Development Review* 19 3 431-466
- Myers, N.** 1993 Environmental refugees in a globally warmed world *Bioscience* 43 752-761
- 1997 Environmental refugees *Population and Environment* 19 2 167-182
- Naik, Asmita, Elca Stigter, and Frank Laczko** 2007 *Migration, Development and Natural Disasters: Insights from the Indian Ocean Tsunami* International Organization for Migrations - IOM Migration Research Series 30, Geneva
- Neumayer, Eric** 2005 Bogus Refugees ? The determinants of asylum migration to Western Europe *International studies quarterly* 49 3 389-410
- Perch-Nielsen, Sabine** 2004 Understanding the Effect of Climate Change on Human Migration - The Contribution of Mathematical and Conceptual Models *Diploma Thesis - Dpt. of Environmental Sciences ETH - Zurich*
- Richmond, A. H.** 1988 Sociological Theories of International Migration : the Case of Refugees *Current Sociology* 36 2 7-25
- Richter, R. E.** 1998 Umweltflüchtlinge in Afrika in **J. Scheffran and W. R. Vogt** eds *Kampf um die Natur*, Darmstadt Primus Verlag 42-73
- Robinson, A., J. Lindbergh, and L. Brinkman** 1961 A correlation and regression analysis applied to rural farm population densities in the Great Plains *Annals of the Association of American Geographers* 51 211-221
- Sen, Amartya K.** 1981 *Poverty and famines: an essay on entitlement and deprivation* Clarendon Press, Oxford
- Smith, K.** 2001 *Environmental Hazards, assessing the risk and reducing disaster* Routledge, London

- Stern, Sir Nicholas** 2006 *The Stern Review on the Economic Effects of Climate Change (Report to the British Government)* Cambridge University Press (to be published 2007), Cambridge . Retrieved on 27 July 2007 from:
www.sternreview.org.uk
- United Nations University** 2005 As Ranks of “Environmental Refugees” Swell Worldwide, Calls Grow for Better Definition, Recognition, Support *11 October 2005 - Presse Release - UNU Institute for Environment and Human Security - Retrieved on 27 July 2007 from: <http://www.ehs.unu.edu/article:130>*
- Westing, Arthur H.** 1992 Environmental refugees: a growing category of displaced persons *Environmental Conservation* 19 3 201-207
- Wood, William B.** 2001 Ecomigration: Linkages between Environmental Change and Migration in **A. Zolberg and P. M. Benda** eds *Global Migrants Global Refugees - Problems and Solutions*, Berghahn, New-York 42-61
- Zolberg, Aristide R, Astri Suhrke, and Sergio Arguayo** 1986 International factors in the formation of refugee movements *International Migration Review* 20 2 151-169