Migration, Development and Environment

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Migration, Development and Environment

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CONTENTS

List of Acronyms **5**

Introduction **7**

Conceptualizing the relationship between the migration, development and environment **9**

Environment as cause of migration **15**
1. Environmental Disaster and Migration 19
2. Environmental Degradation and Migration 22

Climate change and migration **31**

Displacement by large projects **41**

Impacts of migration on destination environments **43**

Conclusions and policy implications **47**

Endnotes **51**

References **53**

LIST OF TABLES

Table 1: Overview of Linkages Between Migration, Development and Natural Disasters....20

Table 2: Topology of Environmentally Related Disasters Likely to Precipitate Migration....26

Table 3: Some Estimates of Environmentally-Displaced Population Due to Climate Change Impacts....32

Table 4: Potential Impacts of Climate Change on Atoll Countries....33

Table 5: Population in the Low Elevation Coastal Zone (LECZ), 2005....35

Table 6: Urban Population Counts and Growth Between 1990 and 2000 for China and Bangladesh – by total and in the Low Elevation Coastal Zone (LECZ)....37

LIST OF FIGURES

Figure 1: A Complex Interrelationship: Migration, Environment, Resources and Development....9

Figure 2: A Conceptual Framework of the Interrelationships Between Population and the Environment....10

Figure 3: The Links Between Demographic and Natural Resource Issues....11

Figure 4: The Carrying Capacity Concept....12

Figure 5: Simple Model Showing Effects of Population Growth Exceeding Carrying Capacity....12

Figure 6: Model of the Impact of Innovation Associated with Population Growth on Carrying Capacity....13

Figure 7: Distribution of the Ecologically Fragile Zones in China....24

Figure 8: People at Risk in Urban Coastal Zones....36

LIST OF ACRONYMS

EFZ	–	Ecologically Fragile Zones
GCIM	–	Global Commission on International Migration
IDP	–	Internally Displaced Persons
IPCC	–	Intergovernmental Panel on Climate Change
LDC	–	Less Developed Countries
LECZ	–	Low Elevation Coastal Zone
MDC	–	More Developed Countries
SLR	–	Sea Level Rise
UNFPA	–	United Nations Population Fund
UNHCR	–	United Nations High Commission for Refugees

INTRODUCTION

Environment and international migration and their relationship with development are among the most pressing issues on the contemporary global agenda. They have been the focus of major international attention in the last year with the release of the Report of the Intergovernmental Panel on Climate Change (IPCC 2007) and the holding of the first Global Forum on Migration and Development in Belgium in July 2007. Despite the enhanced profile of environment and migration and their relationship with development, little of this increased attention has been concerned with the complex and multidirectional relationships between them. In both research and policy, environment and international migration's linkages with economic development have evolved separately. Yet it is apparent that their interrelationships are of considerable significance for understanding social, economic and environmental change and for developing effective interventions to reduce poverty and move toward sustainability.

Migration on a permanent or temporary basis has always been one of the most important survival strategies adopted by people in the face of natural or human caused disasters. However, our knowledge of the complex two-way relationship involving environmental change as both a cause and consequence of migration remains limited. Moreover, how migration and environmental concerns interact and impinge upon economic development, social change, and conflict is little understood. In a context where global environmental stress and degradation have accelerated and unprecedented numbers of the world's population are seeing migration as an option, the need for targeted, multidisciplinary research in this area is considerable.

Historically, the vast bulk of migration caused by environmental change has occurred within national boundaries, as have the environmental effects resulting from population movements. The international dimensions of this relationship have been neglected until recently. Moreover, it is argued here that this dimension is of increasing scale and significance in concert with the accelerating pace of globalization processes. Accordingly, the present paper focuses upon international migration occurring as a result of environmental changes and processes and the implications of increasing levels of population movement between countries for the environment and development. We begin with a brief review of some attempts to conceptualize environment-related migration and then consider the extent to which environmental factors have been, and are likely to be, significant in initiating international migration. This is attempted through a consideration of the environment as both a direct and contributory factor in causing such migration, especially south-north international migration. Four types of 'environmental migration' are identified – migration induced by environmental disasters, that caused by environmental degradation, migration and climate change and movement forced by environmental change caused by large scale

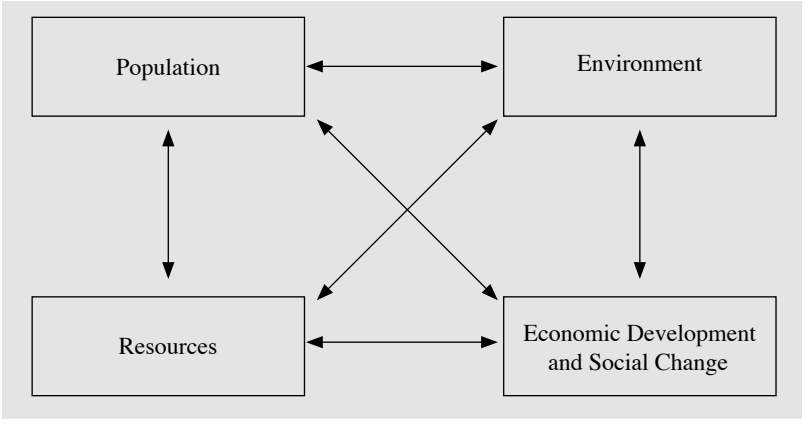
projects. Attention is then focused on migration as an independent variable in the migration-environment relationship, and the environmental consequences of international population movements are discussed. The implications of these relationships for economic development and poverty reduction are then discussed. Finally, some of the ethical and policy dimensions of emerging international migration-environment-development trends and processes are addressed.

The lack of research on the migration-environment-development interface is undoubtedly partly due to the fact that migration and environmental scholars work separately, rarely working in genuinely interdisciplinary teams on cross-disciplinary projects. As a result there is a neglect of environmental issues in such important documents as the report of the Global Commission on International Migration (GCIM 2005) and of migration issues in documents like the Report of the Intergovernmental Panel on Climate Change (2007). In the absence of serious interdisciplinary research efforts there are unsubstantiated claims by interest groups and the popular media of the scale of the impacts of environment population interactions and especially of environmentally induced migration. Despite their lack of empirical basis such claims gain an unwarranted credibility through frequent repetition.

CONCEPTUALIZING THE RELATIONSHIP BETWEEN MIGRATION, DEVELOPMENT AND ENVIRONMENT

It is an underlying premise of this paper that there are not only complex two way interrelationships between migration and development on the one hand and environment and development on the other but also, as Figure 1 shows, significant interlinkages between migration and development.

FIGURE 1: A COMPLEX INTERRELATIONSHIP: MIGRATION, ENVIRONMENT, RESOURCES AND DEVELOPMENT



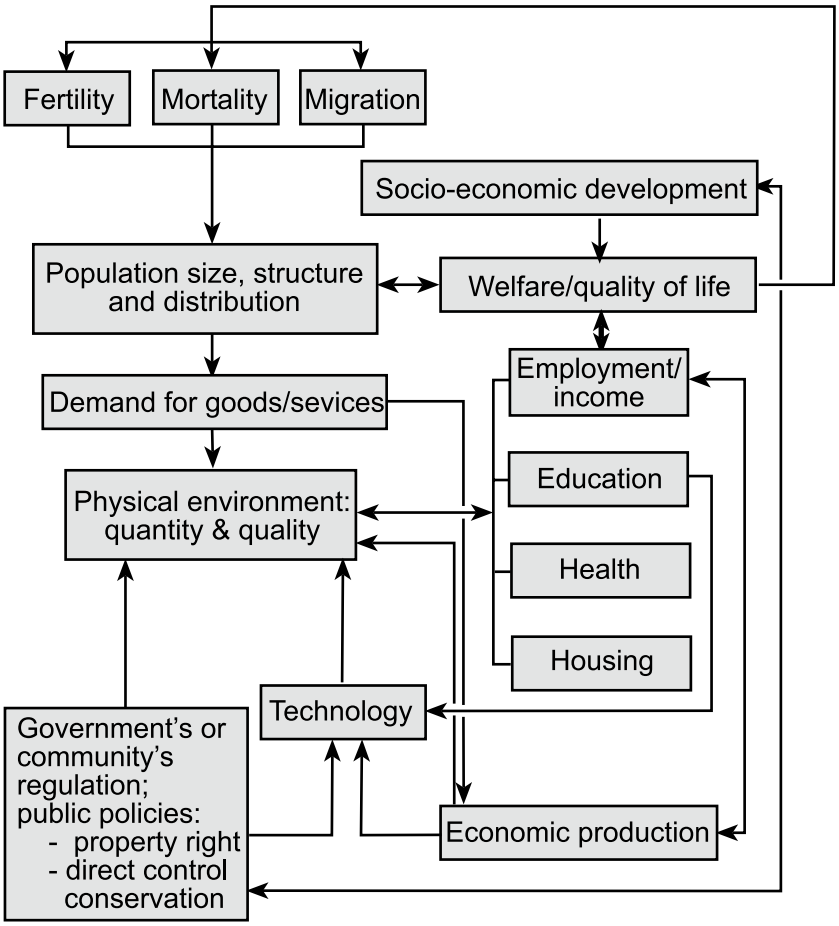
The starting point for discussions of relationship between migration and the environment is usually the formulations that link population processes generally (of which migration is one) with environmental change. Here the simple equation developed by Erlich and Erlich (1990) is relevant, namely …

Environment Impact (I) = Population Size (P) x Affluence (A) x Technology (T)
where (P) = the number of people or population size
(A) = the affluence of each individual or per capita consumption of goods and services
(T) = technology or quality of resources consumed and pollution generated during production and consumption of goods and resources (Green, Rinehart and Goldstein 1992, 3)

While this is a highly simplified expression of a complex relationship, migration clearly fits in as one of the key processes influencing changing population size and distribution within and between countries. Migration has been explicitly included

in the elaboration of the basic I = PAT equation in Figure 2. This is an attempt 'to identify or speculate on, how population variables affect and are affected by the environment and how intervening factors or polices and measures could be introduced to cope with environmental as well as population problems' (United Nations ESCAP 1989). Moreover it also explicitly links population and environmental processes to development levels and well-being.

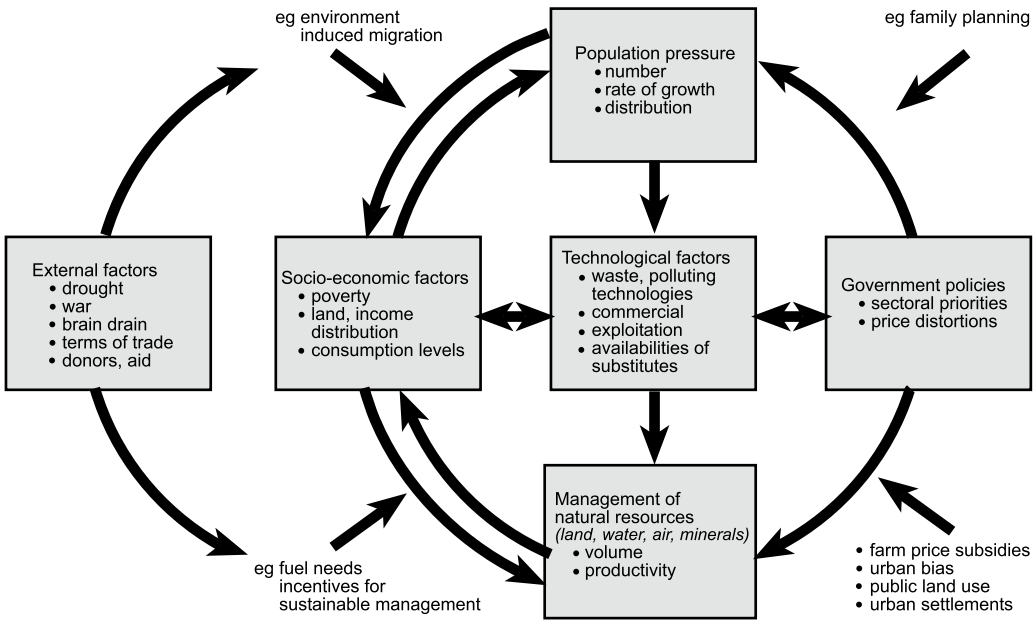
FIGURE 2: A CONCEPTUAL FRAMEWORK OF THE INTERRELATIONSHIPS BETWEEN POPULATION AND THE ENVIRONMENT



Source: UNESCAP 1989

Nevertheless, in the population literature on linkages with the environment (e.g. Green, Richard and Goldstein 1992; UNFPA 1991) most attention focuses on population per se and if the processes which influence population size and growth are explicitly taken into account at all, it is fertility which is most often considered. One of the few frameworks which explicitly mention the role of migration is reproduced in Figure 3 and was developed by the UNFPA (1991). Here two types of migration are seen as being significant. Firstly migration is seen as being both a cause and consequence of environmental pressure although the example given is of environmentally induced migration reflecting the much greater concentration in the literature on environmental change causing migration while migration impact on the environment is little considered. It is interesting though that Figure 3 sees migration as being an important external influence on the environment and development through 'brain drain'. This is referring to the fact that the loss of skilled people from any area can have detrimental effect on both development and the environment in that origin community.

FIGURE 3: THE LINKS BETWEEN DEMOGRAPHIC AND NATURAL RESOURCE ISSUES

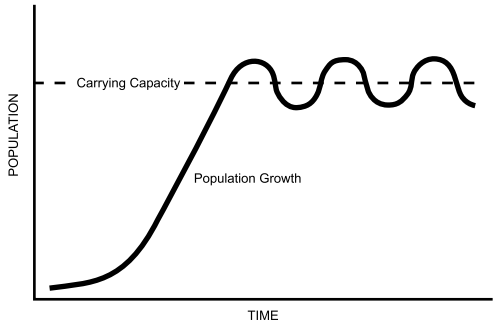


Source: UNFPA 1991

Another common starting point for examining the population and environment relationship is the carrying capacity concept which was originally developed to apply to animal populations. Stated most simply it is the 'maximum number of individuals

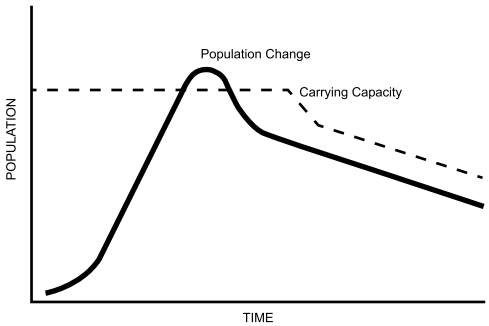
in a particular species that can be indefinitely supported by the resources in a particular area' (Meagher 1991, p. 55). For most animal contexts the carrying capacity will be determined by the amount of food available, the number of predators and the rate at which the environment can replace the resources which are used by the population. Figure 4 presents a simple model whereby the numbers of animals in a particular area increases, initially slowly, but then quickly, as it approaches the carrying capacity, and thereafter will fluctuate above and below that carrying capacity.

FIGURE 4: THE CARRYING CAPACITY CONCEPT



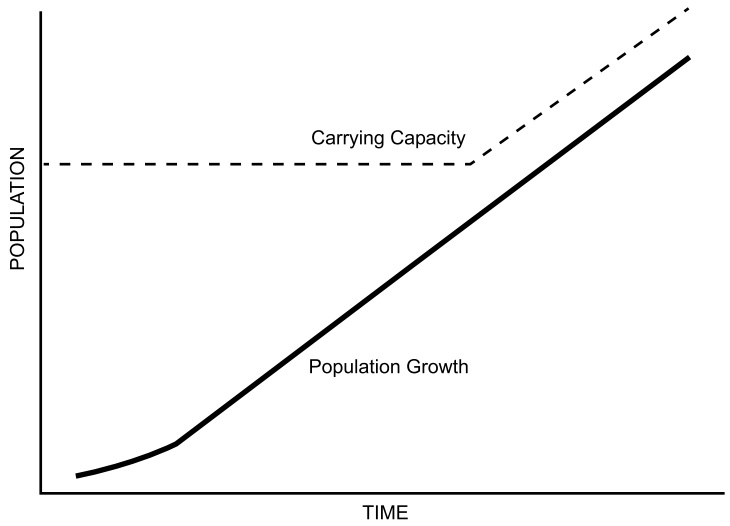
However, if the resources cannot be replaced or renewed by the environment at a sufficient rate there will be environmental deterioration and the carrying capacity of that environment will decline. Accordingly, there is outmigration and increased mortality and the population will begin to fall as Figure 5 indicates. Hence a population cannot increase its size *ad infinitum* and finite environmental resources place an upper limit on the growth of population. Moreover, there is an implication that if the resources are over-exploited their capacity to renew will be reduced and the carrying capacity will fall. A fall in carrying capacity will be accompanied by a decline in the population due mainly to environmentally induced outmigration. In the contemporary context it is important to note that the level of carrying capacity can also go up or down as the result of climate change.

FIGURE 5: SIMPLE MODEL SHOWING EFFECTS OF POPULATION GROWTH EXCEEDING CARRYING CAPACITY



There have been attempts to extend the carrying capacity concept to apply to humans as well as other species. A region's human carrying capacity has been defined as 'the estimated maximum number of people who can live there indefinitely and be given the opportunity to live long, healthy, self-fulfilling lives' (Cocks and Foran 1995, 67). However, there are at least two ways in which people differ from other species when considering the carrying capacity concept. Firstly, human beings have the capacity to innovate and use technology which animals do not, so they have the capacity to redefine upward the limits imposed by carrying capacity (Boserup 1965). On the other hand, the actions of animals can only maintain or diminish a resource (e.g. in the case of over grazing). Hence as Figure 6 indicates, population growth may be associated with an upward redefinition of the carrying capacity because population pressure may be a stimulus for, or be associated with, a redefinition of the resource base due to innovation. Of course people too, like animals, can be the cause of a downward change (Figure 5) in the carrying capacity if they 'overgraze' and human actions can lead to deterioration in the resource base.

FIGURE 6: MODEL OF THE IMPACT OF INNOVATION ASSOCIATED WITH POPULATION GROWTH ON CARRYING CAPACITY



A second important difference about including humans in the carrying capacity concept is that whereas for animals it is possible to determine an upper limit on numbers by the area's capacity to provide sufficient food and water to sustain that number of animals this is not the case for people. Human populations need and use a much wider range of resources from the environment than food and water.

A great deal of difficulty has been experienced in operationalizing the carrying capacity concept for human populations for particular areas. For example, the development of transportation systems allows resources to be sent from areas of 'surplus' to areas of 'deficit', innovations are constantly making resources out of new elements in the environment and it is clearly a value judgement as to what levels of consumption are to be used in fixing the carrying capacity. Accordingly, it seems unlikely that a quantitative definition of the human carrying capacity which is agreed upon by a majority of analysts or commentators can be produced for the human population of a region. Nevertheless, the human carrying capacity is a device which has been of considerable utility in drawing attention to the finite limits of the environment in regions, the pressures placed upon resources by population growth and unsustainable use of the environment and drawing out important implications for resource use and environment policy.

Where does migration fit into this framework?

- Countries and regions with abundant and valued environmental attributes and resources will attract inmigration (and immigration).
- Inmigration (and immigration) into an area can potentially increase the pressure placed by population on regional environments.
- Deterioration of environments can cause outmigration (and emigration) from an area.

Before we examine in some detail environment: migration interrelationships and their implications for development there are a number of generalizations which can be drawn from the limited literature on migration and environment (Hugo 1996):

- Most migration which is environmentally induced occurs within nations as internal rather than international migration.
- Whereas in the past the migration destination options for environmental migrants have overwhelmingly been to move within their country of origin, international destinations are of increasing significance.
- Migration as both a cause and consequence of environmental change occurs predominantly in poorer, less developed countries (LDCs).
- The scale and pace of environmental change has accelerated so environmentally influenced migration is also increasing.

ENVIRONMENT AS A CAUSE OF MIGRATION

In the literature on migration and environment the focus of research has clearly been an environmental change as a cause of migration rather than a consequence. Yet the concept of environmental induced migration remains a contested one (Black 2001; Castles 2002). Castles (2002) suggests that there are three major elements in the debate on environmentally induced migration:

- A debate over the terminology and definition of 'environmental refugee' (Hinnawi 1995; Jacobsen 1988).
- Can environmental factors be recognized as a root cause of migration?
- Who will provide protection for environmentally displaced people?

Fundamental to the consideration of environment as a cause of migration is the distinction which is conventionally recognized in migration study between forced and unforced migration (Fairchild 1925; Peterson 1958). However, the distinction between voluntary and involuntary migration is not as clear cut as it would appear at first glance. As Speare (1974, 89) points out:

> 'In the strictest sense migration can be considered to be involuntary only when a person is physically transported from a country and has no opportunity to escape from those transporting him. Movement under threat, even the immediate threat to life, contains a voluntary element, as long as there is an option to escape to another part of the country, go into hiding or to remain and hope to avoid persecution.'

On the other hand some scholars of migration argue that much of the population mobility which is conventionally seen as being voluntary occurs in situations which in fact the migrants have little or no choice. Amin (1974, 100), for example, in his discussion of migration in Western Africa states that:

> 'A comparative costs and benefits analysis, conducted at the individual level of the migrant, has no significance. In fact it only gives the appearance of objective rationality to a 'choice' (that of the migrant) which in reality does not exist because, in a given system, he (sic) has no alternatives.'

Indeed the early typology developed by Peterson recognized this degree of overlap between voluntary and involuntary movement and distinguished an intermediate category. He differentiated between '… *impelled* migration when the migrants retain some power to decide whether or not to leave and forced migration when they do not

have this power' (Peterson 1958, 261). These, in turn, are separated from free migration in which the will of the migrants is the decisive element initiating movement.

Population mobility is probably best viewed as being arranged along a continuum ranging from totally voluntary migration, in which the choice and will of the migrants is the overwhelmingly decisive element encouraging people to move, to totally forced migration, where the migrants are faced with death if they remain in their present place of residence. The extremes in fact rarely occur, and most mobility is located along the continuum. Environmentally induced migration is concerned with moves toward the forced end of this continuum.

There is also some diversity in the literature with respect to the particular types of involuntary migration which can be identified. Much of this centres around the issue of defining the term 'refugee': While the term refugee migration in some cases is used as a synonym for involuntary migration, others apply it only to a very restricted subset of all such movements. The 1967 United Nations Protocol on Refugees considers a refugee as 'every 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' (Keely 1981, 6). However, this has been modified and extended in practice by both the United Nations High Commission for Refugees (UNHCR) and individual Third World countries and regions. Nobel (1985, 44), after an exhaustive discussion of contemporary refugee determination in Third World countries concludes that the common elements can be listed as follows:

(1) Cases of well-founded fear of being persecuted for any of the reasons mentioned in the Geneva Convention and/or the Statute for the Office of UNHCR.
(2) Cases where lives, safety and freedom are threatened by events seriously disturbing public orders like external aggression, occupation, foreign domination, massive violations of human rights or generalized violence in the whole or part of the country of origin.

This definition, however, still only recognizes migrants who are forced to move because of political pressures or conflicts. Other commentators have adopted wider definitions of refugee and forced migrations. A good example of such a definition is that provided by Olson (1979, 130).

> 'Refugees differ from other, spontaneous or sponsored migrants, largely in the circumstances of their movement out of one area to another, and the

effects these have on them in the settlement and adjustment phases of their relocation. Refugees are forced to leave their homes because of a change in their environment which makes it impossible to continue life as they have known it. They are coerced by an external force to leave their homes and go elsewhere.'

This definition stresses the involuntary, forced nature of the move, the 'uprooting' suddenness of most refugee moves and the externality to the mover of the force or forces impelling the move. It also implies a substantial degree of powerlessness among the movers in the decision to move and selection of destination. There is no consideration in this definition of the distance the refugees move or whether or not they cross an international boundary, although Olson points out 'these spatial factors do affect refugees' adjustment after flight.' This definition is clearly more holistic and sees refugee moves as a subset of all population mobility rather than of international migration.

Olson's definition is also broader than that of the UNHCR with respect to the nature of the external force or forces, the threat or presence of which impels refugee movements. Again the UNHCR definition is somewhat restrictive in that it refers only to persecution or fear of persecution, as initiating refugee movement. Olson identifies a number of 'external compulsions' which can alone or in concert create refugees and these include 'physical dangers'.

There would seem to be a case for identifying environmentally displaced migrants as a meaningful and relevant category from both academic and policy perspectives despite its conceptual fuzziness (Castles 2002). This is for at least two reasons:

- Manifestly environmental factors are an important trigger for migration and the reality of its widespread occurrence cannot be questioned.
- The people displaced often are drawn from the poor and they are in urgent need of support and assistance.

However, although the term 'environmental refugee' has gained wide currency, given the specific legal connotations of the term refugee in international and national discourse it would seem more appropriate to refer to them as environmental migrants.

Since environmental migrants are likely to have had a significant element of involuntariness on their migration it is important to note some important differences between forced and voluntary migrants in relation to their situation at their destination.

- Involuntary migrants because they, by definition, didn't want to move in the first place and had no prior intentions of moving until the onset of a crisis are unlikely to be as prepared to adjust to circumstances of their destination as are voluntary migrants.
- Involuntary migrants are likely to maintain a greater commitment to their place of origin and retain a strong desire to return to it regardless of how unrealistic that might be. The obverse of this is that their commitment to their destination will be generally less than is the case for voluntary migrants and this has a detrimental effect on their adjustment to the destination.
- Involuntary migrants are more likely to be in a state of emotional and physical stress because of the losses of family, friends and property they have suffered and the uncertainty about their future. This also will considerably reduce how quickly and well they adapt to life at their destination.
- Involuntary migrants are much less likely to bring with them to the destination belongings, money and other economic asses than is the case with voluntary migrants. This is a function of the suddenness of their uprooting, the fact that many capital assets are not mobile, that involuntary migrants are drawn disproportionately from among the poor and that in many cases they may have been stripped of their assets either at their place of origin or by groups involved in, or encountered during, their flight. Clearly this lack of economic assets hinders attempts to adjust to life at their destination.
- Involuntary migrants, especially those in the initial waves, are less likely to have established linkages with people and institutions at their destination. On the other hand, most voluntary migrants "rely on the traditional kinship system and on ethnic identity to help them during the transition to life in the city. On arrival they often live with a relative or close friend who gives them meals, assistance in the job search, information about urban life and moral support" (Kols and Lewison 1983, M-257). This constitutes a major difference between voluntary and involuntary migrants.
- Involuntary migrants are more likely than voluntary migrants to be moving to a destination in which the dominant language, culture, food, etc. is different from their own. This greater unfamiliarity will also hinder their adjustment at the destination.

On each of the bases outlined above involuntary migrants are more likely to suffer difficulty in adjusting to, and establishing themselves at, their destination than do voluntary migrants. Clearly this means that they are deserving of, and should attract, special attention from relevant agencies.

We will now consider some of the major trends and issues with respect to environmentally induced migration. There are four major types of such migration. Most obvious are those sudden flows of people responding to an environmental disaster.

However, environmental degradation, while more gradual, forms an important second type of environment migration. Thirdly, climate change which creates changes in environmental conditions in particular areas, is increasingly being recognized as a significant cause of environmental migration. The final type of environmental migration also is a response to change in local and regional environments but in this case the cause of displacement is the construction of a 'mega project'. While each of these types of environmentally induced migration is quite distinct there are instances where they are interrelated. This is an area where many estimates of the numbers of environmentally displaced migrants are made without substantiation and must be approached carefully.

1. Environmental Disaster and Migration

The most dramatic environmentally induced migrations occur in response to the onset (or fear) of a natural calamity or disaster – floods, earthquakes, volcanic eruptions, tsunami, etc. While the cause of such migration would seem obviously environmental there can be very important social dimensions to such movement. Poorer countries and groups can be at a disadvantage because they do not have the resources to put in place sophisticated warning systems or to fund a rapid, planned, well provisioned flight from the disaster and to subsequently assist the victims to recover. Moreover, some natural disasters may have their root causes in long term political, social, economic or agricultural policies which have disturbed environmental balance. The UNHCR (2006, 27) quotes the Red Cross and Red Crescent Societies as estimating that:

> '… the total number of people affected by natural disasters has tripled over the past decade to 2 billion people, with the accumulated impact of national disasters resulting in an average of 211 million people directly affected each year. This is approximately five times the number of people thought to have been affected by conflict over the past decade.'

Hence the scale of the impact of environmental disasters is massive, although how far this translates to displacement migration is not known as is what proportion of that movement crosses international boundaries.

Naik, Stigter and Laczko (2007) have pointed out that the nexus between migration, development and natural disasters remains uncharted territory among policy makers and researchers and Table 1 presents their typology of how these issues interact. This shows how (Naik, Stigter and Laczko 2007, 14-15):

- Migration can be both positive and negative in its effects on development; it can foster disaster preparedness through improved resilience and help support recovery once a disaster has occurred.
- Development can both inhibitor encourage migration; lack of economic opportunities can foster migration but some resources are required because the poorest of a society generally don't move.
- Natural disasters may lead to increased outmigration if areas become economically and socially moribund in the aftermath of the crises but they can also draw inmigrants to provide support and new migrants in search of work in the reconstruction effort.

TABLE 1: OVERVIEW OF LINKAGES BETWEEN MIGRATION, DEVELOPMENT AND NATURAL DISASTERS

	Migration	Development	Natural Disasters
Migration		- Migration can support development, e.g. through remittances, in-kind support, return of qualified nationals. - Migration can undermine development , e.g. brain drain	- Migration, by promoting or undermining development, can lessen or exacerbate the effect of natural disasters. - Migration, through remittances and support from migrants abroad, can aid recovery and re-development after natural disasters.
Development	- Under-development can increase the prospects of migration as people leave in search of economic and other opportunities. - A certain level of development is required to enable migration to occur, as some minimum assests are needed to migrate and often the poorest in society are not able to leave.		- Development can decrease the impact of natural disasters on affected areas/ communities by enabling greater resilience and protection.
Natural Disasters	- Natural disasters can undermine economic/ social prospects of the affected area and lead to emigration. - Natural disasters may also lead to migration into the affected area by relatives/ families of those affected or migrants in search of work in reconstruction.	- Natural disasters undermine development, at least of individuals and communities affected, and sometimes at the national level if the disasters are particularly large in scale and/or recurrent in nature making it difficult for countries to continually absorb shocks successfully.	

Source: Naik, Stigter and Laczko 2007, pp. 13-14

In recent times there has been no natural disaster that has had as great an impact as the Asian Tsunami of December 2004 which killed 298,055 people in 12 Asian and African countries surrounding the Indian Ocean (*Asia Monitor*, 16, 3 March 2005) and left some 5 million people in immediate need for assistance (UNHCR 2006, 21). Estimates of the numbers of persons displaced vary between over 1 million (UNHCR 2006, 21) to over 2 million (AidWatch 2006). In Sri Lanka 450,000 were forced to move in the aftermath of the Tsunami (Yin 2006). In Indonesia, in the province of Aceh, there were 533,000 Internally Displaced Persons (IDPs) at the end of 2004 (Yin 2006) and in the Aceh census of 2005 there were still 203,817 IDPs. Overwhelmingly the people forced to move by the Tsunami moved to other locations within the region they previously lived in although some travelled longer distances to stay with relatives. The connections with international migration have been explored by Laczko and Collett (2005) who concluded that:

- Diaspora of migrants from the areas hit by the Tsunami quickly mobilized to send money and supplies back and lobbied destination governments to provide support.
- In some cases (e.g. Thailand) migrant workers were among the victims of the Tsunami.
- Deportations of undocumented migrants back to the affected areas were delayed in Malaysia because of the disaster.
- Displacement may result in people being more likely to migrate in the future.

Naik, Stigter and Laczko (2007) have examined in some detail the migration dimensions of the Tsunami including:

- Migrants in Tsunami Affected Countries. They show that the Tsunami further aggravated the precarious legal and socio-economic position of Myanmarese (Burmese) migrants in Thailand.
- Migrants from Tsunami Affected Countries. Migrants from origins affected by the Tsunami can be placed in a vulnerable position by the disaster.
- Migration Out of Affected Areas. This is an expected response and in the Tsunami affected areas the only evidence of increased emigration abroad was in Sri Lanka.
- Migration Into Affected Areas. Relatives moved in to assist families, some have moved in to gain work in the reconstruction effort.
- Trafficking. Natural disasters increase the risk of trafficking as economic opportunities and social support mechanisms become stretched or completely disintegrate.

- Diaspora Response to Natural Disaster. *Remittances* were an important form of assistance to victims of the Tsunami. Diaspora also sent skilled labour and in-kind support and assisted in mobilizing external support.

The massive scale of displacement associated with the Asian Tsunami, not to mention the tragedy of loss of life and prosperity 'sparked an extraordinary mobilization of resources. Governments, private citizens and corporations, NGOs in the effected countries and beyond were quick to respond with offers of money, supplies and manpower' (UNHCR 2006, 21). However, it also brought into sharp relief the need for an international agency to respond to environmental migration. The UNHCR (2006, 21) found that a range of protection concerns were identified in the aftermath of the Tsunami including access to assistance, enforced relocation, sexual gender-based violence, safe and voluntary return, loss of documentation and restitution of property. In addition, problems of camp management and providing shelter, water sanitation to IDPs and problems of coordination between agencies were identified. Many of these issues are similar to those which the UNHCR confronts in dealing with forced displacement caused by conflict and persecution. However, there would seem to be a case for a separate organization to cope in a timely and effective way with the growing problem of environmentally displaced persons.

There is a consensus that the number of environmental disasters is increasing in incidence and that the extent of resultant environmental displacement is also increasing. Lackzo and Collett (2005) quote the International Red Cross and Red Crescent's *World Disasters Report 2002* as saying that the number of people affected by weather-related disasters rose from 275,000 in the 1970s to 1.2 million in the 1980s and 18 million in the 1990s. The UNHCR (2006, 28) agrees that there has been an escalation in the numbers affected by environmental disasters but argues that this is due more to rising vulnerability to hazards than to an increase in the frequency of hazards *per se*.

2. Environmental Degradation and Migration

While the occurrence of a disastrous environmental event is a significant and increasingly important cause of environmentally induced migration, more migration occurs due to less dramatic, gradual, deterioration of environments. It is not sufficient to consider the migration-environment relationship only in terms of migration induced as a response to the occurrence of particular environmental events. As Suhrke (1992, 5) points out:

'From a broader development perspective, environmental degradation appears as a proximate cause of migration. The underlying causes are found in increasing population pressures on land and the patterns of resource use. Demography and political economy, in other words, are most salient causal factors. Yet these obviously interact in critical ways with specific environmental variables. Sometimes the result is stress of a kind that leads to massive outmigration. But to understand why, it is necessary to focus on the broader development process.'

Similarly, Richmond (1993, 8) argues:

'… when environmental degradation leads to migration it is generally as a proximate cause linked to questions of economic growth, poverty, population pressure, and political conflict.'

Bilsborrow (1991), in his case studies of Indonesia, Guatemala, and Sudan, depicts environmental degradation as one of a cluster of causes of outmigration. He suggests that environmental changes induced migration through their 'social' effects by:

(1) reducing income;
(2) increasing the risk of income reduction in the future;
(3) making the environment less healthy.

Environmental degradation occurs when population growth exceeds the land's carrying capacity such that there is deterioration in natural resources. Population pressure, especially in Less Developed Countries (LDCs), can lead to extension of settlement into ecologically fragile areas which are particularly vulnerable to degradation. Since the environmental change is not as sudden as a catastrophic environmental disaster, its impacts often go unnoticed. Spitz (1978) characterizes the impact of drought, famine and the progressive onset of food shortage associated with the gradual degradation of environments as 'silent violence'.

The process of desertification whereby deserts are extending into arable areas especially in Africa, Asia and Latin America has been a major cause of outmigration. These environmentally induced migrations are especially marked in Africa. As Jacobsen (1988, 11) has pointed out …

'Of all the continents, Africa, a land where poor soils and variable rainfall pose a harsh climate for agriculture, has spawned the most environmental refugees. Most came from the Sahel, a belt that spans several agro– ecological zones and stretches west to east across some nine countries form Mauritania and

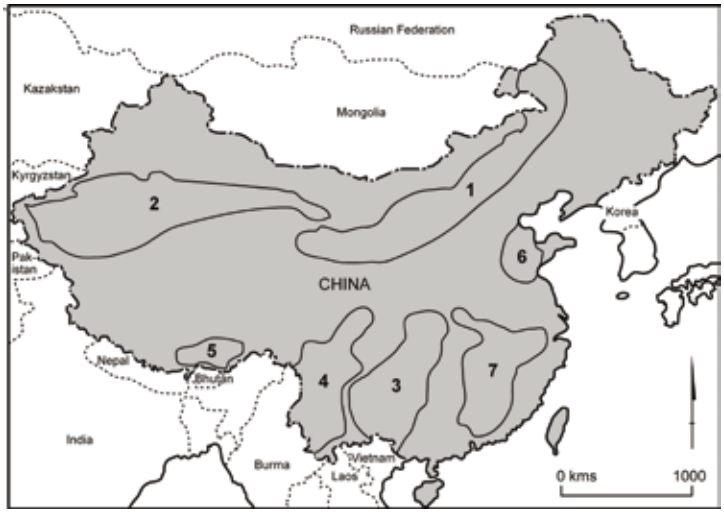
Senegal on into the Sudan. Desertification is accelerating in the Sahel, the world's largest area threatened by the wholesale loss of arable land.'

The droughts of 1968-1973 and 1982-1984 led to millions of environmental refugees. In the first of these, there were a million environmental refugees in Burkina Faso alone. In a review of migration resulting from desertification and droughts in LDCs, Leighton (2006) showed that remittances from migrants are an important coping mechanism for communities under environmental pressure.

There are however some sceptics such as Black (2001, 5) who have questioned the impact of desertification on environmental migration in the Sahel. He claims … 'the evidence for desertification causing migration in any straightforward way is somewhat limited. First, it is important to note that the concept of desertification itself has come under fire in recent years, particularly as availability of satellite images of the region has improved. Thus the work of Dregne and Tucker (1988) has shown a highly elastic response of vegetation cover to growing season rainfall with the desert margin of the Sahel fluctuating from year to year as a result'.

Some of the most substantial migrations induced by environmental deterioration have occurred in China. Figure 7 shows that extensive areas of China have been classified as 'Ecologically Fragile Zones' (EFZs) which are environments with little

FIGURE 7: DISTRIBUTION OF THE ECOLOGICALLY FRAGILE ZONES IN CHINA



Source: Modified from Zhao (1999, 24), Tan 2008a

Note: 1. Semi-arid and semi–humid areas in north China; 2. Semi-arid areas in northwestern China; 3. Lime rock mountains in southwestern China; 4. Mountainous areas in southwestern China; 5. Qinghai-Tibetan plateau; 6. Plain areas in northern China; 7. Hilly areas in southern China.

resistance to external disturbance, are unstable and sensitive to population pressure and have a low capacity to support human settlement (Tan 2008a). West China in particular is experiencing severe environmental degradation associated with soil erosion desertification, deforestation, water shortage, degradation of grasslands, overgrazing and the impact of mining activity. Bao (2006) estimates that in 2004, 2.94 million km^2 of West China were suffering from soil erosion – 82.6 per cent of the entire eroded area in China.

Tan (2008a) has explained that the Chinese government has encouraged environmental migration out of the EFZ in West China as a strategy to relieve pressure on the environment, rehabilitate the deteriorating ecosystem and eradicating poverty in that region. She explains that some early attempts at resettling environmental migrants occurred in the provinces of Ningxia, Yunnan, Guizhou and Inner Mongolia but up to 2002 no direct compensation was given to the people who move. In 2002 environment-related migration and resettlement became an official policy of the Central Government. There was a plan to relocate and resettle seven million persons over the next decade. It is estimated that 1.02 million environmental migrants were displaced from the fragile environments in West China between 2000 and 2005.

Richmond (1993) recognizes that certain contexts, are more susceptible to environmental disruptions likely to force outmigration than others. These, for example, would include: ecologically fragile ecosystems which, when subject to excessive cropping, forest removal or other human use impacts, become less productive areas at high risk of natural disaster – earthquake zones, low lying areas subject to inundation, etc.; marginal agricultural or pastoral areas subject to frequent drought; and areas of poverty where the residents do not have the accumulated reserves to prevent, ameliorate, or cope with the onset of a natural disaster. Hence, the predisposing factors for environmental migration can be environmental but also are related to population pressure upon natural resources, the way in which the environment is being exploited by people, and the wealth and capacity of the occupants of the area. In general, these predisposing conditions are more likely to occur in less developed than in more developed countries (MDCs).

Environmentally induced migration is likely to be precipitated by a particular environment-related event which effectively forces people to move. Table 2 is a list of factors identified by Richmond (1993) as being likely to precipitate reactive migration which has direct or indirect environmental implications. He stresses that these factors are not independent of oneanother. Whether or not an event-producing disruption to the environment actually produces migration, however, is partly influenced by the predisposing conditions mentioned earlier. It also will be shaped by a range of constraints and facilitators to migration which exert in the area affected. These include

TABLE 2: TOPOLOGY OF ENVIRONMENTALLY RELATED DISASTERS LIKELY TO PRECIPITATE MIGRATION

Naturally Induced Disasters (NIDs)		
Hurricanes	Tornadoes	Whirlwinds
Earthquakes	Volcanic Eruptions	Avalanches
Floods (freshwater)	Floods (saltwater)	Hail and Snow Storms
Fires	Electric Storms	Lightening
Droughts	Famines	Plagues
Technologically Induced Disasters (TIDs)		
Chemical	Nuclear	Oil Spills
Pollution (air)	Pollution (water)	Pollution (Soil)
Explosions	Building Collapse	Rail or Airplane Crash
Dams (floods, etc.)	Mining Accidents	Power Cuts
Factory Accidents	Soil Exhaustion	Urban Dereliction
Economically Induced Disasters (EIDs)		
Deforestation	Crop Failure	Fishery Exhaustion
Mineral Exhaustion	Species Extinction	Human Redundancy
Population Clearances	Relocation	Structural Adjustment
Politically Induced Disasters (PIDs)		
War (external)	War (internal)	Terrorism
Apartheid	Ethnic Cleansing	Holocaust
Exile	Persecution	Rights Violations
Totalitarianism	Anarchy	Extremism/Intolerance
Socially Induced Disasters (SIDs)		
Ecological Extremisms	Animal Rights Activism	Green Crusaders
Fanaticism	Excommunication	Jihad
Class War	Shunning	Boycott

Source: Richmond 1993

the existence or lack of escape routes not only in the form of transport networks but also kinship and social networks which mean that some environmental migrants can move to an area where they have relatives and friends who can support them. The presence of such networks undoubtedly acts as a facilitator to such movement while their absence would constrain movement. These include the existence or lack of escape routes not only in the form of transport networks but also kinship and social

networks which mean that some environmental migrants can move to an area where they have relatives and friends who can support them. The presence of such networks undoubtedly acts as a facilitator to such movement while their absence would constrain movement.

Richmond (1993) stresses the importance of feedback effects in consideration of environmentally induced migration. The migration itself may have positive effects on the origin area through reduction of pressure of population on the local environment and hence reduce the likelihood of the occurrence of an environmental disaster. Similarly, environmental policies introduced as a result of those disasters may influence migration. Hence, in Indonesia the erosion of uplands causing flooding and salinization in lowlands has resulted in a policy of sedentarization whereby people who have practiced a type of slash and burn, shifting cultivation in the upland areas have been resettled in sedentary agricultural communities in lowland areas. This has affected some 4 million people (Hugo 1988).

There are a number of developments in contemporary LDCs which have exacerbated the predisposing conditions and increased the incidence of precipitating events for environmentally induced migration (Hugo 1996, 115-117).

- Population growth has continued to increase pressure on agricultural land although significant fertility declines have occurred in Asia and Latin America and in parts of Africa. This has forced more people to settle in and cultivate marginal areas, making them more subject to flooding, erosion, desertification and other environmental degradation.
- Fornos (1993, 6) argues that farmers in LDCs … 'were once able to grow crops in marginal lands by employing such methods as crop rotation, fallowing and terracing … Population and economic pressures, however, have driven farmers throughout the developing world to use short cut methods that almost inevitably lead to long term land degradation'.
- Continuation of high incidence of poverty has meant that both individuals and nations have not the resources to initiate environmentally sustainable practices. For many there is a total preoccupation with survival which makes it difficult to produce environmental stewardship.
- Concerted efforts to increase food production through the green revolution have seen some spectacular increases in output, but often at the expense of environmental concerns. Hence, clearing practices, heavy use of fertilizers, herbicides and pesticides have all often had undesirable environmental outcomes.
- Many LDCs have liberalized their economies to encourage foreign investment, especially in manufacturing, and multinational companies have taken

advantage of cheap labour to establish factories. In many cases environmental controls on such developments are less comprehensive than in MDCs and certainly the policing of existing regulations is usually weaker so that environmental pollution from such activity can be considerable.

- In many LDCs the ability to enact legislation for environmental sustainability and to policy existing legislation is restricted by limited infrastructure and corruption. Accordingly, it is difficult to control deforestation, air pollution, water pollution, land degradation, etc., in the face of increasing pressures on exploitation of the environment created by growing population, increasing involvement of foreign enterprises, etc.
- Fragile ecological zones in many LDCs are often occupied by ethnic minorities who frequently are neglected by central governments so that ecological conditions can worsen because of a lack of resources from government to adopt more sustainable patterns of land use.

Most environmentally induced migration occurs within countries but there is increasing evidence that environmental degradation is influencing international migration. Togola (2006), for example, explains that people from Mali have been forced to migrate to other West African countries as well as overseas because of persistent droughts and desertification. It is estimated that two out of every three families in the Kayes region of Mali have a member of their household who has emigrated.

It is apparent that particular ecosystems, especially in LDCs, are especially vulnerable to environmental degradation and subsequent environmentally induced outmigration. The Millennium Ecosystem Assessment (2005), for example, identifies the 2 billion people living in arid, semi-arid and sub-humid regions as being especially vulnerable to environmental degradation. In dry regions, Renaud *et al*. (2007, 24) note:

- Between 10 and 20 per cent are already degraded.
- There is increasing pressure on dry land ecosystems.
- Climate change is increasing water scarcity which is already under water stress because the zone has only 8 per cent of global renewable freshwater resources but a third of the global population.
- Droughts are becoming more frequent placing great stress on communities' coping mechanisms.

Nepal is a country which has a long history of environmentally induced migration (KC 2003, Myers 1986). Shrestha and Bhandari (2005) examine changes in environmental security resulting from declining access to forestry resources due to deforestation as a major factor shaping labour migration. Their multinomial logistic

regression analysis showed that, net of other factors, a decrease in access to forest resources increased the likelihood of migration for work of individuals regardless of destination, domestic and international.

With respect to environmental impacts on international migration Afifi and Warner (2007) develop a gravity model that assesses the impact of global migration factors on migration flows across 172 countries. Some 13 of the 26 independent variables employed are environmental. All of the environmental variables (except for floods which are suspected to cause internal displacements rather than international migration) were found to have a significant positive impact on migration flows. This would suggest that environmental degradation does have an impact on international migration.

In the examination of the impact of environmental degradation on population it is important to remember that migration is only one of the ways in which populations affected respond. It can be argued that there needs to be more attention paid to other responses, in particular in situ adaptations to the effects of environmental processes. This is of particular significance when considering the provision of assistance to population impacted by environmental degradation.

CLIMATE CHANGE AND MIGRATION

The release of the Stern Review (2006) and the report of the Intergovernmental Panel on Climate Change (2007) has focused global attention on the issue of climate change and reflects the scientific consensus regarding the reality, urgency and significance of global climate change. The IPCC report makes frequent reference to the fact that climate change will have an influence on migration such as:

> 'Stresses such as increased drought, water shortages and riverine and coastal flooding will affect many local and regional populations. This will lead in some cases to relocation within and between countries, exacerbating conflicts and imposing migration pressures'.

The report indicates that by 2080 between 1.1 and 3.2 billion people will be experiencing water scarcity, 200-600 million hunger and 2-7 million people per year coastal flooding. While no estimates are made of the number of likely environmentally displaced migrants the implication is clear that substantial movements will result. The Christian Aid Agency (2007) has estimated that there will be one billion people displaced by global warming by 2050. Myers (2002, 2005) estimated that 25 million people in 1995 had migrated with a possible doubling by 2010 and a potential of 200 million environmental migrants due to global warming later in the twenty-first century. There has been an estimate that the number of people displaced by climate change in China was 30 million (Lambert, 2002). Nevertheless, all of these estimates have little empirical basis but gain a totally unwarranted credibility with repetition. In general, there is a tendency to equate "populations at risk with populations displaced". Many of the well known estimates of environmentally displaced persons due to global climate change in Table 3 fall into this category. However as Black (2001, 9) indicates …

> "calculating the population 'at risk' from sea level rise (SLR) is a long way from predicting mass flight of a refugee nature'

The key issue as Adamo (2008, 6) points out is …

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

TABLE 3: SOME ESTIMATES OF ENVIRONMENTALLY-DISPLACED POPULATION DUE TO CLIMATE CHANGE IMPACTS

- People at risk of SLR 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 (Almeria 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 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)

Source: Adamo 2008

Indeed in the dramatic advance in understanding of climate change and its potential impact over the last decade a glaring gap has been analysis of the potential scale and impact of environmental migration (Christian Aid 2007).

There are a number of environmental changes associated with climate change and global warming which would be likely to induce environmental migration. These include rising sea levels, increased frequency of extreme weather events, decreased rainfall in some areas, increased rainfall in other areas, shifts in disease patterns due to changes in weather regimes and temperature change. Most attention however has been focused on global warming and its inevitable effects (Hugo 1996):

- As high altitude tundra melts, CH4 would be released, increasing greenhouse warming which is already significant from greenhouse gas emissions.
- Increased freshwater runoff in high latitudes and reduced differentials in temperature between poles and equator could radically change ocean currents, leading to altered weather patterns.
- There could be a significant melting of the West Antarctic Ice Sheet, resulting in a sea level several metres higher than it is today.

While there is some debate it is anticipated that sea level may rise one metre by the year 2100,[1] affecting 360,000 km of coastline (Suhrke 1992). Since almost two-thirds of the world's population lives within 100 km of the coast and 30 of the world's 50 largest cities are located on the coast, the potential for population displace-

ment from a significant rise in sea level is considerable. Indeed, some commentators have painted future scenarios of millions of people being forced to move by sea level changes (Gleick 1989; Kaplan 1994). A recent Australian report by CSIRO (Committee Scientific and Industrial Research Organization) on climate change in the Asia-Pacific region concluded that … 'inundation of populated areas by rising seas may ultimately displace millions of individuals forcing intra- and interstate migration (Preston, Suppiah, Macadam and Bathols 2006, 4).

Particular attention has been focused on low lying islands in the Pacific and Indian oceans in discussions of the impact of rising sea levels. In particular there has been concern in the media as well as the scientific community for the future of coral atolls. Connell (2003, 91) summarizes the impact as follows:

> 'The greenhouse effect thus has the potential to lead to reduced agricultural potential, a possible decline in marine biodiversity and stock, and a loss of important water, timber and firewood resources, thus reducing the potential of the few areas where coral atolls have some degree of self reliance'..

TABLE 4: POTENTIAL IMPACTS OF CLIMATE CHANGE ON ATOLL COUNTRIES

Potential loss of land area due to rising sea levels
Shifts in species competition and composition
Coral reefs, mangroves and seagrass adversely affected, with negative affect on reef fish populations
Increased salinization of soils in coastal margins
Increasingly variable rainfall, with more intense drought events
Increase in cyclone intensity with larger storm waves and more intense flooding events
Adverse effects on staple crops due to changes in soil moisture, salinity and rainfall
Decline in food security due to adverse effects on crops on declining reef fish populations
Coastal erosion and changing climatic conditions may adversely affect tourism
Adverse economic impacts through infrastructure damage from increased intensity of extreme events, coastal protection measures, and decline in tourism income
Decline in human health through vector-borne diseases and enhanced food insecurity

Source: Nurse and Sem 2001

The IPCC has concluded that 'climate change induced SLR, sea surface warming, and increased frequency and intensity of extreme weather events puts at risk the long-term ability of humans to inhabit low lying atolls (Barnett and Adger 2003, 321). Table 4 summarizes the potential impacts of climate change on atoll countries. It is not just SLR which is the problem but projected increases in sea surface temperatures which threaten coral reefs ability to live and grow. Coral reef mortality prevents the reefs

to grow to combat SLR (Barnett and Adgen 2003, 325). Moreover, because of their small size, isolation, low levels of income and poor physical infrastructure make atoll countries vulnerable to global economic forces as well as to climate change (Barnett and Adger 2003, 322).

It must be borne in mind that there is a great deal of uncertainty about historical and projected sea levels for islands in the Pacific and Indian oceans because of the volatility and the shortness of historical records. However, a recent review concludes there is a general consensus the sea levels in the region are rising and that its direct and indirect (e.g. increased frequency of extreme events) effects will cause serious problems for the inhabitants of some of the islands during the twenty-first century (Church, White and Hunter 2006, 166). The issue thus becomes what should the response to this be? The atoll of Tuvalu in the Pacific Ocean has become a focus of the global discourse on this issue and a '*cause celebre*' in the international media. Connell (2003, 102) has discussed how the international media have accentuated concerns over global warming and its impact on Tuvalu:

> '… their message is consistent and in accord with the worst fears of Tuvaluans. Moreover, they have built upon each other in an almost continuous feedback loop; local fears and distant media perceptions accentuate and emphasize each other. There is no room for doubt'.

The Tuvaluan government has been very active in seeking compensation from and immigration opportunities in countries like Australia. Yet there are some who believe that (Connell 2003, 105):

> 'Emotion, environmental degradation and politics have overwhelmed science. Crucially the emphasis that Tuvalu and others have given to the present impacts of SLR, and the need for imminent relocation, have diverted attention from the real need both to transform those policies in metropolitan states that continue to contribute to global warming and to develop appropriate environmental management policies within atoll states'.

Others too have pointed to how this 'doomsday scenario' has diverted attention away from the adaptation and mitigation strategies that are required to deal with the problems being faced by atoll countries (Farbotko 2005; Adger *et al*. 2003; Barnett 2001).

Some attention has been paid to the Low Elevation Coastal Zone (LECZ) – the continuous area along coasts that is less than 10 metres above sea level and is hence vulnerable to the effects of SLR. This impact of course is not only inundation but also increased intensity of storms, flooding salinization of aquifers, etc. Balk (2008) has estimated that over 10 per cent of the world population lives in the LECZ. Table 5 shows that 73.5 per cent of the population of the LECZ is in Asia and another 8.8 per

TABLE 5: POPULATION IN THE LOW ELEVATION COASTAL ZONE (LECZ), 2005

Region	Total Population		Urban Population		Per cent of Land	
	No. (m)	Per cent	No. (m)	Per cent	Total	Urban
Africa	56	7	31	12	7	7
Asia	466	13	238	18	3	12
Europe	50	7	40	8	2	7
Latin America	29	6	23	7	2	7
Australia-NZ	3	13	3	13	2	13
North America	24	8	21	8	3	6
SIS	6	13	4	13	16	13

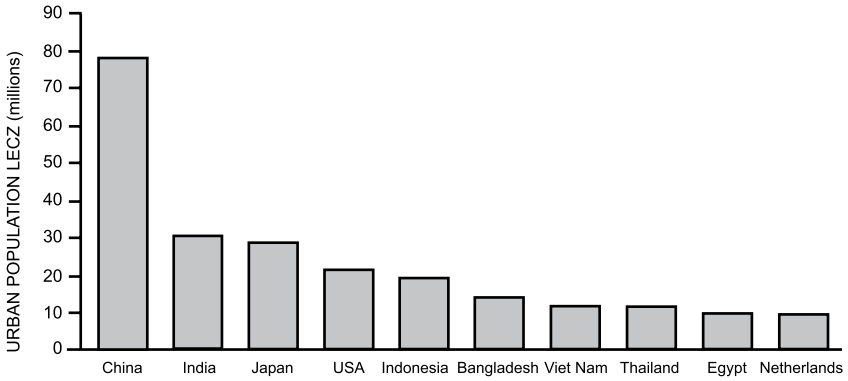
Source: Balk 2008

cent is in Africa – well above their share of the global population. Hence, while it is the situation of tiny countries like Tuvalu that have alerted the world to the potential disaster of SLR it is in Asia and Africa that the largest populations are at risk of being impacted. It is noticeable also in Figure 8 that the world's urban population is disproportionately concentrated in the LECZ with 13 per cent of global urban inhabitants living in the zone. Figure 8 also shows the countries which have the largest numbers of urban dwellers at risk are in the Asian nations of China, India, Japan, Indonesia, Bangladesh, Vietnam and Thailand. The USA, Egypt and the Netherlands are also in this group. Island countries[2] are predominant among those countries with the high percentages of their population at risk. The important point is that many of the megacities of Asia lie within the LECZ and their ability and capacity to plan for a likely future effect of SLR and resource mitigation measures is less than their counterparts in Europe and North America. Moreover, weaker planning controls may be exacerbating the effects of climate change.

FIGURE 8: PEOPLE AT RISK IN URBAN COASTAL ZONES

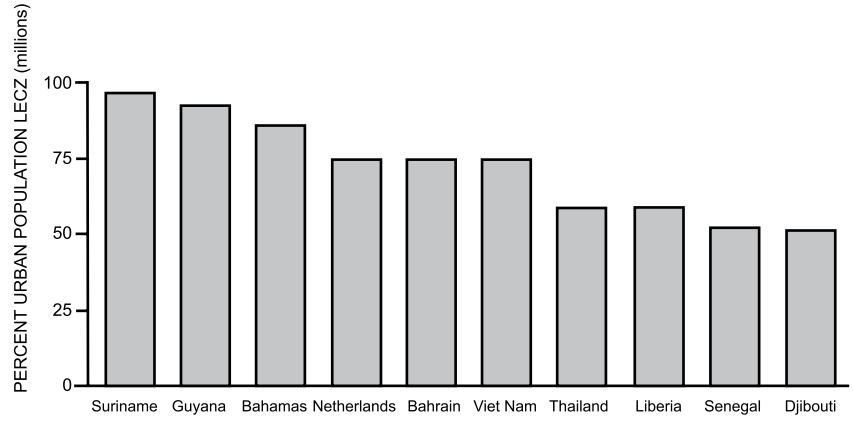
A high proprotion of the urban population in low-and middle-income countries live within the LECZ: the continous area along the coast that is less than 10 meters above sea level.

Nations with the largest urban populations in the LECZ



Low-income and lower-middle income nations have a higher proportion of their urban population in this zone than high-income nations. As yet, the data are not available to assess exactly who among these people is at risk from a given SLR.

Nations with the highest proportion of their urban populations in the LECZ



Source: Id21 Insights 2008

Moreover, a recent paper by McGranahan, Balk and Anderson (2007) has argued that the LECZ not only is home for a significant proportion of the global population, especially that in low income countries, but also is a zone in which the population is growing at faster rates than the countries as a whole. Hence, Table 6 shows that in the countries with the largest and third largest LECZ populations (China and Bangladesh respectively) the population in the LECZ was growing at twice the rate of that in the country as a whole. In China particularly there has been a massive internal migration

toward the coastal zone, especially the major cities. However McGranahan, Balk and Anderson (2007, 33) point out whereas only two per cent of China's land is in the LECZ this is the case for more than 40 per cent of the land area in Bangladesh.

TABLE 6: URBAN POPULATION COUNTS AND GROWTH BETWEEN 1990 AND 2000 FOR CHINA AND BANGLADESH – BY TOTAL AND IN THE LECZ

	POPULATION ('000)		Annual Growth rate 1990-2000 (%)
Country	**1990**	**2000**	
China	**1,138,676**	**1,262,334**	**1.04**
Urban China	336,577	423,730	2.33
LECZ China	119,103	143,880	1.91
Urban LECZ China	56,059	78,278	3.39
Bangladesh	**110,024**	**123,612**	**1.17**
Urban Bangladesh	23,097	26,865	1.52
LECZ Bangladesh	50,568	62,524	2.14
Urban LECZ Bangladesh	11,686	15,429	2.82

Source: McGranahan, Balk and Anderson 2007, 32

Meeting the challenge of SLR for the LECZ, Balk (2008) argues that there are three 'Ms' required:

- Mitigation – investment and infrastructure should be diverted beyond the zone.
- Migration of persons and industry within and beyond the zone to other areas within countries and to other countries.
- Modification (and other adaptation mechanisms), technological solutions.

As is the case with environmental disasters, climate change is likely to have a more devastating impact on LDCs. As Baird (2003, 11) points out:

> 'Climate change ultimately affects us all, but our capacity to withstand its consequences can come down to economics.'

There is a real problem in considering the effects of climate change since we are dealing largely with the future. There are estimates of environmental refugees caused by climate change which confuse the numbers of people at risk of being affected by such change with the number of potential migrants. As was mentioned earlier, adap-

tation will be an important response to climate change and must be factored in to all considerations regarding it. Undoubtedly, there will be population displacement but it will be one of a number of responses.

One issue which applies not only to climate change induced migration but also other environmentally-related movements is that it is not a gender neutral process. Brown (2007, 74), for example, has correctly pointed out:

> 'Far from being gender neutral, climate change and the use of migration as a coping mechanism, will have specific gendered impacts given that there is a strong relationship between poverty and vulnerability to environmental change, and the stark fact that women as a group are poorer and less powerful than men'.

There is a clear need to examine contemporary and likely potential future environmental impacts on migration with gender sensitivity. It is likely to have gender specific impacts and gender is one of the elements shaping responses to environmental change which must be considered.

While most attention has been paid to climate change induced migration due to SLR it is apparent that changes in rainfall and run off patterns also have implications for migration. It is estimated that the South Asian monsoon will become stronger with 20 per cent more rain falling on east India and Bangladesh by 2050 (Houghton 2005). On the other hand reduced rainfall could have serious impacts in semi arid and arid Central Asia. Crop yields in Central and South Asia could fall by 30 per cent by 2050 (IPCC 2007). Melting glaciers threaten to make river flows in South Asia and China more variable and subject to flooding (Stern 2006).

In addressing the potential impact of climate change on migration, Brown (2007, 10) argues that it is important to make a distinction between climate and non-climate drivers. Climate drivers include slow onset, gradual processes such as sea level change and climate events which are sudden and dramatic hazards such as monsoon floods, glacial lake outburst floods, storms, hurricanes and typhoons. Brown (2007, 11) explains however, that non-climate drivers are equally important …

> "A natural hazard (like an approaching storm) only becomes a 'natural disaster' if a community is vulnerable to its impacts. A tropical typhoon, for example, becomes a disaster if there is no early warning system, the houses are poorly built and people are unaware of what to do in the event of a storm."

Hence, poverty becomes a major issue since poorer communities are much less likely to have the resources and capacity to have adoptive mechanisms in place. As Brown (2007, 13) argues, population, poverty and governance are key variables. They are crucial mediating factors which can influence whether or not climate change produces migration and if so what type of migration.

In considering the potential impact of climate change on migration it is important to differentiate between the effects of climate change related events which are sudden and dramatic such as extreme weather events or storm surges and those which are more gradual and cumulative in their impact such as rising sea level or decline in rainfall. Clearly the types of migration responses will be quite different as will the types of policy responses needed to prepare for, and cope with them.

There is a particular need for an assessment to be made of the potential impact of climate change on migration despite all of the uncertainties which must surround such an exercise. Disentangling the complexity of the environment-migration relationship and establishing how to use this knowledge as the basis "for quantifying the additional numbers of migrants that might be expected in response to changes in climate (Kniveton *et al*. 200, 37) has not been well developed, although there is a growing literature in the area (Adamo 2008, Perch-Nielsons 2004, Kniveton *et al*. 2008). The latter (pp. 37-8) explains two approaches to such a process.

- The Sustainable Livelihoods Approach
- The New Economics of Labour Approach

DISPLACEMENT BY LARGE PROJECTS

One important way in which environmental change induces significant forced migration is through large infrastructure development projects. Such 'mega projects', especially dam construction, have become common, especially in LDCs where there are escalating demands for electricity and water associated with rapid urbanization (Cernea 1990; Cernea and McDowell 2000). In each case there are people displaced and forced to move elsewhere so there is another dimension of the development – migration inter-relationship (Cernea 1990, 300). One of the largest cases is the Three Gorges Dam Project located in the lower reaches of Yangtze River in China. The seventeen years of construction will be completed in 2009 and has involved a displacement of more than 1.2 million people. The Chinese government has had a range of approaches over the years for the resettlement of those displaced (Tan 2008b) involving settlement both near the dam and at more distant locations. However, Tan (2008b) has shown that many of those forcibly relocated have suffered significant losses despite government assistance.

Fernandes (1991), drawing on Indian examples argues that the people displaced by large dam projects are often the poor and powerless who do not participate in any way in decision making concerning the projects. Moreover they are often not compensated fairly for their losses. As Baker (2001, 6) points out:

> 'governments or powerful agencies make these decisions without consulting the people of the designated area and reap the benefits without distributing them to the people who lost their lands and livelihood.'

The displacement migration associated with environmental change initiated by large scale projects can be differentiated from that induced by other changes in that the timing of displacement is fixed ahead of time by governments or other agencies and there is usually a degree of planning of displacement and compensation planned in advance. While this is not always the case and the planning is often not consultative, it does at least promote the potential to cushion the impact of displacement. The migration associated with displacement from large infrastructure projects can take many forms. Tan (2008b) notes several kinds of movement associated with the displacement from the vast area inundated by the Three Gorges Dam in China. These include …

- Resettlement in nearby areas which was often unsatisfactory because of the poor quality of the land, often on steep upland slopes and already significant population pressure.

- Resettlement in more distant areas where population pressure is less but where there are problems of clashes with local people, lack of local agricultural knowledge and limited support networks.
- Migration off farms and into cities.

It is not always however that there is a planned displacement of population by infrastructure projects. In some cases there may be unintended environmental consequences of such projects which force environmental migration. A case in point occurred in East Java in Indonesia in 2006. Drilling of a wildcat well by a company owned by a prominent Indonesian tycoon and politician and foreign interests opened a fissure in the ground from where mud has flowed ever since (Montlake 2008, 16). Despite efforts to dam or redirect it, the flow has continued and now covers an area of 6.5 km2 engulfing 11 towns and displacing 16,000 people. Yet as Montlake (2008) explains this is only one example in Indonesia where such instances are frequent. He cites the deliberately lit fires in Sumatra and Kalimantan to clear vast areas to make them available for plantations or another situation where small farmers are forcibly displaced by the acts of government or large scale entrepreneurs.

IMPACTS OF MIGRATION ON DESTINATION ENVIRONMENTS

The complexity of the environment-migration relationship needs to be recognized and the causality can also be in the other direction. As Lohrmann (1996, 838) points out … 'environmental degradation leads to mass migrations which further accelerate environment overloads elsewhere and can lead to further, subsequent migration'. Lohrmann (1996) reports on a conference which discussed links between mass migration and environmental impacts and produced considerable evidence of impact on water pollution and deforestation.

Suhrke (1992, 2) points out that the body of research on the impact of migration on the environment is considerably greater than that on the environment as a cause of migration. Again, however, the bulk of the evidence relates to internal migration, with little examination of the ecological and environmental consequences of international migration. There are many case studies where expanding land settlement into marginal and fragile ecosystems in LDCs have led to desertification, deforestation and other environmental degradation (Suhrke 1993; Bilsborrow 1991, 1992; Allen and Barnes 1985; Bilsborrow 1987; Bilsborrow and DeLargy 1991; Blaikie and Brookfield 1987; Cruz, Zosa-Feranil and Goce 1988; Georges and Bilsborrow 1991; Hafner and Apichatvullop 1990; Pichon and Bilsborrow 1992). The expansion of agricultural settlement into hitherto untilled areas in some LDC contexts has led to severe environmental deterioration. This occurs both in government organized and sponsored land settlement programmes and especially where the settlement occurs outside of government controls and involves squatters. In Indonesia, for example, the ecological impact of the government's Transmigration Programme has been substantial (Secrett 1986).

One type of international migration which has attracted attention because of its environmental impacts is refugee movement. The sudden unplanned influx of large numbers of people into a generally spatially restricted area, often already vulnerable to environmental degradation, can have devastating environmental impacts (Stevens 1993). Ghimire (1994, 661) has recently summarized the situation:

> Deforestation is one of many environmental problems facing refugees in developing countries. Others include the depletion and contamination of water, overcrowding, poor sanitation, soil erosion and pasture degradation. In some cases, forest coverage and other environmental problems existed prior to the arrival of refugees; in others the problems have been exacerbated by the refugees. Dwindling resource base has also led to increasing conflict

> with local populations and much hardship for refugees. There are a number of studies which depict situations in Africa, and to a lesser extent Asia, where refugee settlement has resulted in environmental degradation (Ek and Kuradavi, 1991; Simmance 1987; Christensen and Scott 1988; Utting 1992; Aguayo *et al.* 1987; Hugo 1987).

Sudden mass migrations can often have a severe environmental impact on destinations and refugee flows are frequently of this nature. The unpredictable nature of refugee moves and their suddenness can mean there is no time for environmental assessment of refugee settlement sites or for putting in place appropriate environmental safeguards. Moreover, such settlements often have very high densities which put pressure on local environments through production of wastes, clearing of forest and vegetation, etc. Hence, mass migrations can both exacerbate existing environmental problems and create new degradation issues.

However, all the impacts of mass influxes of groups like refugees are not negative. Stevens (1993, 3), for example, points out:

> 'some environments have benefited from the pressure of refugees. Improved water supply and sanitation schemes have benefited both refugees and local population and contributed to rural development in many developing countries. Refugee labour has also been employed in reforestation, rangeland management and land cleaning schemes.'

In the traditional immigration nations such as Canada, the United States and Australia, debates about immigration have generally raged around the issues of ethnic composition of the intake and the economic consequences of the immigration. However, there are some indications of the environmental effects of immigration becoming an increasingly important element in that debate. To take the case of Australia, in the 1980s there were a few commentators who argued that Australia should dramatically reduce immigration levels because of environmental concerns that an expanding population will have detrimental effects upon the native environment, flora and fauna and upon the capacity of the nation's resource base to accommodate that expansion (Birrell, Hill and Nevill 1984; Day and Rowland 1988). However, in more recent times, concern about the environmental consequences of immigration has seen this issue emerge as one of the dominant arguments against expanding immigration levels.

While it is apparent that international migration can and does have negative environmental consequences, in some contexts there are considerable dangers that the migrants involved can become scapegoats for a general failure to adopt sustainable

policies of land and other resource use in the destination areas. In Australia, a review (Clarke et al. 1990) of literature concerned with immigration, population growth and the environment, concluded that Australians will be better off in general using resource management policies targeted to deal with specific resource and environmental concerns, rather than using immigration policies. This should not be taken to mean that population growth and immigration are not of relevance in discussion about Australia moving toward a sustainable development strategy but rather as Toyne (1990) has pointed out:

> 'It is vital the immigration debate is moved directly into the broader debate over ecological sustainability in Australia. No long-term resolution to the question of appropriate net immigration levels can be found until the broader questions are settled.'

There have been a number of studies which have looked at ways migrants, beyond contributing to population increase have impacted upon environments. These studies look at the ways in which migrants use the environment (Begosi 1998; Curran 2002; Curran and Agardy 2002; Naylor *et al*. 2002). As Cassells, Curran and Kramer (n.d., 3) point out … "evaluating migrant impacts on the environment requires *comparing* their knowledge and technical skills, wealth and access to resources with those of non-migrants". Several studies have focused on how migrants differ from non-migrants in behaviour which is destructive of environments (e.g. Sierra 1999). A recent interesting strategy of migrant – non-migrant differences in fishing behaviour in coastal villages in North Sulawesi, Indonesia has been made by Cassells, Curran and Kramer (n.d.). They make the important conclusion that the connection between migration and environment is not a linear one and that other factors besides migrant status influence resource extraction and use. The ecological and social context may matter more than migration. They found a clear association between migration and lower environmental quality but that the context and timing of migrant assimilation seems to be a more important explanation than simply being a migrant. They argue that studies of migration need to focus more on how migrants are incorporated into destination societies and on their social relations especially in relation to how the environment is used. The call for a more nuanced understanding of how migrants impact on the environment would seem very timely and appropriate.

As was indicated earlier, migrants are often scapegoated as being the cause of problems – environmental degradation, crime, health and disease problems, etc. and their environmental impact in the Senegal River Valley. Black and Sessay (1997) compared wood fuel use by refugees and local populations. There was concern in the area not only because of the increase in local population that the refugee movement created but also the common notion that they were 'exceptional resource degraders'.

Since their stay in the area was perceived by them as temporary they had no incentive to use resources in a sustainable way. However, Black and Sessay (1997) using a household survey and direct measurement of wood fuel use, found little or no evidence that refugees used more wood than non-migrants now that they are more destructive in their collection of wood.

CONCLUSIONS AND POLICY IMPLICATIONS

The causes and effects of environmental deterioration in LDCs cannot be quarantined within the national boundaries of individual nations. It is clear that much contemporary environmental degradation in LDCs has its real roots in historical processes such as colonial exploitation which produced different modes of agricultural and pastoral activity to meet the needs of the colonial power and different patterns of population growth and distribution from those which prevailed in precolonial times. Similarly, international inequalities in power, access to resources, unequal terms of trade, etc., have all been influential in shaping patterns of land use and settlement in LDCs, as have the interventions of international companies and agencies. Moreover, the consequences of deforestation, pollution, etc., are not confined to single nations. The rapid depletion of rainforests in a few countries like Brazil and Indonesia, for example, has climate change and loss of biodiversity implications which are global. The clear message, not only from the IPCC but from as far back as the 1972 Stockholm Conference on the Human Environment and the 1987 publication of the World Commission on Environment and Development report, *Our Common Future*, is that achieving ecologically sustainable development demands action at the global level as well as the national and individual levels. Successfully tackling many of the environment problems of LDCs and MDCs will require a global approach, and central to this is the pressing need to eradicate poverty so that people can have access to the resources to live sustainably. This will demand several redistributions from MDCs to LDCs through changes in international power, trade and aid relationships. In short, the environmental pressures which are increasingly the cause and consequence of population movements in LDCs should not be seen as exclusively the problems of the individual countries involved since those pressures have been caused partly by forces outside the country and they have consequences which extend beyond the borders of those countries.

Migration is a logical and common immediate response to environmental degradation and disaster, but it is rarely a medium or long-term solution to environmental problems. This will only be attained via lower levels of population growth through substantial and sustained fertility decline and adopting ecologically sustainable ways of using the environment. Both of these goals are only going to be achieved through overcoming the poverty and powerlessness among the people living in regions subject to environmental disaster and degradation. Only through improving employment opportunities for men and women, health, education, human rights and enhancing the status and roles of women within such societies can long-term sustainability be achieved. Just as international processes have contributed to the creation of environmental problems in LDCs, long-term solutions will only be possible with significant involvement of the international community.

Environmental pressures are undoubtedly an increasing element initiating outmigration from many rural areas in LDCs. However, environmental factors are more significant as contributory and proximate causes of such migration, although forced environmental migration is significant. The bulk of such movement is intra-national, but just as other forms of migration in LDCs are increasingly involving crossing international borders, it is likely that a larger proportion of environmentally displaced persons will move to other countries. However, such migration cannot be generally seen as a solution to environmental problems in LDCs because:

- The vast scale of such movement is such that the sheer logistics of moving and establishing such refugees in other nations is many times larger than any previous global migration (Keyfitz 1991).
- It does not represent a real and lasting solution to environmental problems, which can only come through eradicating poverty, reducing fertility, and adopting environmentally sustainable practices.

International relocation may provide an enduring solution only in very specific circumstances such as in small island nations influenced by a significant rise in sea levels or in small regions devastated by an environmental disaster.

The fact remains, however, that there are significant displacements of population occurring in LDCs as a result of environmental disasters or deterioration. Most of this displacement occurs within the boundaries of nations and there is certainly no indication of a lessening of the numbers of environmental migrants in LDCs. Hence, it is imperative that the international community look to short-term measures as well as the longer-term solutions discussed above. As was indicated earlier, the people involved are certainly not covered by international refugee protocols, and there is a pressing need for this group of forced migrants to be systematically incorporated into an expanded international regime to assist people who are uprooted involuntarily from their home areas (Rogers and Copeland 1993, 132).

Lonergan and Swain (1999) argue that:

> 'although the estimates and projections of environmental refugees are based almost entirely on anecdotal evidence and intuitive judgment, it is important not to trivialize the role environmental change and resource depletion may play in population movements.'

This differs from the view of Black (2001, 1) who, in also recognizing the weaknesses of the concept of 'environmental refugees' maintains that:

> 'although environmental degradation and catastrophe may be important factors in the decision to migrate, and issues of concern in their own right, their conceptualization as a primary cause of forced displacement is unhelpful and unsound intellectually and unnecessary in practical terms.'

It is clear regardless of "conceptual fuzziness" and the concept of environmental migrants remains a contested one in academic circles, that:

(a) environment is an important cause and effect of migration
(b) environment factors are increasingly significant in both inducing migration and in the assessment of the impact of migration. In such a context it is difficult to disagree with Renaud *et al*. 2007 that there is a need to consider environment and migration from a policy perspective. They make five policy suggestions:

- There is a need to put in place programmes to achieve a better understanding of the cause-effect mechanisms between environmental degradation and forced migration.
- It is important to raise worldwide knowledge based public and political awareness of issues surrounding environment and migration. In particular, they argue that the issue of migration and environment should be included in the work of the IPCC.
- There is a need to put in place a framework for recognition of environmental migrants as in a separate Convention or as part of Intergovernmental Treaties on Environment. They recommend that the 1951 Convention on Refugees not be extended to include environmentally forced migrants.
- There is a need to empower the relevant entities of the UN and other relevant agencies to provide assistance to environmental refugees/migrants.
- Strengthening institutions at all levels to provide assistance to environmental migrants.

(c) The area of environment and migration is repleted with unsubstantiated exaggerations on the numbers of environmental migrants. It is clear that there needs to be a quantum improvement in the knowledge base on the interrelationships between environment and migration. This means better conceptualization and measurement as well as more detailed cross-disciplinary research.

ENDNOTES

1. A more recent prediction (Houghton et al. 2001) projects the rise to be between 9 and 88 cm depending on emissions control.

2. The analysis included only countries with a population of at least 100,000 persons and a land area of at least 1,000 square km. Hence it excludes many of the Pacific atoll countries discussed earlier.

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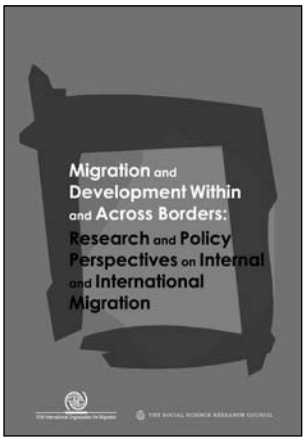

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IOM is delighted to be able to publish this volume of research, as it is likely that interest in the subject of internal migration and its relationship to development is likely to grow in the future.

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Environment and international migration and their relationship with development are among the most pressing issues on the contemporary global agenda. They have been the focus of major international attention recently with the release of the Report of the Intergovernmental Panel on Climate Change (IPCC 2007) and the holding of the first Global Forum on Migration and Development in Belgium in July 2007. Despite the enhanced profile of environment and migration and their relationship with development, little of this increased attention has been concerned with the complex and multidirectional relationships between them. In both research and policy, environment and international migration's linkages with economic development have evolved separately. Yet it is apparent that their interrelationships are of considerable significance for understanding social, economic and environmental change and for developing effective interventions to reduce poverty and move toward sustainability.

This paper explores the conceptual framework of the interrelationships between migration, environment and development through an analysis of the current literature. It offers an in depth analysis of the various permutations of this relationship: a) environment as a cause of migration, in particular environmental disasters and environmental degradation; b) climate change and migration; c) displacement by large projects; d) impacts of migration on destination environments. The implications these have for policy are considered.

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