

A Human Ecological Approach to Environmental Security and Displacements

Luc Hens

INTRODUCTION

Human displacement, either temporary or long lasting, will be a dominant feature definitely during the first decades of the new millennium. Migration and transboundary human movements have been a normal part of human history, but the scale of various types of migration, whether voluntary or involuntary, have reached unprecedented levels (Stiles, 1997). United Nations officials consider that making sure people stemming from different regions live together in peace is one of the main defeats for the new millennium.

An impressive number of examples world-wide indicate that people are forced to leave their land because it can no longer support them.

Haiti is an impressive example of this causal relation between environmental degradation and migration. In this country, deforestation, consequent erosion and population growth, has depressed per capita grain production to half what it was in the middle 1950's. Haitians now get just 80 per cent of their minimum nutritional needs. Added to that are the chronic political unrests and injustice of the previous regime. It is therefore understandable that 1.3 million Haitians have left their island during the last quarter of the 20th century. Most have crossed borders and went to other Caribbean islands or the United States.

Unequal distribution of water resources in the Middle East reflects another aspect of the same phenomenon. In the case of the West Bank, population growth in the Jordan River basin increased demand for the scarce supply of fresh water. The over pumping of aquifers depleted and degraded the water supply, and salt intrusion from the Mediterranean affected some aquifers. As 40 percent of Israel's groundwater originated from the former Occupied Territories, the former sought to protect its water supply by limiting its use by both Jewish settlers and Arabs during the occupation of the West Bank. However, there was a marked differential in access: stringent restrictions on water use by Arabs meant that settlers consumed about four times as much water per capita as Arabs. Combined with other Israeli restrictions on Palestinian agriculture, this situation encouraged many West Bank Arabs to abandon farming and to move to towns. The migrants became either unemployed or day labourers within Israel.

In recent years the Aral Sea has lost 70% of its volume and has become polluted with pesticide residue and industrial pollutants. With the almost complete collapse of the Aral Sea fishing industry, sedentary fishermen have become "nomadic fishermen", migrating during many months from their original homes. Of the croplands around the Aral Sea, 78% of the irrigated areas are now salinised due to years of over-irrigation. Negative environmental impacts are sub-regional and interregional, as environmental displacement from one region affects other areas as well. Pollution, decreased sea levels, and salinised lands are now considered irreversible processes. With ever fewer jobs in agriculture, fishery and industry, some three million people have been uprooted from the Aral Sea region.

Senegal, in West Africa, has fairly abundant agricultural land, but much of it suffers from wind erosion, loss of nutrients, salinisation due to over-irrigation, and soil compaction caused by intensification of agriculture. Mauritania borders Senegal in the North. Except for the Senegal River valley, along its southern boarder, and a few oases, Mauritania is for the most part arid desert and semiarid grassland. During the 1970's, the prospect of chronic food shortages and a serious drought period, encouraged the region's governments to build a series of dams along the Senegal River, a rich agricultural region. Land values in the basin rose, since enhanced irrigation was expected to generate high returns from agriculture. To seize control of this valuable resource, the Islamic Mauritanian government, controlled by Moors of Arab origin, abrogated the rights of black Mauritanians to farm, herd and fish along the Mauritanian side of the river. In 1989, violence erupted after Mauritanian border guards killed two Senegalese. A spiral of retaliatory attacks took place against Moors living in Senegal and blacks living in Mauritania. Hundreds died and thousands became refugees in the violence that followed.

Environmental scarcity in Pakistan's rural areas - in particular, declining per capita availability of cropland and water - has increased rural-urban migration. The rural migrants settle on the least desirable land-areas that frequently flood and lack basic infrastructure. Environmental causes are not the only ones causing displacements in and around the country. Since 1979, Pakistan has been playing host to over 3 mil-

lion refugees from Afghanistan. At the withdrawal of Soviet troops from Afghanistan, old caseload refugees have begun to repatriate, but it has also brought new waves of Afghan refugees fleeing into Pakistan. In all, fourteen different categories of refugees and mass migrants can be identified in Pakistan. It is most difficult to distinguish them accurately. Urban growth averages about 4 to 5 percent per year. Urban services are unable to keep up with urban growth. Sanitation services are often non-existent. Public health has been affected: waterborne diseases due to poor sanitation account for 25 to 30 percent of total cases in public hospitals in Karachi. The migration contributes to higher grievances within marginal groups in Pakistan's major cities and aggravates tensions and violence among diverse ethnic groups.

Ranging from the Amazon Basin to northern Saskatchewan, from the tropical rain forests of the Amazon, over sub-Saharan Africa, to Southern Asia, exploitation of natural resources including gas, oil, hydropower, timber, minerals, and other mega industrial projects by multinational corporations and governments has devastated, dislocated and decimated numerous locals, often indigenous tribal communities.

These examples illustrate the impact and the dimensions of environmental security and displacement. Moreover, they show key characteristics of the problem:

- environmental degradation is a driving factor in causing refugees, both within and between countries.
- environmental degradation in relation to migration is often the consequence of multiple factors.
- seldom does the environment act alone. Environmental causes precede, amplify or underlie other causes of refugees: political and/or religious oppression, economic collapse, military and/or civil terror and/or war.
- environmental security threatens not only human existence but also the peace and stability of regions around the world, especially (but not only) in poor countries.

Environmental displacement is a typical example of a complex issue in the human-environment interrelationships. It is also an issue which deserves more attention from researchers than it does today. In particular a human ecological analysis and approach is indicated to provide a suitable framework which allows to liaise ecological, demographic, economic, cultural and political aspects underlying this problem.

This paper advocates this approach and lists basic elements which might stimulate human ecological re-

search on environmental displacements. It provides an analysis of the causes and mechanisms of environmental displacements and lists the main possible measures and policy responses. These data are preceded by a discussion on the problems related to the definition of environmental displaced persons.

DEFINITIONS

Environmental displacement is closely interlinked with environmental security. Displacement can be the cause or the result of a lack of environmental security. People may be forced to leave a region because the environment does not allow a safe living anymore. Moreover, it is possible that the displacement of people may eventually cause environmental insecurity both in the region of origin and in the new settlement area.

Environmental security is a state in which an ecosystem is able to support the healthy pursuit of livelihoods of the people living in that system. An environment can by itself be naturally insecure; for example, areas that are prone to natural disasters, such as floods, cyclones and volcanic activity. Moreover, there are human impacts that result in environmental changes, such as industrial pollution, or over exploitation of natural resources. Special attention should be given to global environmental changes such as desertification, biodiversity and climate changes. Human actions may also lead to sudden and disastrous environmental disruption. This is for example the case when constructing large infrastructures such as dams, transport corridors and industrial accidents. Both human-made and natural environmental security may interact and mutually reinforce each other. For instance, when natural floods in the low-lands are exacerbated by the consequences of large-scale deforestation in the upper regions.

Lack of environmental security does not necessarily lead to displacement of people. There are many examples of populations who coped with difficult environmental conditions and adjusted to possible dangers from natural disasters. If resources such as water, become scarce, they may be used more efficiently (e.g. through integrated water management) or be replaced by substitutes (e.g. by replacing surface water by groundwater). Soil degradation can be prevented or slowed down, by using appropriate agricultural techniques. But next to the environmental elements, there are other factors that make people vulnerable to the lack of environmental security. These factors include economic conditions such as ownership, income, the social network, health, edu-

cation and the family situation. When the combination of environmental, economic and social factors is too unfavourable, people might decide to migrate. If the environmental component is a major factor in their decision to move out, they are referred to as environmentally displaced persons. These are *persons who are displaced within their country of habitual residence or who have crossed an international border and for whom environmental degradation, deterioration or destruction is a major cause of their displacement, although not necessary the sole one*.

During the 1980's and the early 1990's, environmentally displaced persons were called environmental refugees. "Refugee" is however a term which has a strong legal connotation. "Refugee" is an international term, defined in section 6B of the 1950 statute of the Office of the United Nations High Commissioner for Refugees (UNHCR), and in article 1 of the United Nations Convention of 1951 relating to the Status of Refugees. In these documents a refugee is *"any ... person who is outside the country of his former habitual residence, because he has or had well-founded fear of persecution by reason of his race, religion, nationality or political opinion, to avail himself of the protection of the government of the country of his nationality or, if he has no nationality, to return to the country of his former habitual residence"*. Environmental refugees consequently refers then to the people who are being forced to leave their homes; to retreat after losing battles with their environment, both natural, such as droughts, floods, cyclones and earthquakes, and permanent human-caused changes, such as dams, the slow degradation of farmland, the remnants of war and from industrial accidents.

A more recent, concise definition has been provided by Myers. Environmental refugees are persons who no longer gain a secure livelihood in their traditional homelands because of environmental factors of unusual scope, notably droughts, desertification, deforestation, soil erosion, water shortages and climate change, also natural disasters such as cyclones, storm surges and floods. In the face of these environmental threats, people feel they have no alternative but to seek sustenance elsewhere, whether within their own countries or beyond and whether on a semi-permanent or permanent basis. However in the strict sense of the interpretation "environmental refugees" do not meet the "persecution test". Also, in contrast with environmentally displaced persons, environmental refugees are defined as people crossing national borders. Environmentally displaced people are sometimes (but not always) also seen as voluntary migrants: persons who for economic, so-

cial, cultural, personal or other reasons leave voluntarily the country of their habitual residence. Next to people pressed by environmental reasons, voluntary migrants include poverty migrants in search of better economic and social opportunities. This is not completely fair. A key feature of environmentally displaced persons is that they move because they have no other choice.

To avoid confusion with the legal definition of "refugees" provided above, the term "environmental refugee" is avoided. More and more frequently it is replaced by "environmentally displaced people" or "environmentally displaced persons". This points not only to a semantic discussion. The use of "environmentally displaced people" also includes that there is no legal recognition on this ground under the 1951 Convention relating to the Status of Refugees.

As environmental displacements are in part caused by exploitation of natural resources by mega industrial projects, environmentally displaced people face also environmental injustice. *Environmental injustice implies any undue imposition of environmental burdens on innocent bystanders or communities that are not parties to the activities generating such burdens. Environmental inequity involves a skewed (or disproportionate) distribution of environmental risks by nationality, race, ethnicity, or class*.

These and related definitions are listed in Box 1.

Box 1: Definition of environmentally displaced persons and related terms.

Refugee is any person who is outside the country of his former habitual residence, because he has or had well-founded fear of persecution by reason of his race, religion, nationality or political opinion, to avail himself of the protection of the government of the country of his nationality or, if he has no nationality, to return to the country of his former habitual residence (United Nations Convention on the Status of Refugees, 1951).

Environmentally displaced persons are persons who are displaced within their country of habitual residence or who have crossed an international border and for whom environmental degradation, deterioration or destruction is a major cause of their displacement, although not necessary the sole one (OECD, 2000).

Environmental refugee is a person who no longer gains a secure livelihood in his/her traditional homeland because of environmental factors of unusual scope, notably droughts, desertification, deforestation,

tion, soil erosion, water shortages, and climate change, also natural disasters such as cyclones, storm surges and floods (Meyers, 1995).

Internally displaced people is a person or persons who have been forced to flee or to leave their homes or places of habitual residence as a result of, or in order to avoid, in particular, the effects of armed conflict, situations of generalised violence, violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognised state border (Hampton, 1998).

Environmental injustice implies any undue imposition of environmental burdens on innocent bystanders or communities that are not parties to the activities generating such burdens. Environmental inequity involves a skewed (or disproportionate) distribution of environmental risks by nationality, race, ethnicity, or class (Adeola, 2000).

MECHANISMS OF ENVIRONMENTAL DISPLACEMENTS

(a) Multi-factorial Responses

Reasons why people decide to migrate differ from case to case and from area to area. However, apart from the case of catastrophes, whether natural or human-induced, they have in common that they are complex.

An investigation of responses to food insecurity in four villages in the Bawku East District in the north-east savannah of Ghana showed that food insecurity in these communities is mainly a result of the increasing frequency of drought in the area, which has only one rainy season. Sixty-eight women and men were interviewed. Responses are shown in table 1. Although migration is not the most frequent response, almost half (48%) of the respondents in the study reported that some household members migrated to look for work during the last five years. Most migrants leaving Bawku are destined for the cocoa plantations in southern Ghana and sometimes in Côte d'Ivoire, while a smaller proportion seek employment in the urban centres of Kumasi and Accra. These data show that environmentally displaced persons exist not only as a result of acute economic problems, but also due to gradual environmental changes.

This type of research is, however scarce, and is often based upon limited samples, making it difficult to extrapolate the results to a larger scale. Reliable, systematic, comprehensive data on environmental migrants are non-existent.

Table 1: Coping responses to food insecurity, 1996; Bawku East District, north-eastern Ghana (after Awumbila, 1997)

<i>Main coping strategy</i>	<i>Absolute number of respondents</i>	<i>%</i>
Sale of animals	44	65
Sale of agricultural produce	7	10
Selling firewood	6	9
Borrow	5	7
Migrate	5	7
Casual labour	1	2
Total	68	100

(b) Environmental Degradation Spirals

A growing frequency of natural disasters, partially linked to climate changes, is one of the causes of the destruction of people's basic means of living. Difficult circumstances may drive people towards marginal (e.g. the edges of the Sahara), fragile (e.g. mountain areas) or disaster-prone (e.g. the fertile, but flood prone islands in front of Dhaka's coast) areas, not fit for cultivation or human settlement. The result is a further degradation of a land and a narrowing of the basis for their already precarious situation. In many developing countries, notably in Africa and Southern and Eastern Asia, the likelihood and frequency of natural and human-made disasters is closely linked to economic, social and political difficulties. Countries which are hardest hit by natural disasters are often those, in which environmental degradation is proceeding rapidly as a result of human activity. In many Southeast Asian countries upstream deforestation has made coastal areas more vulnerable to cyclones and floods. Rapid population growth and poverty drives people to cultivate fragile and endangered land, and adds to steadily rising numbers of people vulnerable to environmental change. A vicious spiral of environmental degradation and displacement may start if the problem of environmental insecurity is not addressed at an early phase.

CAUSES OF ENVIRONMENTAL DISPLACEMENTS

Although complex and interwoven, it is possible to detect in an analytical way the major causes of environmental displacements. The most important ones are schematised in table 2. The table shows that these root causes can be natural or human-made. Among the latter are resource degradation and climatic changes which require the following special attention:

(a) A natural disaster is *"the impact of a natural hazard upon a population or area which is vulnerable to such impacts and where impacts result in substantial damage, disruption and casualties"*. They include earthquakes, volcanic eruptions, hurricanes, floods, droughts, heat- and coldwaves, and fires. In all these situations the impact is manifested as a disruption of the human ecology of the affected area. They have become hazards since humans are involved and they have become disasters as a result of the way humans live in natural hazard-prone areas.

Natural disaster prone areas are unevenly distributed over the world. Areas where tectonic plates meet are prone to earthquakes. Hurricanes can only originate in areas where the surface temperature of the ocean water is 26°C or higher. Islands offer an interesting case study. Some of them are prone to earthquakes and volcanic eruptions as a result of their geographic location and geological ontogenesis. Moreover, many islands and island archipelagos lie in the oath of revolving storms. Extreme weather events such as the El Niño/La Niña climatic phenomena also effect island states causing forest fires and droughts and an increase in epidemics and disease outbreaks such as malaria, Dengue fever and cholera. Islands in the Caribbean, South Pacific, and Indian Ocean are particularly at risk to multiple natural hazards.

During the last quarter of the 20th century natural disasters killed an average of 3311 people each year on islands globally. They also affected nearly 6 million islanders per year. During this period 1280 island disasters were reported, an average of 51 natural disaster events per year. Most of them were experienced on Asian islands and the least on European islands. Most disasters during this period were the consequence of high wind incidents (30%), with islands in Asia and the Caribbean being prime hosts of hurricanes and typhoons. There was also a significant number of earthquakes (10,5%) and floods (17%) reported during this 25 year period.

"Damages and economic losses directly related to the occurrence of a disaster situation" is the indicator used to estimate the economic impact of disasters. Disasters on islands caused 61 billion US\$ in damage over 25 years, i.e. islands on the average face nearly 2.5 billion US\$ in direct financial costs a year. Asian islands bore over 80% of these costs.

In 1998 the incidence of natural disasters was particularly high. 44 disasters were reported to have affected islands. In 1998, one event, a tsunami, killed over 2000 people in Papua New Guinea. This is the event with the highest number of reported deaths during this year. Over 10 million islanders suffered from various consequences of disasters including loss

of their homes, livelihoods, family and injuries. Although this is an alarming picture, it is unclear how many people, driven by these catastrophes, decided to leave their homeland and to migrate.

(b) *Land Degradation*: Erosion, salinisation and water logging of irrigated lands are the main causes of land degradation. Today, an estimated 6.070.500 ha of land each year lose its productive capacity. 20% of vegetated land in Asia is degraded since 1945. In Africa this figure amounts to 22% and in South America it is 14%.

Erosion threatens the topsoil in a dramatic way. During the past 20 years some 500 billion tons of topsoil have been eroded away world-wide, roughly equivalent to the topsoil in India's croplands. In countries as disparate as Mexico, Costa Rica, Mali and Malawi, soil erosion causes annual losses in farm output worth 0.5 to 1.5 percent of the GNP. Yet between a quarter and half a billion impoverished people in developing countries find themselves obliged to farm hillsides where they cause exceptional erosion.

Improper irrigation has caused world-wide 3.5 million km² of salinised land. 15.000 to 20.000 km² are lost every year to salinisation.

(c) *Water Shortage*: 550 million people today live in countries with chronic water shortages. According to the World Water Council 25 countries cope today with serious water shortage. In 2005 this number will be increased to 60 countries. By 2025 an estimated number of 3 billion people will have to live with "waterstress", structural shortage in different intensities. The principal risk areas include parts of India and Pakistan, the Middle East and much of Africa.

Water shortages causes major problems for health, irrigated agriculture and industry. The World Bank estimated that providing the population world-wide with drinking water will cost 600 to 800 billion dollars. Treating this water (to recycle it e.g. in agriculture) doubles this figure. Offering basic water security by the year 2025 would necessitate at least a doubling of the investment cost in water infrastructure works.

Water shortages could well be made worse by increasing droughts in the wake of global warming. Droughts that have only a five percent frequency today may increase to 50 percent by 2050. Water is intimately related to preventable diseases as the main group among them is water borne, agricultural yield and poverty.

(d) *Desertification*: Today 30% of the earth's land surface is affected by the degradation of fragile drylands. It thereby threatens the livelihoods of at least one billion people in 100 countries, of whom

135 million are experiencing the rigours of severe desertification. It eliminates 60.000 km² of agricultural land each year, and reduced another 200.000 km² to a state of grossly depleted productivity. The cost of agricultural output lost is around 42 billion US\$ per year.

Areas which are most threatened include north-eastern Brazil, north and central Mexico, western India, Pakistan and North Africa. But drought is a still more important factor in Sub-Saharan Africa. This is the region with some of the greatest population pressures, and committant environmental pressure. It has by far the largest proportional numbers of environmental refugees already. Especially at risk are the Sahel countries, where the desert moves up and down, from the Horn of Africa, and a "dry corridor" in the South and from Namibia through Botswana and Zimbabwe to southern Mozambique. Details on the situation in Sudan are as an example described in Box 2.

Box 2: Desertification, drought, famine and displacement in Sudan (Badawi, 2000).

Most of Sudan falls within the Sahelian Belt, which is periodically affected by drought. Also, the marginality of the climate and the extent of the semi-desert and savannah that constitute more than two-fifth of the country contributes to the vulnerability of Sudan to desertification. Desertification should not be confused with drought, which is the main cause of desertification.

The affected area of the country is situated between the 10° and 18° latitude; 13 states out of the 26 states of Sudan are affected; 50% of the total area of the country is desert; 19.5 million people are affected. Moreover, desertification started to affect the Southern Savannah and Buttana areas on the East of the Nile extending to the Red Hills. The desert has advanced 90-100 km during the period 1980-1997 and is currently proceeding at a rate of 5-6 km per year.

Drought is periodically and frequently experienced in the country; the most catastrophic stroke was in 1984. This drought and the resulting famine touched the entire Sahel Belt. However, the UN estimated that 5 million out of the total 30 million affected people were in Sudan (Wani, 1991).

More than two million people of the Western Sudan were seriously affected by drought. Thousands converged from the west into the capital Karthoum in the hope of finding food and employment. Another 1 million people migrated southwards. The migrants experienced difficult living conditions in

the displaced persons settlements in Khartoum and other towns.

The Red Sea Region inhabitants were most affected; they camped along the road to Port Sudan to beg for food and water from passing motorists.

Refugee camps were set up in Sinkat, Dordeab and Tahamiam. The displaced people shared the same drought and famine which they had left behind when they lost most of their family members and livestock (Malik, 1991).

Desertification is a typical example of a complex human ecological problem: it reduces the land's resilience to natural climate variability, it undermines food production and contributes to famine, it deeply affects the socio-economic conditions of the local population, thereby triggering a vicious spiral of poverty, ecological degradation, migration and conflict.

(e) *Deforestation*: It has been estimated that up-to-date 350 million people may face absolute shortages in fuel wood. In 2010, 40 to 50% of the existing forest cover is projected to be lost. Well over half of all the forestation is caused by slash-and-burn cultivators, most of them are peasants displaced by soil erosion, water deficits, landlessness, poverty and population pressure in traditional farmlands. These "shifted cultivators" now totals at least 200 million and possibly as many as 500 million.

Whatever the causes of deforestation are, it eliminates the homelands and the livelihoods of large numbers of people. Especially ethnic minorities and other indigenous people are most vulnerable. Documented cases of involuntary migration caused by (among other reasons) deforestation exist in the Philippines, Ethiopia, Madagascar, Peru, Haiti and Brazil.

Deforestation influences flood/drought regimes and local rainfall. Tropical deforestation is also the cause of the bulk of species extinction.

(f) *Climate Change*: median estimates project a 3 to 5 °C rise in temperature by 2060. This temperature effect will unevenly be distributed over the world, with more pronounced changes at the poles as compared to the equator. Sea rise is expected to be 18cm by 2030, indicating the loss of coastal lands and flooding estuaries. Today, there are 70 to 80 annual cyclones world-wide, causing 15.000 to 23.000 deaths a year. The damage they cause is estimated at around 1.5 billion US\$. The trend increases.

Areas which are most vulnerable include coastal zones where one third of the world population lives,

islands with a minimal elevation above sea level such as the Maldives in the Indian Ocean and many Caribbean Islands, and areas prone to cyclones, which are formed over seas with surface temperatures above 27°C.

This allowed the Intergovernmental Panel on Climate Change (IPCC) to conclude that "the gravest effects of climate change may be those on human migration as millions are uprooted by shoreline erosion, coastal flooding and agricultural disruption".

(g) *Industrial Accidents*: A classical example of the link between displacement and industrial accidents is provided by Chernobyl (Ukraine). There were two successive explosions the morning of Saturday 26 April 1986 at 24 minutes past midnight. In the days after the explosions and fire, some 135,000 people had to be evacuated within a 30 km radius from the stricken plant. Of the 91,000 Ukrainians evacuated - the other people were from Byelorussia, just across the border - some 60,000, including most residents of Pripyat, ended up in Kiev. Of these displaced people, many were housed into dingy over-crowded apartment buildings on the western and southern fringes of the city. These areas are now referred to as "little Chernobyl".

The resettlement was only the beginning of the problems for the displaced people. Thousands needed treatment for milder forms of radiation sickness. Up to 300,000 Ukrainians and Byelorussians are now being treated for the consequences of the accident. For administrative purposes, the Ukraine now has divided its contaminated areas into four zones around Chernobyl, containing nearly 3 million people, including 500,000 children.

Chernobyl is not a unique example of an industrial accident linked to displacement. Similar relocation involved people threatened by the effects of hazardous waste contamination. Evacuation and relocation of people is part of any industrial emergency and disaster plan. In those cases where relocation of people can limit exposure to the pollutants emitted during an accident it will be practised.

(h) *Predictable environmental causes* of displacement involve people who had to move because their homeland was destroyed by nuclear tests. Immediately after the second World War the US decided to use the Pacific Marshall and Gilbert islands as their nuclear testing ground. The entire population of a number of these islands had to move. The 120 natives of Bikini were allowed to vote on which of the other thirty-one atolls in the Marshall they would move to, and they picked Roderick. Today, more than 50 years after the atomic bomb tests, the people of the Rongelap Atoll still cannot go home as their land

is still contaminated. The complex story of these people is characterised by bitter exile, illness, tales of suppressed medical evidence and natives treated like subhuman.

Displaced people characterise also the construction of large dams world-wide. Currently there are about 45,000 dams higher than 15 meters ("large dams") throughout the world. Three quarters of them have been built during the last 50 years. The reservoirs formed by these dams store about 3600 km³ of water. Benefits of these dams include water supply, irrigation for agriculture, flood control, hydropower and inland navigation. Most of these dams are built for several purposes. While dams provide benefits to society, there are also a number of impacts which offer serious concerns. These include resettlement and relocation, local socio-economic impacts, environmental concerns, sedimentation issues and safety aspects.

The relocation issues are undoubtedly most significant, as might be illustrated by the case of the Hoa Binh hydropower dam in Northern-Vietnam, about 100 km north-west of Hanoi. The lake created by this dam inudes 19,800 ha, of which 2,700 ha were rice fields and 2,400 ha was crop land. 51,600 people from 8,000 families had to be resettled. This coincides with 10 ha of inundated land and 27 resettled people per generated MW. In spite of major efforts by both the Vietnamese government and the local population, the resettlements resulted in a disruption of traditional agricultural practices, households which had to move many times, difficulties in stabilisation of resettled people in new localities, problems with the existing population in the resettlement areas, shortage of water in some places, and threat to remaining forests near the resettlement sites. 40% of the relocated households are in poverty with food shortage. Ironically, not all resettled people can use the electricity generated by the water of the dam.

The core discussion on dams today is whether these concerns and adverse impacts of dams can really be minimised and mitigated by careful planning, environmental impact assessment, and management. If the answer to this question is negative, this will put a big burden on the construction of large dams in the future.

(i) *Population Pressure*: Large numbers of people concentrated in specific areas such as coastal zones, can, in conjunction with environmental factors, lead to forced migration. Documented examples exist in the Philippines, Japan, Bangladesh, Ethiopia, Mexico and Central America. The problem of population pressure as a driver of migration is closely associated with poverty and other forms of marginalisation.

(j) *Diseases and malnutrition* contribute to displacements. Readily preventable diseases kill almost 20 million people in developing countries each year. Water is a key issue in this respect as most of these preventable diseases are water-borne.

Chronic under-nutrition afflicted 800 million people in 1990, at least 400 million suffered from outright malnutrition, and some 25-35 million people were at risk of famine. Today, one child in six is born underweight, a proportion that rises twice as high by the age of five.

Beginning of the year 2000 a famine threatened 12 million people across seven countries in the Horn of Africa.

(k) *Poverty*, and especially absolute poverty, works in conjunction with environmental factors and population pressures to produce sizeable numbers of refugees. The problem is widespread and growing worse. People in poverty will grow from 1.3 billion in 1995 to 1.8 billion in 2010.

In many developing countries, there has been a steady decline of per-capita income since 1980, in some instances as much as 25 percent (Sudan, Rwanda, Nigeria, Ivory Coast, Madagascar, Nicaragua and Haiti). As a result, the poorest one third of humanity receives an annual cash income of less than 5 percent of the global economy.

Poverty is closely associated with environmental decline, disease, malnutrition, population growth and general destitution, all factors acting in combination and pushing to further migration.

ACTIONS AND MITIGATION

Cause Related Approach

The analysis of the causes of environmentally induced displacements provides a framework for actions to prevent environmental insecurity and such displacements. When migration has occurred, mitigation and rehabilitation measures should be established.

The possibilities to prevent natural disasters, except those emerging from global changes, are limited. Nevertheless much more can be done on research to develop early warning systems, preparedness, mitigation and rehabilitation. This necessitates a complex system of collecting data, identification of possible affected areas, the building of early warning systems, the training of personnel and the population for disasters, disaster mitigation and rehabilitation strategies often after the disaster has occurred.

The impacts of human driven causes of environmental insecurity differ in scale, timeframe, intensity, predictability and reversibility (Table 2). Therefore, they call for a variety of interventions.

(a) Immediate Impact, with Limited Predictability

Industrial accidents and natural disasters such as flash flooding, earthquakes, typhoons, or volcanic eruption, have similar characteristics, in that both events are sudden, uncertain and may cause severe damage to the environment and human security. In

Table 2: Environmental change as a cause of migration (after IOM, 1996)

		Time frame	Scale and intensity	Predictability	Reversibility
Natural causes	Earthquakes, volcanic eruptions, flooding etc. necessitating disaster relief	Short-term	Local and severe	Limited or none	Sometimes
	Global warming, acid rain, pollution of riverways, etc.	Long-term and gradual	Global, regional and incremental	To some degree	Partial and difficult
	Industrial accidents	Short-term	Local and severe	Limited or none	Sometimes
	Predictable environmental causes of displacement (reservoir construction, nuclear testing, hazardous waste site construction, megaprojects, etc.)	Medium to long-term	Local and sometimes severe	Yes	No
	Depletion of resources	Medium to long-term	Basically local, and could be serious	To some degree	Sometimes partial
Human-made causes	Localised problems (degradation of agricultural base; soil, water, wildlife resources)				
	and/or Irreversible problems (severe soil erosion and desertification)	Long-term	Local to regional and serious to severe	To some degree	No
	environmental degradation				

both cases the prospects of predicting their intensity, outreach and duration are limited. The major difference between natural disasters and industrial accidents, however, is in the general opportunity for humans to prevent or reduce the probability of the latter.

The concept of disaster reduction is crucial in this context. It extends to natural and other disaster situations including environmental and technical disasters and their interrelationships which can have a significant impact on social, economic, cultural and environmental systems. All efforts should be undertaken to apply the existing scientific and technological potential to prevent severe disaster situations, which would lead to displacement with no possibility to return. This includes adequate risk assessment, vulnerability analysis, and countermeasures in the field of infrastructure planning and project implementation, hazard monitoring, and structural strengthening of infrastructure. National environmental legislation should be strengthened to establish an environmentally less harmful economy.

Prevention of the consequences of climate change, necessitate particular attention. The Rio Convention on Climate Change has initiated a dynamic which, for the time being, resulted in the Kyoto protocol. The results of this process are that there exist now on a world-wide basis quantitative targets to curve down the emissions of CO₂. Although the Kyoto targets are insufficient to stop the effects which are foreseen to result from the increase of greenhouse gas concentrations in the atmosphere, they constitute a necessary first step of a process which needs to be intensified in the future.

(b) Immediate Impact, with High Predictability

Large scale infrastructure projects can imply negative environmental impacts similar to industrial accidents. The negative environmental impacts, persons to be displaced and causes of displacement of a large scale hydropower plant or a hazardous waste site, can be identified during the planning phase of the project. Nevertheless, possible environmental risks of such projects are often accepted on the basis of economic, political and other considerations.

The world opinion is actually split on the likeliness of these mega projects. It is unclear whether there is a decision to continue to build large dams, especially because the benefits are smaller than the global costs. However, if such projects are realised, environmental impact assessments (EIA) should be undertaken, with explicit components on the risk of out-migration and the potential environmental impacts

in the new resettlement areas of displaced populations.

(c) Gradual Impact, with Partial Predictability

The process of environmental degradation may be gradual, as in the cases of water pollution and water shortage, coastal flooding and more frequent disasters due to global warming and sea level rise, over exploitation of natural resources, desertification and soil erosion. Detrimental environmental problems may remain undiscovered until a certain threshold is reached beyond which they become a severe threat to the environmental security of the region.

Preventive action is the most important strategy to use in tackling these problems. Although a legislative and policy basis exists to address these issues, this should be strengthened both at the national and the international level.

Next to prevention, there is a need to identify these dangers at an early stage. Regions that are likely to become environmentally insecure should be monitored. Research is needed to collect both the physical data (e.g. using geographic information systems) and the socio-economic and political situation in the area and the vulnerable groups living there.

Principles and Instruments

To act on the minimisation and alleviation of environmentally-induced population displacements, a number of specific needs can be identified. Moreover, it is possible to address them using a set of policy instruments, which should be used in a context for which a number of basic principles apply. Key elements in this framework are the following:

(a) *Research*: More research targeted towards a better understanding of the synergies between the underlying factors of dislocation is necessary. Environmental change is by no means the only source for the displacement of people. Studies must be customised to consider specific cultural, economic and political circumstances to determine the real causal network underlying environmental insecurity.

Geographic information systems (GIS) have an important role to play here. They can be used to describe and analyse a wide variety of drivers, including drought, earthquakes, erosion, floods, forest change, irrigation, landslides, mining, pests, population, salinisation, storms and volcanic eruptions. They can equally be used in locating potential problem zones, in making inventories of problem zones and in verification and analysis of the information. They have been used in monitoring both preventive

asures but also to the monitoring of environmental displacements.

(c) *Strategic Environmental Planning*: One of the most important problems environmental displaced persons face is that their problem is still marginally recognised. For those who had to move this recognition by authorities and society as a whole is most important. Part of it entails that environmentally induced population displacement should be integrated into environmental plans and national conservation strategies. These strategies and plans must include capacity building for forecasting, monitoring and contingency planning; mitigation and rehabilitation measures; be based upon participatory approaches; and be developed in a decentralised way. They should also be linked up to economic development plans.

(d) *Resettlement and Return Policies*: Many problems faced and caused by environmentally displaced people originate from the fact that there is no guidance when they have to be resettled. People who saw their home place destroyed by an artificial hydro-power lake move into the adjacent mountains, where they start agriculture in inhospitable areas, causing erosion, render the environment most unsustainable, and finally migrate for years leaving behind a trace of environmental destruction.

To avoid this, countries should have resettlement policies to prepare for those situations in which environmentally displaced people cannot return to their home countries.

When, such as after floods, return is possible, an active policy which aims at assisting migrants to return to their home areas should be developed.

These resettlement and return policies should have a number of distinct particularities. They should entail environmental and technical measures to avoid that the next flood will lead to similar disasters as the previous one. In resettling people attention should be paid to the needs of local communities and defusing potential conflict and competition over scarce resources.

(e) *Local Participation*: Those who have written and spoken most about environmentally displaced people are academics, analysts, investigators, journalists, and policy groups, but almost never the displaced people themselves. However, wide consensus exists that projects not supported by local participation and general awareness are not sustainable in the long run. Therefore, it is very necessary that actions in this area should encourage the active participation and involvement of the displaced and local communities. Actions should include education and awareness raising about environmental problems as well as about linkages between the environment, the economy and the land-use.

(f) *Co-ordination*: Environmentally displaced persons are a problem involving a wide range of target groups. International, national, regional and local actors, whether government, authorities, NGOs, co-operation agencies, the private sector or donors, are all indispensable for instituting the required prevention, mitigation and rehabilitation measures. There is a need for more active interchange of information and co-ordination of actions.

(g) *International Agenda*: Although during the last decade the number of conferences and discussions which had environmentally displaced people and environmental security as a key focus on the agenda, is increasing, the issue is recorded a rather low attention on the international refugee and environmental agenda. This has to change. A variety of tools should be utilised by states and organisations to highlight the situation and focus international attention on the problem. The media is a powerful player in bringing this message across. Drawing more international attention on environmentally displaced people is an important precondition to finding viable and effective solutions.

DISCUSSION

People who are forced to leave their land mainly because it can no longer support them, are called environmentally displaced people in this contribution. However these people:

- leave their land are persecuted by causes outside their control,
- do this because there is relatively insufficient management of the root causes of the problem, and
- cross eventually national borders.

Therefore, indeed these people are environmental refugees. Calling them "environmentally displaced people is only based upon avoiding confusion with the legal definition of "refugees".

There are at least 25 million environmentally displaced people (Meyers, 1995). He estimated that this number is likely to rise to 50 million by 2010, and could reach 200 million by the middle of next century if global warming effects such as sea level rise, coastal flooding and weather pattern changes become obvious.

The global figure of 25 million environmentally displaced people compares with 23 million traditional refugees, people fleeing political oppression, religious persecution and ethnic troubles. It is also a ratio of one person in 225 world-wide.

Most environmentally displaced people are in the African Sahel, the Horn of Africa and other parts of Sub-Saharan Africa. But also Mexico, the Indian

subcontinent and China are areas where people leave their home land driven by mainly environmental reasons. Moreover, also the US and Europe have areas prone for example to drought, which might contribute to people's decision to migrate.

The discussion on environmentally displaced people is characterised by an important deal of scientific uncertainty. The numbers cited above constitute only a first-cut assessment. This paper has provided an overview of the causes and the driving actors behind environmental displacements. However, at the same time, it was pointed out that environmental change is by no means the only cause of the displacement of people. More fundamental causes are inbuilt in the interaction between environmental, socio-economic and politic factors. Understanding the nature of the interacting and disfilling the causal relationships of the driving factors of environmental displacements, necessitates the use of new inter- and transdisciplinary approaches and for which science is still searching for a proper paradigm and appropriate methods. Here human ecology comes into the picture. Environmental displacements are a matter of complexity in the human-environmental interface. Broader, interdisciplinary human ecological frameworks of analysis must allow a more accurate understanding of the phenomena going on in this area, better predictability, higher acceptance of post-modern science approaches and better decisions. In this way "Environmental displacements" should become one of the focal areas of research for the decades to come.

This scientific uncertainty hampers the development of appropriate policy responses. However, during the last decade of the 20th century both scientific and political attention for the problem increased. But the problem of environmentally displaced people still lack official and legal recognition. People who migrate for environmental reasons fall outside the categories protected by the instruments of international refugee law, both in terms of the text and the intent of the drafters, and in terms of contemporary practice. This does not only hamper the design of a proper policy to manage the problem, but might even work counterproductively. There are limits to host countries' capacity, let alone, willingness, to take in eventually displaced people. As a result, immigrant aliens present abundant scope for popular resentment, however unjust this reaction might be. In the wake of perceived threats to social cohesion and national identity, refugees can become an excuse for outbreaks of ethnic tension and civil disorder. Here the problem of "environmentally displaced people" links up with the wider context of "environmental security", which threatens not only human existence but also the peace and stability of regions around the world.

For Leiderman (2000) environmentally displaced people are bio-indicators of environmental quality. Today, there are refugees from floods, toxic spills, dump sites, desertification, hydroelectric projects, strip mining, radiation exposure, severe logging, soil erosion, agricultural land abuse, disease epidemics, defoliation, land mines, and other unwitting or intentional human activities. Therefore, the over-riding objective for all countries, whether industrialised, or economies in transition or developing, is to reduce the motivation for environmentally destitute people to migrate by providing them with acceptable lifestyles through sustainable development. No doubt each country has its responsibility on this issue. But there are also important international dimensions of the problem: the aspect of crossing borders, the global migration patterns towards the "North", the worldwide causes and effects of the underlying drivers. Therefore, environmentally displaced people should move fast on the agenda of international co-operation and environmental diplomacy.

KEYWORDS Environmentally Displaced People. Refugee. Environmental Security. Environmental Justice. Climate Change. Desertification. Deforestation. Environmental Accidents.

ABSTRACT Persons who are displaced within their country of habitual residence or who have crossed an international border and for whom environmental degradation, deterioration or destruction is a major cause of their displacement, although not necessarily the sole one, belong to environmentally displaced people. These persons are refugees in the real sense of the word, but their situation does not coincide with the legal definition of "refugee". Therefore, the term "environmental refuge" which is common in the literature, is not used in this paper. Primary causes for environmental displacements include natural events necessitating disaster relief such as earthquakes, volcanic eruptions and floods. Human-made causes are by far the most underlying causes of the displacements. They include depletion of water, soil and other resources and/or environmental degradation, dam construction, nuclear testing, hazardous waste site construction, and industrial accidents. Global warming necessitates specific attention. Secondary causes (which in part result from the primary ones) include population pressure, diseases, malnutrition and poverty. In discussing environmentally induced displacements, it is important to grasp the underlying mechanisms. Environmental displacements are seldom caused by one event. Rather they are a response to multi-factorial stresses. Moreover, many of the causes are interlinked. Water shortage for example results in threatened harvests, famine, disease, poverty and social marginalisation. This type of environmental degradation spirals is the real motivation of a population's decision to move as their homeland cannot sustain them any longer. Action responses to environmentally induced migration have to do both with prevention and mitigation. At the prevention and preparedness side, environmental impact assessment, strategic environmental assessment, implementation of international environmental conventions and national environmental plans are among the most important instruments. Relocation policies, resettlements, technical improvements, early warning systems, and local ownership of mitigating actions are essential elements of the mix of instruments which is necessary to help environmentally displaced people with rehabilitation and their eventual possible return to their homeland whenever possible. At

this moment, their number is estimated at 25 million and the trend is increasing. More research is needed to understand the fundamental causes and mechanisms driving environmental displacements. More interdisciplinary research is needed to understand causes and mechanisms and to come to better decision making. Human ecological frameworks are of particular importance in this respect. But probably the main problems these people actually face is a lack of official and legal recognition. This does not only hamper the formulation of more intensive policies to manage the problem, but also makes their presence prone to the generation of excuses to justify the outbreaks of ethnic tension and civil disorder. This shows how closely related environmental displacements and the broader concept of environmental security are. It equally shows that international recognition of environmentally displaced people as a vulnerable group that needs special assistance, may now be seen to be desirable.

REFERENCES

- Adeola F.O.: Cross-national environmental injustice and human rights issues. A review of evidence in the developing world. *American Behavioral Scientists*, **43**: 686-706 (2000).
- Awumbila, M.: Sustainable human development. A case study of gender and food security in the north-eastern savannah region of Ghana. pp. 47-62. In: E.K. Boon and L. Hens (Eds.). *Environmental Management in West Africa*. Human Ecology Department, VUB, Brussels, Belgium (1997).
- Badawi, N.B.: Environmental and health problems in the internally displaced population (IDPs) camps: a case study of Karton Kassala (Hay Al-Baraka) Hag Yousief Sudan: with emphasis on community participation in environmental rehabilitation for sustainable development. Master thesis. Master's Programme in Human Ecology, Vrije Universiteit Brussel, Brussels, Belgium (2000).
- Hampton, J.: *Internally Displaced People: A Global Survey*. Earthscan Publications Ltd., London, UK (1998).
- IOM - International Organisation for Migration. *Environmentally-Induced Population Displacements and Environmental Impacts Resulting from Mass Migrations*. Geneva, Switzerland (1996).
- Leiderman S.M.: *Comprehensive Portfolio on Environmental Refugees and Ecological Restoration*. University of New Hampshire, Durham (2000).
- Malik, A.: Information and disaster management in Sudan. In: Abi Sin (Ed.). *Disaster Prevention and Management in Sudan*. Khartoum University Press, Sudan (1991).
- Meyers N.: *Environmental Exodus: An Emergent Crisis in the Global Arena*. Climate Institute, Washington DC (1995).
- OECD: *State-of-the-Art Review of Environment, Security and Development Co-operation*. Paris, France (2000).
- Wani, P.: Effects of disasters on population redistribution. In: Abi Sin (Ed.). *Disaster Prevention and Management in Sudan*. Khartoum University Press, Sudan (1991).
- Author's Address:** Luc Hens, Human Ecology Department, Vrije Universiteit Brussel, Laarbeeklaan 103, B-1090 Brussels, Belgium. Tel.: +32-2-477.42.81; Fax: +32-2-477.49.64; E-mail: gronsse@meko.vub.ac.be