

POPULATION, POVERTY, AND VULNERABILITY: MITIGATING THE EFFECTS OF NATURAL DISASTERS

By George Martine and Jose Miguel Guzman

Abstract

Hurricane Mitch was one of the most destructive natural disasters of recent times, and it exposed the underlying vulnerability of the Central American region, where poverty magnifies the threat of natural hazards. International assistance for national disasters tends to focus on short-term recuperation rather than on long-range prevention. Policymakers need to pay greater attention to the role of population dynamics within necessary prevention efforts. This article analyzes the relationships between demographic dynamics and Hurricane Mitch in Central America, and extracts from that experience lessons that can help reduce vulnerability to natural disasters in the long run. Specifically, it centers on three aspects: How did demographic processes condition the area's vulnerability prior to Mitch? What are Mitch's consequences for population dynamics in the short- and long-term? How must population dynamics change in order to mitigate the effects of future natural disasters? Systematic use of such information could help blunt natural-disaster impacts in three important ways: planning of spatial organization, reproductive health needs, and design of adequate information systems.

Mitch is considered to be the most powerful hurricane to have hit Central America and the Caribbean in the last two centuries as well as one of the most destructive natural disasters of recent times. Its passage exposed the underlying vulnerability of this region and threatened the very fabric of the societies affected. Not only did it test these societies' capacity to face critical issues, but it also brought into question their social, economic, and political structures.

Mitch, however, was not an isolated incident. Central America and the Caribbean are perennially exposed to natural hazards of a physical, geological, or meteorological nature. Table 1 portrays the deaths resulting from the region's recent vulnerabilities and various natural hazards. During the last 30 years, Central American natural disasters have caused more than 56 million deaths and \$22.45 billion dollars of economic damage. Such destruction has contributed to the deterioration of the region's living conditions as well as to a reduction in its rates of economic growth (ECLAC & CCAD, 2002).

Natural hazards become disasters because Central

America is extremely vulnerable. Social factors (high levels of poverty), economic factors (failure to consider natural disasters in the location and characteristics of economic activity), and environmental factors (inappropriate land use on steep slopes, deforestation, erosion, inappropriate location of settlements, and occupation of watersheds) all compound this vulnerability (SICA, 1999).

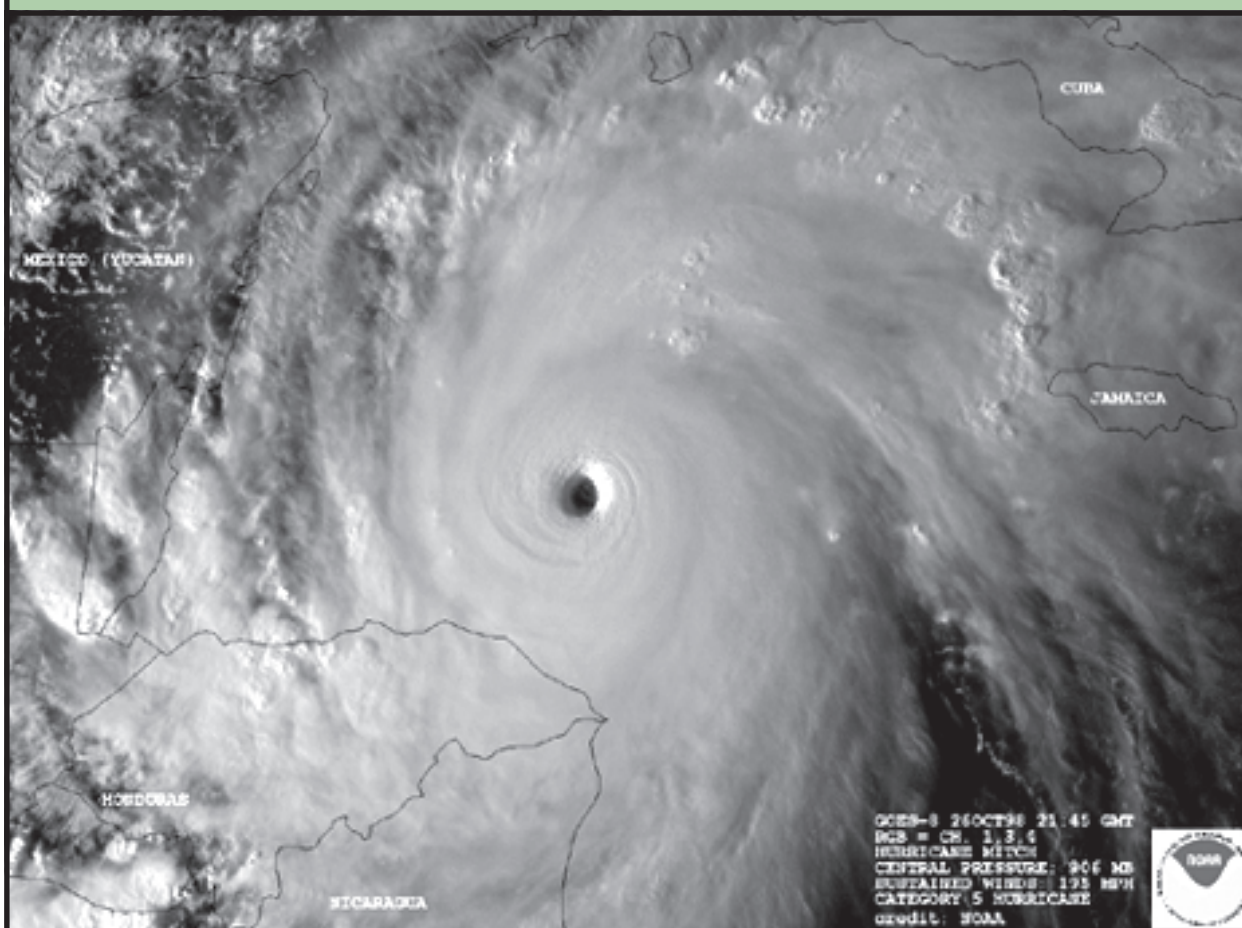
Given this blend of natural and social conditions in the region, the recurrence of Mitch-type events can be expected in Central America and the Caribbean. Unfortunately, global attention to such threats tends to wane quickly, with international assistance focusing principally on issues of short-term recuperation rather than on medium- and long-range prevention. A critical lesson from past disasters has not yet been put into practice: more effective contributions require a long-range preventive approach directed to structural issues rather than short-term remedial actions.

Within this perspective of longer-range prevention, policymakers need to pay greater attention to the role of population dynamics. It would seem obvious that demographic factors such as settlement

George Martine is director of the UNFPA Country Support Team for Mexico.

Jose Miguel Guzman is population affairs officer in the CELADE/Population Division of the Economic Commission for Latin America and the Caribbean (ECLAC) in Santiago, Chile.

Hurricane Mitch on 27 October 1998



Source: U.S. National Oceanic and Atmospheric Administration

patterns and migration are fundamental to the nature and gravity of natural-disaster impacts. Yet these factors are rarely taken into account. Even the UN International Decade for Natural Disaster Reduction¹ paid scant attention to population dynamics in its campaign. True, policymakers and specialists alike routinely assert that population growth and rapid urbanization increase the negative effects of natural occurrences. However, this truism does not lead to effective action. The relationship among natural disasters and development patterns, population growth, and spatial distribution has been rarely identified with clarity. At most, policymakers express a vague wish for reduced population growth or an end to rural-urban migration. This approach is largely ineffective, since the underlying rationales for people's demographic behavior tend to be overlooked.

This article (a) analyzes the relationships between demographic dynamics and Hurricane Mitch in Central America, and (b) extracts from that experience

lessons that can help reduce vulnerability to natural disasters in the long run. Specifically, it centers on three aspects: How did demographic processes condition the area's vulnerability prior to Mitch? What are Mitch's consequences for population dynamics in the short and long term? How must population dynamics change in order to mitigate the effects of future natural disasters?

As seen from Table 2, every Central American country was affected by Mitch. Honduras and Nicaragua were the worst hit. Although the frame of reference for this article is the entire region, many of the illustrations below are taken from Honduras, the country most affected by this hurricane.

1. SOCIO-DEMOGRAPHIC CONDITIONERS OF VULNERABILITY

The capacity to survive and recover from the effects of a natural disaster is the result of two factors: the

Table 1: Important Natural Disasters in Central America and the Caribbean Since 1970

Year	Country	Type of Hazard	Deaths	Total Population Affected
1972	Nicaragua	Earthquake	10,000	400,000
1974	Honduras	Hurricane Fifi	7,000	15,000
1976	Guatemala	Earthquake	23,000	1,200,000
1978	Honduras, Belize	Hurricane Greta	5	...
1979	Dominica	Hurricane David	38	81,000
1979	Dominican Republic	Hurricane David/Frederic	1,400	1,200,000
1980	Haiti	Hurricane Allen	220	330,000
1982	Nicaragua	Hurricane Alleta	69	...
1986	El Salvador	Earthquake	1,100	500,000
1987	Dominican Republic	Hurricane Emily	3	50,000
1988	Jamaica	Hurricane Gilbert	45	500,000
1988	Nicaragua	Hurricane Joan	116	185,000
1989	Antigua, Guadalupe	Hurricane Hugo*	56	220,000
1991	Costa Rica	Earthquake	51	19,700
1992	Nicaragua	Tsunami	116	13,500
1993	Nicaragua	Tropical Storm Gert	13	62,200
1993	Honduras	Tropical Storm Gert	103	11,000
1995	Nicaragua	Heavy Rains	32	1,343
1996	Costa Rica	Hurricane Cesar	26	...
1996	Nicaragua	Hurricane Cesar	9	...
1996	Nicaragua	Eruption Madera Volcano ***	50	1,550
1998	Dominican Republic, Haiti	Hurricane George	294	296,637
1998	Honduras, Nicaragua	Hurricane Mitch **	19,800	1,300,000

* Also affected Monserrat, Virgin Islands, and Saint Kitts

** Also affected Guatemala, Costa Rica, Belize, and El Salvador

*** Ometepe Island (Landslides)

Sources: OPS/OMS (1994); CEPAL (1999); OPS/OMS (2002); NCDC (1999).

physical magnitude of the disaster in a given area, and the socioeconomic conditions of individuals or social groups living in that area. Vulnerability (the degree to which a society or group is threatened by the impact of natural hazards) is differentiated by social groups in almost all natural disasters. Altogether, it is estimated that 90 percent of victims and 75 percent of all economic damages from natural disasters are in developing countries (Thouret & D'Ercole, 1996, p. 409).

As aptly stated by UN Secretary General Kofi Annan (1999b), "...poverty and population pressure force growing numbers of poor people to live in harm's way—on flood plains, in earthquake-prone zones and on unstable hillsides." In Central America, the relationship between socio-economic conditions and

the impact of natural disasters can generally be expressed as follows: economic constraints force the poor to live in precarious homes, made of flimsy, non-durable materials, on the least-valued plots of land. The poor build their shacks on steep hillsides; on floodplains; in fragile ecosystems and watersheds; and on contaminated land, right-of-ways, and other inappropriate areas. Even government housing and urban-development policies tend to overlook environmental constraints and lack adequate information for land-use planning. Inappropriate location invites serious social and environmental problems, which are aggravated by deforestation as well as by inadequate management of rainwater and wastes. During disasters, inadequate services and infrastructure further complicate survival efforts. Health risks are similarly

Table 2. Population Affected by Hurricane Mitch

Country	Population in Shelters	Directly Affected (not in shelters)	Total Population Affected	Deaths Plus Missing	Total Population Estimated 31 December 1998
	<i>Absolute Numbers:</i>				
Honduras	617,831	...	5,371,368	13,715	6,231,434
Guatemala	54,725	106,000	750,000	389	10,945,053
Nicaragua	65,271	368,261	867,752	4,015	4,872,553
Costa Rica	5,411	9	3,886,222
El Salvador	55,864	28,452	346,910	259	6,092,190
	<i>As a Percent of the Total Population (31 December 1998):</i>				
Honduras	9.9	...	86.2	0.220	100.0
Guatemala	0.5	1.0	6.9	0.004	100.0
Nicaragua	1.3	7.6	17.8	0.082	100.0
Costa Rica	0.1	0.000	100.0
El Salvador	0.9	0.5	5.7	0.004	100.0
<i>Source:</i> Population affected: ECLAC (1999) (Various country reports) Estimated Population: Based on CELADE (1999)					

accentuated. By comparison, the homes of the upper and middle classes are built with hardier materials on more stable terrain, and their residents enjoy better services. These classes also have more resources with which to rebound from disasters.²

In short, poverty is a central component of vulnerability—a centrality dramatically demonstrated by Hurricane Mitch. A task force formed by INCAE (Instituto Centroamericano de Administración de Empresas) and by Harvard University's Institute for International Development concluded that "the conditions of poverty in Central America are the fundamental cause of their vulnerability in the face of natural disasters" (Hernández, 1999, p. 8). In Nicaragua, Hurricane Mitch most significantly affected those municipalities with the highest levels of poverty, especially in rural zones (UNDP, 1998). In Guatemala, Vice President Luis Flores Asturias affirmed that "the tragedy highlighted accumulated needs and deficiencies as well as shoddy handling" (Hernández, 1999, p. 8). And in Honduras, although the damage spread to all social strata, "there is no doubt that the greatest number of victims emerged from the most humble communities such as those of the Municipality of Choloma, La Lima and El Progreso, its towns and banana fields" (Hernández, 1999, p. 8).

In turn, demographic processes impact the makeup and persistence of poverty. Population growth and distribution result from the interaction between three variables: fertility, mortality, and migration. Levels and patterns of these three variables together define a region's vulnerability, including the size and spatial location of population in given social and economic contexts. Even though the path of natural phenomena such as tropical storms is difficult to anticipate, the

occupancy and utilization of a given territory greatly conditions the gravity of natural disasters. Similarly, varying reproduction patterns among different social groups determine the relative size of their families and, to a certain extent, their levels of poverty, housing characteristics, crowding, access to services, infrastructure, and other elements. These predetermine not only these groups' susceptibility but also their capacity to handle natural disaster. The following analysis of demographic processes and their relation to vulnerability in the case of Hurricane Mitch will illustrate this phenomenon.

The three Central American countries most affected by Mitch are, coincidentally, those characterized by the highest fertility levels in the region: Honduras, Guatemala, and Nicaragua. However, fertility levels among social groups differ significantly in each of these countries, with the poorest sectors showing much higher levels. These fertility patterns reflect the fact that the poorest have the least capacity to exercise their reproductive preferences. As shown in Table 3, surveys conducted among the female population show that women from the lowest socioeconomic level in Honduras have twice as many children as they would like.³ Their inability to exercise their reproductive rights is the starting point for a vicious circle centered on the intergenerational transmission of poverty. Poor women have limited information and resources to limit the number of births. They also tend to have less power in decision-making on many topics, including sexuality and reproduction. Forced to rear many children, these women have greater difficulty in obtaining paid employment, leading to a lower per capita income for their families. Their children have fewer educational opportunities,

Table 3. Honduras: Ideal Number of Children⁴ and Total Fertility Rate According to Socio-Economic Level

Socio-economic level	TFR*	Ideal number of children	Difference
Low	6.9	3.4	3.5
Middle	4.1	2.9	1.2
High	2.7	2.7	0.0

*TFR: Total Fertility Rate
Source: ENESF (1996)

and when these children begin their sexual life—often at an early age—they too will have little reproductive health information or resources, thus reinitiating the poverty-high birth rate cycle.

Mortality levels also clearly differ by socioeconomic strata. According to the 1996 ENESF Survey in Honduras, a child's probability of dying before the age of five is 64 per 1,000 in strata defined as "low," compared to 38 per 1,000 in children in the "high" strata. These statistics demonstrate that the factors behind differential mortality prior to Mitch—malnutrition, lack of access to services, poor water and sanitation, and so forth—also condition differential susceptibility to disaster.

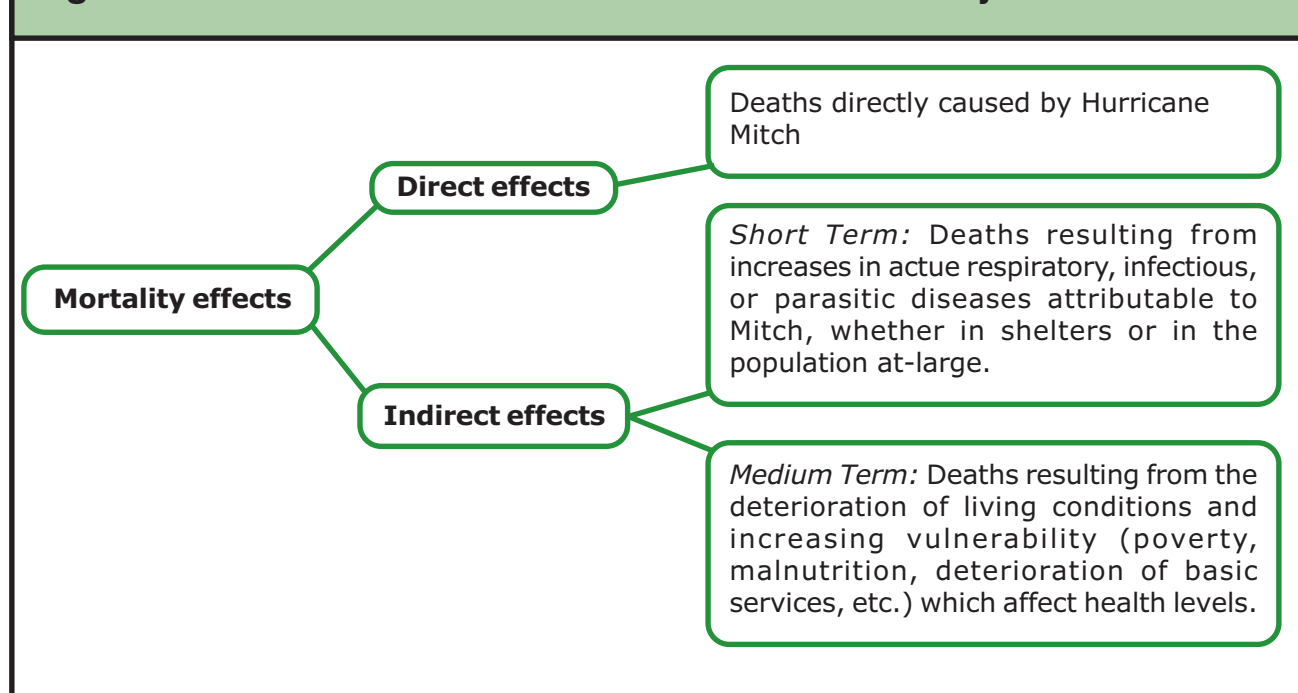
But perhaps the most visible and direct relation between demographic dynamics, poverty, and vulnerability relates to patterns of spatial redistribution of the population. Rural-urban migration and urban growth, which partly result from poverty, also aggravate and heighten the impact of natural disasters. Over the last decades, all Central American countries have experienced migration that has increasingly concentrated their populations in urban areas, particularly in the most important cities. In Honduras, during the five years leading to that country's 1988 census, a majority of its internal migrants went to the northern and north-central part of the country—the provinces of Cortés and Francisco Morazán. Although

these provinces did not endure the worst of Hurricane Mitch, they did—according to an ECLAC report (1999a), have the greatest number of people directly or indirectly affected by Mitch.

Migration currents in Central America have also varied by gender. Women primarily migrate to urban centers, while men move proportionately more to agricultural areas. The sweatshop manufacturing industry concentrated in San Pedro Sula and Puerto Cortés has particularly attracted female labor. These migration patterns are consonant with those repeatedly observed throughout Latin America during the last 50 years.

Rural-urban migration results from factors of both expulsion and attraction. In rural areas, agricultural demand for workers does not keep up with demographic growth. Despite some migration to frontier areas, rural areas have a surplus of workers. Concomitantly, cities attract migrants with a greater relative availability of jobs (whether real or perceived), higher incomes, and easier access to services. The concentration of population in the cities has resulted in a scarcity of housing alternatives for migrants. As capricious market factors determine spatial utilization and access to land, cities cannot accommodate the throng of recently arrived poor migrants. Considering the probability that rural-urban (as well urban-to-urban) migration will continue to increase, urban marginality can be expected to grow significantly.

Figure 1. Theoretical Effects of Disasters on Mortality



Vulnerability will also expand unless specific measures are taken to counter current trends.

According to an ECLAC report on Mitch's effects, Honduras' capital, Tegucigalpa, faces the same situation as other Latin American cities, where there is

inappropriate territorial occupation and utilization with a lack of regulations for urban organization and construction. These factors, coupled with urban growth and a high incidence of poverty, result in conditions which could imply that a significant part of the population of this city may be exposed to serious risks as experienced with Hurricane Mitch (ECLAC, 1999a).

2. SOCIO-DEMOGRAPHIC EFFECTS OF HURRICANE MITCH

A series of questions related to the specific effects of Mitch on the socio-demographic dynamics of the region are worth raising. How has Mitch impacted demographic trends and levels of mortality, fertility, and migration? How are the dynamics of the demographic transition affected in the short and long term? How has reproductive health been affected? To what extent do demographic factors determine a poor population's level of vulnerability to disasters?

Quantifying the demographic effects of disasters is a complex task. The effects may be direct or indirect, immediate or longer-term. Long-term effects may be difficult to perceive and may themselves result from interaction between demographic variables and a number of other factors also affected by disasters, such as changes in the structure of production, in infrastructure, in communications, or in access to basic services. The effects of these changes may go in different directions, depending on the nature and effectiveness of actions taken following the disaster.

In addition, concrete data (beyond the number dead or missing due to Mitch) are difficult to obtain. The lack of baseline information hinders the establishment of detailed and reliable estimates of direct or indirect and short- or long-term effects. In spite of such difficulties, a simple model of possible relations and effects of Hurricane Mitch on demographic variables—and on population dynamics in general—provides interesting leads. The exercise in this case focuses on Honduras. (see page 62 for a map of Honduras'd departments.)

Effects on demographic variables

Mortality

Figure 1 shows the theoretical effects of Hurricane Mitch on total mortality rates in Honduras. The only concrete data available refer to *direct effects*. If we add the number declared missing to that of the confirmed dead, Mitch caused an estimated total of 13,567 deaths.

These figures imply a 42 percent increase in the number of deaths for the year, using as a baseline the total number of deaths expected in the country under normal circumstances in 1998 (32,000). A similar impact on total deaths (42 percent) may be applied to the crude death rate (i.e. the number of deaths per 1,000 population in a year). The mortality rate, however, was greater in some of the larger provinces such as Gracias a Dios and the Islas de la Bahia, where deaths caused by Mitch exceeded the average annual death total by close to 400 percent.

Only fragmentary data are available in relation to *short-term indirect effects on Honduran mortality*—that is, deaths resulting from hurricane-related deterioration of health conditions. Health authorities confirm an increase in infectious and respiratory diseases, which suggests a likely increase in the number of deaths (particularly if, as can be expected, the lethality levels of these diseases increased). These factors could have a particularly severe impact on children and the elderly. Although vital statistics do not reveal the magnitude of these short-term effects, figures provided by the Honduran Ministry of Health show a 20 percent increase in the incidence of diarrhea in the under-15 population as well as epidemic outbreaks of leptospirosis and conjunctivitis, skin diseases, and acute respiratory infections (Ayes Cerna, 1999). No reliable quantitative data exists, however, regarding the extent of the latter epidemics. Residual after-effects of a more permanent nature can also be expected because of lack of access to drinking water and sanitation as well as the deterioration of conditions in health centers.

Indirect medium-term effects of Mitch on Honduras have been even more difficult to identify. Nevertheless, the magnitude and direction of these effects likely depend on whether or not the damage has motivated (a) the reactivation of economic activity, and (b) the reduction of social and economic vulnerability in important segments of the population. Levels of international assistance and the post-Mitch expansion of sectors such as the construction industry (as well as the intensification of anti-poverty actions) impact on

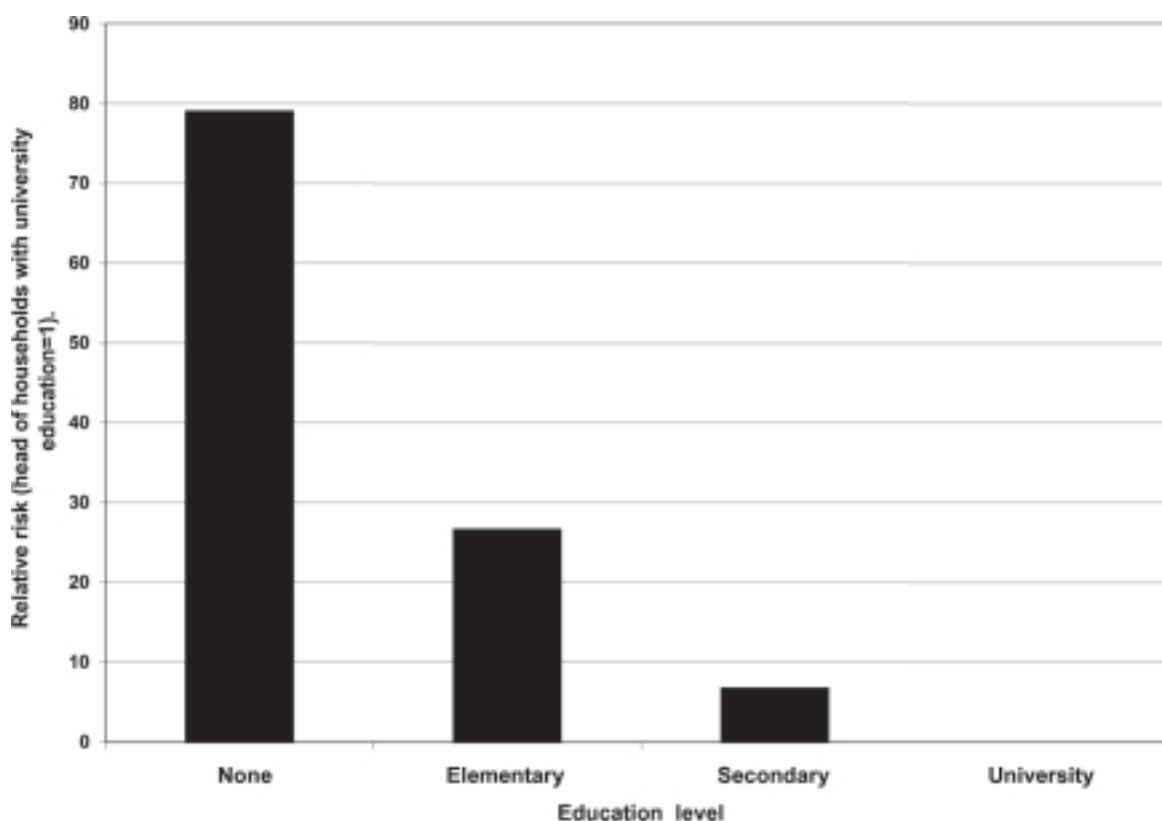
medium-term effects. These effects also depend on the extent to which the Honduran government transforms difficulties into opportunities through its political and economic policies. In the second meeting of the Consultative Group for the Reconstruction and Transformation of Central America (Stockholm Statement, 1999), the international community of donors committed \$9 billion to the reconstruction process (Stockholm Declaration, 1999). Reconstruction plans have focused primarily on: (1) the reactivation of the economy, (2) the alleviation of poverty, (3) the rational utilization of natural resources and protection of the environment, and (4) the promotion of local initiatives that can help mitigate vulnerability to natural disasters.⁵

Hurricane Mitch likely caused a temporary reversal in Honduras' epidemiological transition. In the period immediately following Mitch, several factors—including interruption in the water supply,

deterioration of basic services such as garbage removal, breakdowns in already precarious sewage facilities, and limited effectiveness of the health system—opened the door for the resurgence of communicable diseases (such as cholera, dengue, and malaria) that had previously been held in check. However, the promotion of the reconstruction process in general and in the health sector in particular as well as the recovery of economic activities suggest that Mitch will affect the epidemiological transition less severely in the medium and long term. Moreover, Honduran health programs for emergencies are generally more effective than in the past and include efforts to prevent epidemics.

No reliable or detailed information is available relating the mortality caused by Mitch to different socioeconomic strata of the Honduran population. Nevertheless, two pieces of evidence indicate that the poor experienced the greatest mortality levels. First,

Figure 2. Relative Risk of Being Affected by Hurricane Mitch, San Pedro Sula, Honduras, 1999 (Heads of Households)



Source: Calculations based on data from DIEM (1999).

observations carried out on the effects of the hurricane show that, in both San Pedro Sula and Tegucigalpa, the areas with the greatest number of missing and dead are also environmentally unsafe areas (susceptible to landslides, floods, and other disasters) that house the cities' poorest inhabitants (ECLAC, 1999a).

Second, the composition of the population in shelters can be taken as a valid indicator of vulnerability. Data from shelter censuses in San Pedro Sula and other surveys carried out by city authorities are broken down by education level. As Figure 2 displays, the population with no education at all had a relative risk of being affected by Mitch some 80 times greater than in the population from the highest educational levels. A huge difference in relative risk was also found between households headed by persons with no education at all and those with at least elementary education. The former category concentrates the most vulnerable segment because of abject poverty, the lack of access to information, and the difficulty of processing available information.

Impacts on Reproductive Health

Natural disasters heighten pre-existing situations of precariousness and vulnerability. In the case of reproductive health, they can accentuate reproductive-health needs by intensifying the practical inability of many couples and individuals to exercise their reproductive rights. Disasters have an immediate effect on health conditions, on access to health services in general, and on reproductive health in particular because of several dynamics:

- Deterioration of health services, infrastructure, equipment, medical drugs, and medical materials as a consequence of the disaster;
- Difficulty in access to services as a direct consequence of the disaster and its impact on communications and transportation;
- A shift in medical priorities away from reproductive health services; and
- An increase in sexual abuse, in sexually transmitted diseases (STDs), and in unwanted pregnancies because of conditions and lack of privacy in shelters.

The factors that aggravate such negative effects include: (1) the extent of the disaster itself in each country or region; (2) the level of impact on health service infrastructure; (3) the countries' financial limitations; (4) the population's level of dependency on public services; and (5) the types of contraceptive

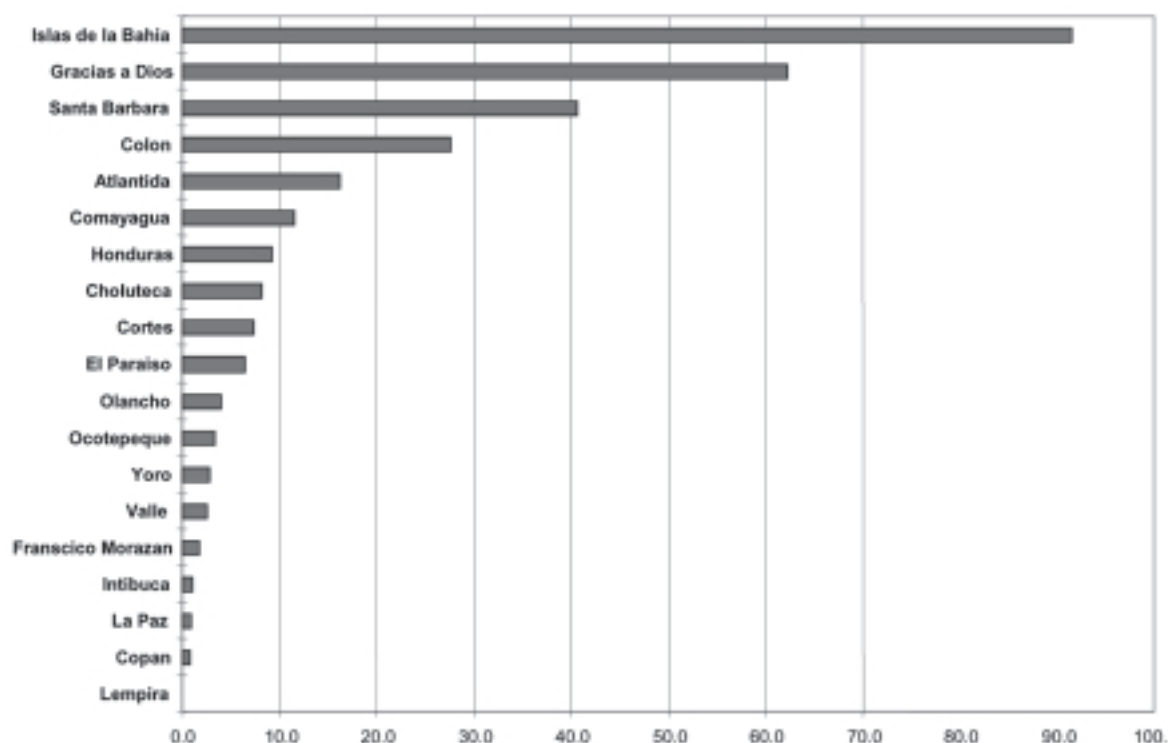
methods available. Changes in the assignment of priorities in national ministries of health (such as prioritizing certain infectious and respiratory diseases at the expense of other areas) also play a role. Investments in infrastructure are often emphasized over direct preventive actions, given the imperative need to reconstruct health centers after the disaster.

A significant portion of the population may face severe difficulties in accessing contraceptive methods and information in the post-disaster period. Given that the poorest segments of the population rely most on the public services hardest hit by the emergency, reproductive health services can suffer severe deterioration exactly in those districts where they are most needed. In the specific case of family planning, limited access to contraceptive methods (leading to their non-use or to the temporary use of ineffective methods) may produce an increase in unwanted pregnancies or in abortions. In addition, delays are inevitable in the implementation of new programs, both in education and in services. If all these possibilities occur, fertility or the number of abortions in the region would increase. Unprotected sexual relations could also lead to an increase in STDs. This relates in part to the increase in rape cases, a problem that tends to increase under the promiscuous conditions and lack of controls prevailing in times of disaster.⁶

Mitch's actual effects on *fertility* have to be viewed in different time frames. In the *short term*, crisis and disaster analyses show that the immediate impact is usually a decrease in the rate of pregnancies and fertility—despite the above-mentioned breakdown in access to contraception and information. In the wake of a natural disaster, marriages are often postponed or cancelled and temporary or permanent separations increase; there is also temporary delay in pregnancies because of less-frequent sexual relations. There could also be an increase in amenorrhea (cessation of menstruation in women of child-bearing years) caused by stress or prolonged malnutrition (see Curson, 1989), although there is no concrete evidence to demonstrate this in the present case.

The magnitude of these changes not only relates to the size of the affected population but also to the duration of the crisis. Mitch likely had a relatively minor short-term impact on fertility *during* the height of the crisis, given the relatively brief duration of its effects on housing arrangements and family separations as well as the fairly rapid recovery of economic activities for the majority of the affected population.⁷ Effects

Figure 3. Percentage of Expected Population Growth in Honduras for 1998 which Failed to Occur Due to Excess Mortality Caused by Hurricane Mitch



Source: Calculations based on the estimated numbers of deaths per municipality (ECLAC, 1999) and population projections by Honduras/UNFPA (1996).

would only be noticed, if at all, in a reduction in births during the months of July and August 1999. As of this writing, there are no monthly data available that can be used to verify this.

There are also *medium-term effects*. Just as fertility tends to decrease in times of crisis, it also tends to increase with recovery. Experiences of war, famine, and other disasters clearly demonstrate this trend. This increase is explained by the recovery of postponed pregnancies, by the tendency of couples to replace lost children, and by the increase in marriages previously delayed or occurring as a result of the optimism which is often displayed some time after the crisis. However, in evaluating these effects, two factors must be considered. First, other natural disasters and socioeconomic crises affect the daily lives of most of the region's inhabitants. Therefore, medium-term effects of Mitch could be conflated with those coming from other events. Second, the prolongation of the

social crisis because of delayed reconstruction efforts and the economic difficulties of the country could continue to depress the birth rate. But the deterioration of reproductive-health services and limited access to services could lead to an increase of non-desired births. Recent data from the a 2001 survey show that fertility for the period 1999-2001 was a little higher than projected (Secretaría de Salud, ASHONPLAFA & CDC, 2002).

In short, tracing the real effects of natural disasters such as Mitch on reproductive health and on fertility involves reviewing a complex array of factors in different time sequences that would need to be analyzed in depth through a detailed field survey. It is clear that pre-existing situations of precariousness and vulnerability are heightened as a result of disasters. Sexual and reproductive behavior undergo abrupt alterations. Access to reproductive health services deteriorates noticeably. Untying the many threads of

causality in this process, especially at the aggregate level, is a daunting task.

Impacts on Migration

Following a crisis or disaster, the number of people migrating in search of new opportunities tends to increase. This migration may result from displacement due to the loss of belongings (housing, lands, etc.) and the need to find new employment and income.

Changes in the structure of production caused by the effects of Mitch (in agriculture, for example) also resulted in increased migration. In Honduras, although highland subsistence crops fared better, the hurricane devastated banana, coffee, sugar, citric fruits, and other crops. Roads and warehouses were flooded. In Nicaragua, cereal crops, produced mostly by small farmers, were seriously affected, as were main export crops and cattle ranching. In Guatemala and El Salvador, damage was less serious although nevertheless important. Altogether, a significant portion of the population lost its source of subsistence. These agricultural losses likely resulted in increased rural-urban migration (ECLAC, 1999b; 1999c; 1999d; 1999e).

Unfortunately, there is no empirical information available to validate these plausible hypotheses, and, unless special surveys are carried out, we will have to await the next census in order to determine the extent to which Mitch has altered spatial distribution in the region. The same is true with respect to international migration. Although an increase in movement abroad has been widely publicized in newspaper accounts, empirical evidence is still limited.⁸ Two measures taken by the United States in response to Mitch—the designation of “temporarily protected migrants” due to environmental disasters; and the suspension of deportations from the United States of illegal citizens from Guatemala until March 8, 1999—were beneficial for Central American migrants (Embajada, 1999).

Impacts on Population Growth

Mitch had a significant effect on population growth in Honduras in 1998. As Figure 3 demonstrates, close to 10 percent of expected growth did not materialize in 1998 due to the effects of Mitch. Some Honduran provinces were considerably more affected. Without factoring in migration, the departments of Islas de la Bahía, Gracias a Dios, and Santa Bárbara saw population growth reduced by 92 percent, 62 percent, and 40 percent, respectively. At the aggregate level, the long-term impact of Mitch on population growth was probably negligible because of the normally high

growth rate of the population and the short-term effects of Mitch on mortality.

3. POLICY IMPLICATIONS FOR THE POST-MITCH ERA

Reconstruction efforts in the post-Mitch era aimed at mitigating the impacts of natural disasters and at promoting sustainable development in Central America should take demographic processes into closer consideration than they have in the past. Three aspects require particular attention for long-range preventive actions: spatial redistribution, reproductive health, and the development of information systems. Potential contributions can be divided into three stages: prevention, emergency, and recovery. This analysis focuses largely on the prevention phase.

Prevention

Mitch clearly demonstrated the limitations of interventions carried out only in a *posteriori* mode. Even though timely actions during and after the crisis were important, the most critical investments evidently concern the prevention phase. In this regard, policymakers should take proactive actions to plan the spatial distribution of population in order to reduce the effects of future disasters. Actions in the reproductive health sector are also critical. Early-warning systems and other data collection systems can make a significant contribution to reducing a disaster's impacts.

Spatial Distribution and Vulnerability

In efforts oriented toward providing a safer future for the population of Central America, improved planning for the utilization of geographic space can contribute to greater sustainability and personal security. The spatial location and organization of human activity is a critical determinant of risk in natural disasters. In order to attain a better balance between space, sustainability, and the reduction of vulnerability, planners and policymakers must review traditional frameworks and integrate a systematic concern with population-redistribution dynamics into reconstruction and development efforts.

Stimulating new patterns of spatial organization in order to reduce vulnerability and to promote longer-term sustainability requires a proactive and holistic approach, encompassing demographic, economic, and environmental aspects. Addressing this challenge requires a new conceptual tool, which we call *the*

*sustainable use of space.*⁹ This approach starts with the observation that every country has a population of size X, growing at the rate of Y, which has to distribute itself over territory Z. The key question in this context is—how can this population (a) be best distributed over this land area in order to promote sustainability and mitigate vulnerability, while (b) also exploiting the country's comparative advantages? The challenge is to identify available concrete options for spatial distribution, evaluate each option's advantages and disadvantages, and devise possible instruments for the promotion of the most sustainable options.

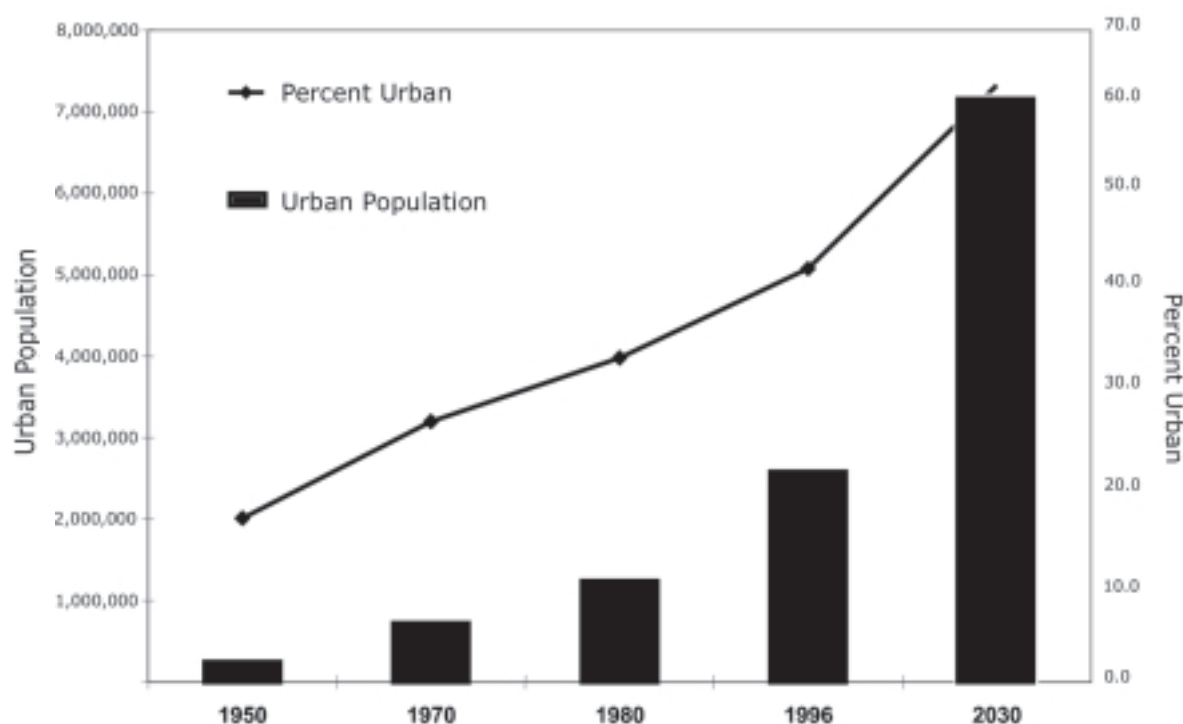
As noted earlier, current patterns of population distribution, determined largely by market factors, result in poor Central Americans being forced to occupy environmentally hazardous areas. The poor have no choice but to occupy disaster-prone areas such as riverbanks, steep or unstable hillsides, deforested lands and toxic grounds, or environmentally critical land such as fragile ecosystems or water catchment areas (Hardoy & Satterthwaite, 1989). Such location patterns contribute enormously to the vulnerability of poor people while also endangering the overall population. And this vulnerability “is compounded by

inappropriate ways of using and managing natural resources which damage the physical and biological environment, exposing certain areas and their inhabitants to the direct and indirect effects of these events” (Bárcena, 2000).

How can this trend be reverted? Do we have a coherent game plan—based on considerations of vulnerability—that would allow us to change this situation? In which directions would we ideally want to promote growth? What do we know about the “ideal map” that could help us take a proactive stance to reduce the vulnerability of poor people in Central American countries?

Dealing with this issue effectively presents both political and technical difficulties. From a political standpoint, intervening in land use requires building a culture of prevention. Such an intervention would also involve short-term costs, long-term investments, and low political returns that politicians anywhere are loathe to assume. As UN Secretary General Kofi Annan has observed, “[b]uilding a culture of prevention is not easy. While the costs of prevention have to be paid in the present, its benefits lie in a distant future. Moreover, the benefits are not tangible: they are the disasters that did

Figure 4. Urbanization in Honduras, 1950-2030



Source: ECLAC (1997); UN Population Division (1997)

not happen” (Annan, 1999a). In addition, land planning involves interfering in one of the most volatile and lucrative of speculative markets, thereby inviting confrontation with politically significant economic interests. Hence, it will never be easy to convince decision-makers to invest in the type of long-term land planning required to mitigate the effects of natural disasters. Crisis periods have to be exploited in order to help build up momentum and public opinion for essential decisions. Progressive segments of society have to be informed of the benefits of such decisions as well as the costs of not taking a proactive stance.

Policymakers then must base their prevention plans on a sound technical platform. A two-step approach is recommended. First, populations at risk must be identified. These risks include: sporadic catastrophes such as hurricanes and earthquakes; recurrent events such as droughts and floods; and other problems such

as landslides, which may result from natural disasters, human interventions, or both. Next, settlement and development of these high-risk lands must be regulated, limited, or even prevented. GIS systems and historical registers can be used to identify areas subject to flooding, seismic movements, droughts, landslides, and even the recurrence of hurricanes. GIS can also enable researchers to analyze the occupational density of areas at risk, evaluate the degree of risk involved, and thus measure the relative urgency of population relocation. Obviously, availability of this information does not guarantee people’s willingness to move from high-risk areas. The fact that people continue to settle along the San Andreas Fault or in Mexico City indicates that other factors such as economics and tradition will always influence residential decisions.

Secondly, in order for population relocation efforts to work, viable alternatives for demographic/economic

Aftermath of Mitch: El Salvador



A sign prohibiting construction in an area damaged by Hurricane Mitch in Jose Cecilio del Valle, El Salvador. “Current patterns of population distribution, determined largely by market forces, result in poor Central Americans being forced to occupy environmentally hazardous areas.”

Credit: Jim Stipe, Lutheran World Relief. (Photograph courtesy of Johns Hopkins University Center for Communication Programs.)

expansion have to be offered. Those areas should be identified that *can* absorb the people (whether new migrants or long-time residents) who would otherwise seek to reside in vulnerable areas or in protected ecosystems. This analysis inevitably involves economic and political as well as socio-environmental considerations: if population distribution ultimately depends upon the spatial location of economic activity, the reduction of vulnerability and the protection of the environment requires an integrated approach to development. The growing field of strategic-impact assessment can contribute considerably to this effort. In the current economic context, an integrated approach will require public/private/civil-society cooperation in order to exploit a country's economic advantages without increasing vulnerability and degradation. The state's role is to orient economic advantages using fiscal mechanisms and other incentives or disincentives such as zoning, building codes, permits, taxes on vacant areas, and fees in order to protect fragile areas, control densities, and define appropriate land uses.

In short, mitigating vulnerability and promoting sustainability require a proactive approach to the use of space that combines economic benefits with social and environmental concerns. Despite challenges, progress can be made primarily in two areas: (a) urban growth, and (b) regional development. Each of these dimensions will now be examined briefly.

a) Urbanization and Urban Growth

Despite the intensity of past migration flows, urban growth is still at an intermediate stage in most of Central America. Urbanization levels remain relatively low by Latin American standards, although they have increased significantly in recent decades. The proportion of the total Central American population living in urban areas currently varies between 40 and 55 percent (CELADE, 1999). More importantly, this proportion is expected to expand several times during the coming generations. In Honduras, for instance, the urban population grew from 28 percent in 1970 to 44 percent in 1996. By the year 2030, it is estimated that the country's urban population will have increased to 7.3 million, representing 64 percent of the total population. (See Figure 4.) That is, the number of persons living in urban areas in Honduras will likely increase by 4.7 million during the interim.

Other countries in the region have experienced the same pace of urban growth—a pace that is projected to continue. In Guatemala, for instance, the urban population is expected to triple from 4.3 million in

1996 to 13.4 by the year 2030. (See Table 4.) Central American urban populations are projected to increase by an estimated 23 million people over the next 30 years. The geographic and physical placement of these additional people (as well as the quality of housing and construction) will help determine the region's future vulnerability. Should current trends persist—trends marked by the absence of effective land-use planning in urban areas, the neglect of the needs of the poor, and the domination of haphazard market forces—it *can almost be guaranteed that the population of Central America will become increasingly vulnerable to natural threats.*

What can be done to prevent this increasing vulnerability? On the one hand, efforts can and should be made to improve living conditions in rural areas. Reducing rural poverty and providing rural dwellers with health services (especially in the area of reproductive health) would lessen the incidence of undesired fertility and thus the rural population's rate of growth. Improvements in living conditions for rural populations would help reduce migration to urban areas, thereby reducing the intensity of urban growth. Nevertheless, history teaches us that no agricultural or demographic policy is likely to retain population in rural areas indefinitely, or even to significantly affect ongoing urbanization trends.

Hence, an analysis of demographic processes and their relation to natural disasters reveals the need to initiate *explicit and effective land-use planning* in urban areas in order to cope with the inevitable: the intensification of city growth and the tripling of current urban population size.

Facing such challenges requires a change in mentality, attitude, and approach. Most disaster-response practices and experiences deal with rural people and rural disasters. Now, disaster response must address urban needs, with particular attention to the dimensions of urban growth and urban concentration. Authorities have traditionally resisted urban growth instead of trying to organize it. Consequently, migrants pressured by the lack of resources and by a speculative land market have been forced to occupy the least desirable and least adequate sites.

The negative stance of political authorities towards urban growth—specifically, their perennial attempts to deny the inevitable nature of urban growth and urbanization—has prevented effective solutions and contributed to compounding vulnerability. In facing up to this challenge, efforts should focus principally on the identification and occupation of new and appropriate localities for migrant occupation. Trying to redress errors

Table 4. Urban Population, Central America, 1996 and 2030

Country	1996	2030	Increment
Honduras	2,582	7,300	4,718
Nicaragua	2,656	6,259	3,603
Costa Rica	1,743	4,003	2,260
Guatemala	4,275	13,437	9,162
El Salvador	2,627	6,026	3,399
Belize	102	239	137
Total	13,985	37,264	23,279
<i>Source:</i> UN (1997).			

and improve conditions in existing residential areas will likely prove extremely costly in political and economic terms, and hence relocation may generally be the most viable option. Focusing on new potential areas for urban expansion is also justified by the fact that most urban growth is still to come. Moreover, prosperous and environmentally sound settlements are *per se* capable of attracting people from other areas, thereby helping to alleviate problems in existing inadequate settlements.

Urbanization arguably constitutes an important potential ally for sustainability (Martine, 1995; 1999). In order for cities to actually generate these potential advantages, however, authorities must intervene in the use of space. Policymakers must be proactive about location, concentration, and spatial utilization to counteract the market's haphazard utilization of urban spaces.

Intervening in urban land markets requires prioritizing the land needs of the poor (WRI, 1997). Past failures in this area have generated serious economic and environmental costs for cities and countries throughout the world. *A posteriori* attempts to resolve the problems caused by squatter settlements have much higher social, economic, and environmental costs. The current mechanisms that organize land markets—land speculation and serendipity—cannot be trusted to provide social and environmental solutions. Should they continue to prevail, *the next disasters will have progressively more serious consequences than Mitch did.*

New initiatives will require ingenuity. For instance, bilateral and multilateral donor agencies may consider

setting up land banks for poor urban migrants. These agencies could devise medium- and long-range land-use strategies and purchase tracts of land in non-hazardous or ecologically fragile areas that would be progressively sold off at reasonable prices to poor urban residents and migrants as demand arises. The profits could then be reinvested in further purchases of adequate land tracts. If proven successful, this idea could then generate its own political momentum and be replicated or taken on by responsible state or local agencies. Although this notion may appear revolutionary, it would ultimately be much cheaper than cleaning up increasingly serious disasters.

Within the theme of urban planning, policymakers give insufficient attention to the issue of density. Compact cities, which concentrate population, housing, and jobs in a relatively reduced space, offer space and energy efficiency. Such cities should, however, be located in areas that are less vulnerable to the effects of natural disasters: otherwise, concentration and density will actually result in greater calamities. Some verticalization of growth (as opposed to the unsustainable American-style suburb) can be a boon. Planning for urban space also requires greater emphasis on public transportation rather than on the private automobile. The Los Angeles pattern of dispersion is unsustainable but is spreading in such places as Panama and even Managua. (Given the geological frailty of its land area, Managua should probably not see any new construction.) The recently announced partnership between Habitat and the Quercus Corporation to develop specialized data

collection, analysis, management, dissemination, and use of knowledge on human settlements for use by “urban observatories” highlights how the private sector can be marshalled towards proper urban planning in disaster-prone areas (“Habitat joins hands,” 1999).

Do we have positive examples of cities that work in developing countries? The city of Curitiba in Brazil represents a positive anomaly in terms of urban spatial

but have assumed increasing weight over time. Land-use legislation, supported by prior acquisition of adjacent lands by the municipality, has encouraged high-density occupation around each axis. These planned axes have also facilitated the implementation of an innovative public transport system. Special arrangements have also been made in Curitiba for industrial zoning and for the housing of poor migrants; the latter has, however, had limited success (Martine, 1999).

b) Regional Development

Planning at the regional level should also be directed toward favoring more sustainable spatial patterns of economic activity and population distribution both within and between Central American countries. In this case, however, generic lessons and general recommendations are more difficult to derive, since solutions depend on the specificities of resource management and economic activity in each country and region. Moreover, in the context of free trade, spatial planning here has to work together with the private sector and with other segments of society in order to take advantage of each country’s comparative advantage. Ongoing globalization makes this process even more complicated, since it can rapidly alter the nature of comparative advantages and make long-term planning difficult.

The reconstruction process still underway in Central America obviously must produce a more robust economy than that which existed prior to Mitch. To succeed, the affected countries will have to undertake a series of measures whose scope transcends the boundaries of this article, including regional integration. The relatively diminutive scale of the countries involved suggests the adoption of a common development and reconstruction strategy. The aforementioned Stockholm meeting underlined the need to carry out reconstruction and transformation efforts with a regional focus.¹⁰

The International Program Forum of the International Decade for Natural Disasters Reduction (IDNDR, held in July 1999 in Geneva) reached similar conclusions, stressing “the importance of developing and strengthening regional approaches to disaster reduction” (IDNDR, 1999).¹¹ The mitigation of vulnerability also requires adjustments to the market model, both in the social and environmental domains. The market cannot assign value to many environmental goods and lacks the long-term vision required for



Central America and Honduras

Source: <http://www.freegk.com/worldatlas/honduras.php>

planning. Its growth has been regulated along the lines of a master plan drawn up in the 1960s. Different administrators have maintained the continuity of the plan, while public participation in its implementation has grown. The key ingredient of the original Curitiba Master Plan was the integration of traffic management and land use in order to limit concentration in the central city. The idea was to substitute the radial “spokes of a wheel” pattern of urban growth with a linear one capable of promoting the expansion of commerce, services, and residences away from the center on “structural axes.” Meanwhile, the historical center of the city was restored, preserved, and made available for pedestrians. Implementation of the plan also focused on physical, cultural, economic, and social transformation of the city. Explicit “environmental” issues were not at the forefront of the original plan,

investment in sustainability. Hence, it is the public sector's duty to orient market mechanisms towards the sustainable use of space through such measures as infrastructure building, zoning, and provision of incentives. Some entity has to take the long-range approach and try to visualize different scenarios of spatial organization with the object of maximizing economic and environmental advantages of new or ongoing investments.

The state should be capable of initiating and coordinating the implementation of a sustainable vision of the future, with the instigation, direction, and control of civil society. Despite the fact that globalization and structural adjustment have questioned the legitimacy of state interventions, the sustainable use of space requires the active presence of the state. Its role is not only to preserve environmental legacies but also to provide an integrated view of the relations between demographic trends, economic activities, and environmental dimensions.

The need for proactive action, particularly from the state, does not mean a return to the technocratic arrogance of the 1960s and 70s. A sustainable future and reduced vulnerability depends on the participation of a variety of social actors. Planning for urban or regional space provides rare opportunities for dialogue aimed at (a) adjusting ideal images and real images, and (b) ensuring that public interests prevail over private interests.

In this regard, community participation is key. All international conferences and meetings (realized within the framework of the IDNDR) consider community participation important in the prevention, preparedness, and recovery stages.¹² For example, the Yokohama Strategy and Plan of Action for a Safer World states that:

Community involvement and ... active participation should be encouraged in order to gain greater insight into the individual and collective perception of development and risk, and to have a clear understanding of the cultural and organizational characteristics of each society as well as of its behaviour and interactions with the physical and natural environment. This knowledge is of the utmost importance to determine those things which favor and hinder prevention and mitigation or encourage or limit the preservation of the environment for the development of future generations, and in order to find effective and

efficient means to reduce the impact of disasters ("Guidelines," 1994).

c) Reproductive Health, Gender Equity, and Vulnerability

Promoting improvements in reproductive health as part of a national strategy can also help reduce medium- and long-range vulnerability to natural disasters and social inequality.¹³ Reproductive health information, knowledge, and services must be provided, especially to the poor. Disasters provide opportunities for international agencies to focus actions and detect deficiencies in their reproductive-health policies and approaches.

Efforts aimed at the reduction of vulnerability of Central American societies during the post-Mitch period would benefit in a variety of ways from a greater investment in reproductive-health and gender-equity programs. The Cairo and Beijing Summits produced a consensus (expressed in agreements that all Central American countries signed) that reproductive health and family planning are basic human rights. Moreover, progress achieved in these areas has important implications for the formation of human capital and thus development.

The lack of family-planning and health services impacts women most severely, as women frequently bear full responsibility for all family-related decisions and concerns, including the economic maintenance of the household. During emergency situations and/or disasters such as Hurricane Mitch, such inequities become more acute.

For these reasons, countries urgently need to take more effective action in the areas of reproductive health and gender equity aimed at allowing both the urban and rural poor to exercise their reproductive preferences for lesser fertility. As noted earlier, reduced fertility will ease migratory pressure towards the urban centers.

Reproductive health also contributes to the improvement of human resources and thus to enhanced competitiveness. At the aggregate level, there are clear and empirically proven propositions that reproductive health is likely to contribute to:

- The health of women and children (or the reduction of maternal and child mortality) through improved family planning and child spacing; this improvement in maternal and child health, in turn, generates savings for society in terms of health services;
- Planning and regulation of procreation also allows

Honduras: Departments



Source: http://www.usmission.hn/english/about_u.s/mapawdepartments.htm

families to reduce their intra-family expenditures and make a greater investment in educational activities;

- Competitiveness of a country is enhanced through improved education for the young and for women;
- Reproductive health contributes to gender equity and to the empowerment of women, allowing them to become better educated and to participate more (and under better conditions) in the labor market; to decide freely on their reproductive lives; to have more opportunities and alternatives in their lives; and to contribute to economic progress according to their real capabilities.

All these elements are important in terms of improving national and local capabilities to prevent and mitigate the effects of natural disasters at the family as well as at the national level. However, even if the positive consequences of improved reproductive health are clear, their significance may vary in different types of societies. For example, in the Central American context, the frequency of unstable marriages results

in a more complex relationship between reproductive health and development. Women head over one-fifth of all households in Latin America, and the majority of female heads do not have a stable partner to support them. In Nicaragua, for example, 35 percent of households are headed by women. The number of common-law relationships is greater than formal marriages (35 percent versus 26 percent), a fact which generally translates into greater instability of unions. During times of crisis and disasters, unstable household compositions can create serious difficulties for families in terms of their ability to recover from disasters. Furthermore, in these situations, gender inequity becomes even more evident in unstable unions or female-headed households, placing even greater demands on women.

d) Early Warning Information

During the pre-emergency phase, effective early warning is the key issue for disaster preparedness ("Guiding Principles," 1997). The knowledge obtained through risk-assessment research makes it possible to

identify the degree to which different population groups, mainly those living in poverty, could be affected by natural hazards. Using this information, these groups can be informed in time and preventive measures can be taken.

Costa Rica, for instance, suffered \$222 million in damages as a result of Mitch. Half of its 81 municipalities were affected, yet only nine people were reported missing or dead. Years of preparation for natural disasters and the existence of early warning systems made the difference. Yet, it is agreed that “much more needs to be done” in order to reduce vulnerability in the country, especially with regards to “the location of human settlements” (OPS/OMS, 1999, pp.70–72).

The population field makes an important contribution to the reduction of vulnerability through the development and updating of integrated information systems that can identify vulnerable areas or population groups. These systems can also help orient migrant settlement patterns in order to lower risks, achieve a more sustainable population distribution, and generate useful information for evaluating the effects of disaster-related damage, especially on women and children. GIS tools that combine a cartographic base with demographic and socio-economic information are thus becoming essential. Unfortunately, despite the increased technological development in this field, the case of Mitch shows that the Central America region needs a much stronger effort in this respect. (The Appendix contains a short list of information needs for the region’s disaster-planning efforts.)

Mitch has also revealed the need to develop methods to collect, process, and present data related to disasters. Such methods could facilitate the analysis of a disaster’s impacts and help provide countries with adequate data resources, both during the emergency itself and in the post-emergency phase. Information concerning the effects on people, families, and homes also should be included. The topic of shelters is also currently characterized by a great lack of coordination and scientific rigor.

The Emergency Phase

Although Central American governments (with the support of international agencies) have developed programs to face natural disasters, these programs have generally operated only during the actual emergency.

Emergency programs are vital in helping to overcome the damages caused by natural hazards. In the case of a hurricane, such effects should disappear fairly quickly, given the brevity of the period in which it affects the population. However, factors related to a country’s underdevelopment (and to its policies aimed at overcoming disasters) can prolong these effects, particularly in the case of reproductive health.

Policymakers should define an *a priori* methodology and approach to dealing with reproductive health needs in emergency situations. Plans might include:

- a) Provision of emergency kits;
- b) Studies of conditions in shelters—particularly concerning women and development of rapid response in reaction to violence, sexual abuse, and need for services;
- c) Support of NGOs and other community-based initiatives working with women in crisis situations.

The Post-Emergency Phase

Post-emergency phase actions should concentrate not only on reconstruction efforts but also on prevention. Following the difficulties caused and/or aggravated by the passage of Hurricane Mitch in Central America, policymakers should address reproductive health needs in two specific ways. First, policymakers should promote efforts to re-establish pre-existing programs as soon as possible, as well as to implement new programs whose initiation has been delayed by the disaster. This component of post-emergency efforts is of the highest importance, given that reproductive health is generally not given priority status during the crisis. It would entail working closely with other national and international institutions for the recovery of the health sector so that the components of reproductive health can be integrated and take advantage of the opportunity to renew practices and redirect actions where possible. Second, the framework of reproductive health actions has to be redefined to incorporate into new programs all available knowledge on the relation between vulnerability, poverty, and reproductive health. In order to attain this goal, we must “strengthen the process of decentralization, so that more egalitarian services directed to the needs of the population may be identified, discussed, and provided” (UNFPA-Nicaragua, 1999).

4. FINAL CONSIDERATIONS

Hurricane Mitch highlighted the fact that socio-economic conditions in Central America magnify the threat of natural hazards for hundreds of thousands of people—especially those living in the most precarious social and economic conditions. Solutions for reducing vulnerability and the impact of natural hazards on the population are not simple, unilateral, or merely technological.¹⁴ Mitch's consequences constitute an invitation to examine the very meaning of development efforts that are being carried out in this region. The

ongoing reconstruction process should not limit itself to rebuilding countries with past methods. Policymakers have a unique opportunity to develop regional, national, and local comprehensive strategies aimed at disaster prevention and mitigation.

Specific contributions from the population field could help mitigate the effects of natural disasters. The tools of population sciences could help mitigate natural-disaster impacts in three important ways: spatial organization, reproductive health, and information systems. To be effective, these applications must be integrated into a broader conception of both the development process and the struggle against poverty.



APPENDIX 1

Studying the Impacts of Natural Disasters: Information Needs and Problems

In the course of this analysis, serious difficulties were encountered in trying to work with the available information concerning Hurricane Mitch's impact. Some of the problems include:

- *Difficulties in evaluating the quality of the basic information on deaths and on affected populations.*

The information available in relation to number of deaths caused directly by Mitch and to the spatial distribution of the population is so aggregated that it cannot be used for in-depth analysis. Detailed and reliable figures on fatalities as well as numbers affected by specific patterns of settlement and socioeconomic condition are unavailable. Additionally, official statistics present anomalies that are difficult to reconcile. It has been mentioned that "all data should be disaggregated by sex and analyzed by gender before, during, and after emergencies" (Delaney & Shrader, 2000). More research and analytical work should be carried out on the gendered dimensions of impact, loss, and recovery during disasters.

- *Lack of coordination in post-Mitch data collection activities.*

Various entities have carried out census and surveys on shelters, using different methodologies and on different dates. There does not seem to be consensus regarding their reliability.

- *Scarce cartographic data prior to and after Mitch.*

With the exception of San Pedro Sula, which has geographically referenced information, researchers lack cartographic information as well as data on the population itself. This shortcoming causes serious difficulties in defining the affected areas according to conditions of vulnerability. Even in San Pedro Sula, which has a strong municipal statistical office, extensive use has not been made of available data from the demographic point of view.

- *Lack of a post-Mitch research strategy that would permit us to quantify the effects on demographic variables.*

There are no surveys on, for example, post-Mitch migration patterns or on changes in reproductive behavior or the impact of mortality.

ACKNOWLEDGMENTS

The authors wish to thank Ralph Hakkert, Jacques du Guerny, Alain Marcoux, Jorge Campos, Jaime Nadal and Antonieta Surawski for helpful comments. The opinions expressed herein are the sole responsibility of the authors.

NOTES

¹ In recognition of the disastrous impact of natural hazards on vulnerable communities, the United Nations General Assembly in 1989 proclaimed the International Decade for Natural Disaster Reduction. The IDNDR's objectives were to reduce (through concerted international action and appropriate use of science and technology) the loss of life and property damage (as well as the social and economic disruption) caused by natural disasters.

² Initial impact of a natural disaster may, in some cases, similarly affect all classes in determined circumstances. Even here, however, the capacity to recover is different due to unequal resources available to various socioeconomic groups.

³ Comparable patterns also prevail in the other countries of the region (UNFPA, 1998, pp. 22–23; Nicaragua, 1998, p. 108).

⁴ Whatever its limitations, “ideal family size” is still the only indicator generated by reproductive health surveys in Honduras that provides a fairly reliable measure of fertility preferences and of their variations among social groups.

⁵ It appears that international efforts have done far less than originally intended in terms of bolstering reconstruction efforts, especially in regional terms. Bilateral and multilateral donors have focused on specific projects and specific countries, but the overall impact on the reduction of vulnerability and the promotion of regional economic integration has come far short of needs. An integrated evaluation of this entire process and its practical limitations would constitute an important contribution to the field.

⁶ As Delaney and Shrader (2000) have noted, “Incidents of familial and sexual violence seem to have decreased immediately after the emergency and have steadily increased during the reconstruction phase. Several shelters have reported problems with increased violence and many have hired security guards to combat it. Some temporary shelters in rural areas have also reported an increase in sexual violence as well as coerced prostitution and promiscuity, particularly among adolescent girls. Both men and women are victimized by increased rates of sexual and physical violence in the rehabilitation phase, as aggression and violence lead to both physical and psychological trauma for all family members.”

⁷ In the case of Honduras, the country most affected by Hurricane Mitch, the population housed in shelters reached some 600,000 during the days immediately following Mitch; three weeks later this figure decreased to 285,000, and by April 1999 it was estimated at 20,000.

⁸ Some authors consider that male migration has increased considerably due to Mitch. Delaney and Shrader (2000) note that “while no hard data exist about the extent of the change, most interviewees have noted a marked increase.”

⁹ For additional information on the sustainable use of space, see Martine (2001).

¹⁰ Among the reasons that would justify a regional approach, the following can be cited: (a) extreme natural phenomena do not respect national boundaries; (b) there are economies of scale in attending problems from a regional perspective; (c) regional initiatives favor coordination between countries on mitigation and prevention mechanisms; and (d) a regional approach helps draw attention to issues which are not clearly perceived when viewed at the national level (SICA, 1999).

¹¹ See also International Programme Forum (1999).

¹² In the case of reconstruction and recovery activities, it has been stressed that “the rationale for community involvement or the community-based approach is now well known: it is responsive to local needs, draws on local expertise, builds up local capacity, is multisectoral and equitable. By contrast, it is said, ‘top-down’ programmes tend not to reach those worst affected by disaster, can be manipulated by political interests, are often inefficient, usually take a unisectoral approach and do not respond to people’s real needs” (Twigg & Greig, 1999).

¹³ In the case of Nicaragua, UNDP and UNFPA have developed a project on “Transition of Emergencies towards Rehabilitation and Development of the Northern Zone Municipalities affected by Hurricane Mitch.” The UNFPA project component incorporates reproductive-health service kits and mobile units for the development of IEC and service promotion activities. During a second stage, UNFPA has given support to actions related to the human settlement component (UNFPA-Managua, 1999).

¹⁴ “Disaster prevention for the future...must involve issues and abilities of sustainable development, environmental management, science and technology, commerce and industry, and the encouragement of participatory forms of governance

that contributes to social well-being and security. It can reflect no single professional culture, alone, because the natural hazards and risks to societies in the coming age will challenge, and call upon, collective abilities” (*Final report*, 1999).

REFERENCES

- Annan, Kofi. (1999a, 10 September). “An increasing vulnerability to natural disasters.” *The International Herald Tribune*. [On-line]. Available: http://www.un.org/Overview/SG/nnan_press.htm
- Annan, Kofi. (1999b). “Introduction to Secretary General’s annual report on the work of the Organization of United Nations, 1999.” Document A/54/1. New York: United Nations.
- Ayes Cerca, M. (1999). “La salud en Honduras” (“Health in Honduras”). PAHO/WHO (April). Tegucigalpa, Honduras. Authors.
- Bárcena, Alicia. (2000). “From rapid urbanization to the consolidation of human settlements in Latin America and the Caribbean: A territorial perspective.” Paper presented at the Latin American and Caribbean Regional Preparatory Conference for the special session of the General Assembly for an overall review and appraisal of the implementation of the Habitat Agenda, Santiago, Chile, 25–27 October 2000. Mexico City: Economic Commission for Latin America and the Caribbean (ECLAC) & HABITAT.
- CCAD/SICA/PNUD/PNUMA/CEPAL. (1999). *El Huracán Mitch: Oportunidad de transformación en Centroamérica* (“Hurricane Mitch: an opportunity for transformation in Central America”). Mexico City: ECLAC.
- Curson, P. (1989). “Introduction.” In J. Clarke, P. Curson, S.L. Kayastha & P. Nag (Eds.), *Population and disaster* (pages 1–23). London: Institute of British Geographers.
- Direction of Research and Municipal Statistics (DIEM). (1999). *Census of shelters and population surveys*. San Pedro Sula, Honduras: DIEM.
- Delaney, Patricia L. & Shrader, E. (2000). “Gender and post-disaster reconstruction: The case of Hurricane Mitch in Honduras and Nicaragua.” Decision Review Draft. LCSPG/LAC Gender Team. Washington, DC: The World Bank.
- Economic Commission for Latin America and the Caribbean (ECLAC). (1996). *Dinámica de la población y desarrollo* (“Population dynamics and development”). Santiago: ECLAC.
- ECLAC. (1999a). *Honduras: Evaluación de los daños ocasionados por el Huracán Mitch, 1998. Sus implicaciones para el desarrollo económico y social y el medio ambiente* (“Honduras: Evaluation of the damage caused by Hurricane Mitch, 1998. Implications for economic and social development and for the environment”). LC/MEX/L.367. Mexico City: ECLAC.
- ECLAC. (1999b). *Nicaragua: Evaluación de los daños ocasionados por el Huracán Mitch, 1998. Sus implicaciones para el desarrollo económico y social y el medio ambiente* (“Nicaragua: Evaluation of the damage caused by Hurricane Mitch, 1998. Implications for economic and social development and for the environment”). LC/MEX/L.372. Mexico City: ECLAC.
- ECLAC. (1999c). *Guatemala: Evaluación de los daños ocasionados por el Huracán Mitch, 1998. Sus implicaciones para el desarrollo económico y social y el medio ambiente* (“Guatemala: Evaluation of the damage caused by Hurricane Mitch, 1998. Implications for economic and social development and for the environment”). LC/MEX/L.370. Mexico City: ECLAC.
- ECLAC. (1999d). *El Salvador: Evaluación de los daños ocasionados por el Huracán Mitch, 1998. Sus implicaciones para el desarrollo económico y social y el medio ambiente* (“El Salvador: Evaluation of the damage caused by Hurricane Mitch, 1998. Implications for economic and social development and for the environment”). LC/MEX/L.371. Mexico City: ECLAC.
- ECLAC. (1999e). *Costa Rica: Evaluación de los daños ocasionados por el Huracán Mitch, 1998. Sus implicaciones para el desarrollo económico y social y el medio ambiente* (“Costa Rica. Evaluation of the damage caused by Hurricane Mitch, 1998. Implications for economic and social development and for the environment”). LC/MEX/L.373. Mexico City: ECLAC.
- ECLAC & Comisión Centroamericana de Medio Ambiente y desarrollo (CCAD) (2002). *El impacto socio-económico y ambiental de la sequía de 2001 en Centroamérica. México*: (“The socio-economic and environmental impacts of the 2001 drought in Central America”). [On-line]. Available: <http://www.eclac.cl/publicaciones/Mexico/1/LCMEXL510Rev1/I510-1.pdf>
- ENESF (1996). *Encuesta nacional de epidemiología y salud familiar* (National Survey of Epidemiology and Family Health). Tegucigalpa: Honduran Ministry of Health.
- Embajada de los Estados Unidos de América en El Salvador: Comunicado de prensa (“Press release from US Embassy in El Salvador”). (1999, February 5). [On-line]. Available: <http://www.usinfo.org/usis0205b99.htm>

- Final report of the scientific and technical committee of the International Decade for Natural Disaster Reduction (IDNDR).* (1999). [On-line]. Available: <http://www.unisdr.org/docs/stcrep.htm>
- “Guidelines for natural disaster prevention, preparedness and mitigation.” (1994). World Conference on Natural Disaster Reduction, Yokohama, Japan, 23–27 May 1994. [On-line]. Available: <http://www.unisdr.org/docs/yokohama/toc.htm>
- “Guiding principles for effective early warning by the Early Warning Programme of the International Decade for Natural Disaster Reduction (IDNDR).” (1997, August). International IDNDR Conference on Early Warning Systems for the Reduction of Natural Disasters. Potsdam, Germany, 7–11. [On-line]. Available: <http://www.idnldr.org/docs/early/guiding.htm#national>
- “Habitat joins hands with Quercus Corp.” (1999, May 4). [On-line]. Available: <http://www.unchs.org/unchs/english/hdv5n2/news.htm>
- Hardoy, Jorge & Satterthwaite, David. (1989). *Squatter citizen: Life in the urban third world*. London: Earthscan Publications.
- Hernández, Gabriela. (1999, February). “El huracán de los pobres...y de las oportunidades” (“The hurricane of the poor...and the opportunities”). *Masica*, 6–18.
- Honduras, Secretaria de Planificación & UNFPA. (1996). “Honduras: Proyecciones de población” (“Honduras: Population projections”). Proyecto Política Social, Población, Género y Empleo (HON/94/P02). Tegucigalpa: UNFPA.
- International Decade for Natural Disaster Reduction (IDNDR). (1999). “The mandate on disaster reduction.” International Program Forum, Geneva, 5–9 July 1999. [On-line]. Available: <http://www.unisdr.org/forum/mandate.htm>
- Latin American and Caribbean Demographic Center (CELADE). (1999). *Latin America: Urban and rural population projections*. Demographic Bulletin No. 63. Santiago, Chile: CELADE.
- Lavell, Allan (Ed.). (1994). *Living in risk: Vulnerable communities and disaster prevention in Latin America*. Bogotá: Tercer Mundo Editores.
- Martine, George. (1995). “Población y medio ambiente: Lecciones de la experiencia de América Latina” (“Population and environment: Lessons from the Latin American experience”). *Notas de Población* 62, 261–310
- Martine, George. (1999). “The urban environment: Impending catastrophe or untapped opportunity?” UNFPA Country Support Team, Working Paper No. 29. Mexico City: UNFPA.
- Martine, George. (2001). “The sustainable use of space.” Paper given at the First Cyber Seminar of the Population Environment Research Network, 2001. [On-line]. Available: www.populationenvironmentresearch.org
- Ministerio de Salud. (1997). *Honduras: Encuesta nacional de epidemiología y salud familiar, 1996: Informe final* (“Honduras: National Survey of Epidemiology and Family Health, 1996: Final Report”). Tegucigalpa: Honduran Ministry of Health.
- National Climactic Data Center (NCDC). (1999). *Mitch: The deadliest Atlantic hurricane since 1870*. (Table 3: Damage synopsis by country). [On-line]. Available: <http://lwf.ncdc.noaa.gov/oa/reports/mitch/mitch.html#DAMAGE>
- Nicaragua, Instituto Nacional de Estadísticas y Censos (INEC). (1998). *Encuesta Nicaragüense de demografía y salud* (“Demographic and health survey of Nicaragua”). Instituto Nacional de Estadísticas y Censos – INEC. Managua, Nicaragua: INEC.
- Organización Panamericana de la Salud/ Organización Mundial de la Salud (OPS/OMS). (1999). *Masica: Revista Centroamericana del programa medio ambiente y salud en el istmo Centroamericano* (“Masica: Central America review of the environment and health program”). San José, Costa Rica: OPS/OMS.
- OPS/OMS. (2002). *Cronología de los desastres ocurridos en Nicaragua (1609-1995)* (“Chronology of natural disasters in Nicaragua”). [On-line]. Available: <http://www.ops.org.ni/opsnic/tematicas/desastres/cronologia-desastres.htm>
- Secretaría de Salud, ASHONPLAFA, & CDC. (2002). *Encuesta nacional de epidemiología y salud familiar (ENESF)* (“National survey of epidemiology and family health”). Tegucigalpa: ASHONPLAFA.
- Sistema de Integración Centroamericana (SICA). (1999). *Reconstrucción y transformación de Centroamérica después del Huracán Mitch: Una visión regional* (“Reconstruction and transformation of Central America after Hurricane Mitch: A regional vision”). San Salvador: SICA.
- “The Stockholm Declaration.” (1999). [On-line]. Available: http://www.ccic.ca/archives/devpol/1999/apg7_stockholm_declaration.htm
- The International Programme Forum. (1999). *The concluding phase of the United Nations International Decade for Natural Reduction*. [On-line]. Available: <http://www.unisdr.org/conference/accountability.htm>

Thouret, Jean-Claude & D'Ercole, Robert. (1996). "Vulnérabilité aux risques naturels en milieu urbain: Effets, facteurs et réponses sociales" ("Vulnerability to natural risks in urban milieu: Effects, factors and social responses"). *Cahiers Sciences Humaines* 32(2), 407-422.

Twigg, J. & Greig, B. (1999). "The age of accountability: Community involvement in disaster reduction." Paper given at UN-IDNDR and QUIPUNET Internet Conference, 14-25 June 1999. Author.

United Nations (UN). (1997). *World urbanization prospects*. ST/ESA/SER.A/166. Sales E.97, XII.3. New York: United Nations.

United Nations Development Program (UNDP)—Nicaragua. (1998). "Valoración de los efectos del Huracán Mitch y propuestas para enfrentar la etapa de reconstrucción" ("Evaluation of the effects of Hurricane Mitch and proposals for the reconstruction phase"). Authors.

United Nations Population Division. (1997). *Urban and rural Areas, 1996*. New York: United Nations.

United Nations Population Fund (UNFPA). (1998). *Pobreza y inequidad de género: Salud y derechos sexuales y reproductivos en América Latina y el Caribe* ("Poverty and gender inequity: Health and sexual and reproductive rights in Latin America and the Caribbean"). VII Conferencia Regional sobre la Integración de la Mujer en el Desarrollo Económico y Social de América Latina y el Caribe. Santiago, Chile: UNFPA.

UNFPA (Nicaragua Office). (1998). "Contributions to the interagency document to the Under-Secretary of the United Nations." Managua, Nicaragua: UNFPA.

UNFPA (Nicaragua Office). (1999). "Informe efectos del Huracán Mitch: Acciones del UNFPA-Nicaragua" ("Report on the effects of Hurricane Mitch: Actions by the UNFPA office in Nicaragua"). Managua, Nicaragua: UNFPA.

World Resources Institute (WRI). (1997). *World resources 1996-97: A guide to the global environment—The urban environment*. New York: Oxford.



ECSP TRADE AND ENVIRONMENT FORUM

Promoting world trade and protecting the global commons are frequently presented as mutual exclusive goals. But this dichotomy often results in a stalemate between the business and environmental communities—a stalemate that inhibits progress both for future trade liberalization and for multilateral environmental solutions.

Headed by Wilson Center Senior Policy Scholar William Krist, ECSP's Trade and Environment Forum (TEF) addresses this critical global policy problem. Recognizing the legitimate claims of both international trade law and environmental law, TEF identifies methods of harmonizing international trading rules with today's rapidly evolving environmental concerns.

Visit the TEF Web site at <http://wwics.si.edu/tef/index.htm> to read TEF publications, find out about TEF Wilson Center meetings, and keep abreast of recent trade and environment developments.