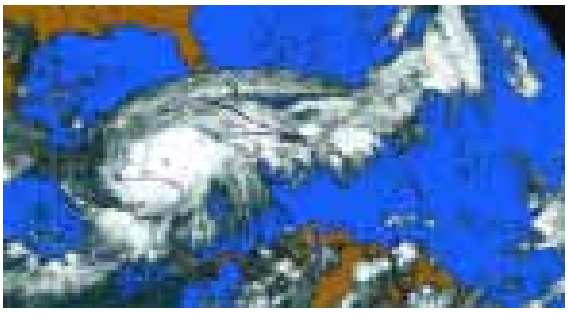
Disasters

Throughout the region, earthquakes, volcanic eruptions, fires, floods, hurricanes, tropical storms and landslides cause significant losses of human lives and livelihoods. It is estimated that throughout the world and over the last three decades almost three million people have died as a result of such events, and millions more have suffered (UN 1997). This is getting worse in two senses: first, the so-called 'natural' disasters are occurring more and more frequently, and second, their effects are becoming ever more severe. Some estimates suggest that the economic loss resulting from such disasters was eight times greater between 1986 and 1995 than it was in the 1960s, reaching a total of US$120 billion in the 1997–1998 biennium (Munich Re 1997, 1998). In general, the poor are the most severely affected, and have the least potential for recovery.

The most common types of disasters in Latin America and the Caribbean are caused by tectonic activity (earthquakes, tsunamis, volcanic eruptions) and climatic phenomena (hurricanes, floods, avalanches, fires), but a number of important anthropogenic factors aggravate the environmental and social impact of such disasters. These factors fall into two main categories – land use patterns (deforestation, urban developments in vulnerable areas, and increased impermeability of the land surface) and humanity's influence on the atmosphere and climate (degradation of the ozone layer, greenhouse gas emissions and global warming). Institutional weaknesses in monitoring, regulation, and response further amplify the impact of these factors.

Tectonic activity affects the whole western coast of Latin America, including all of Meso-America and the Caribbean, due to the pressure between the Pacific and North American plates, the Cocos and Caribbean plates, and the Nazca and South American plates (Cunningham and Saigo 1999). The environmental effect of such seismic and tectonic activity is a relatively high risk of earthquakes and volcanic eruptions, which in some areas adds to the already high risk of hurricanes and floods. In the Caribbean sub-region, where disasters are so frequent and widespread, they are one of the principal causes of environmental degradation.



In late 1998, Hurricane Mitch caused severe damage and loss of human lives in several Central American and Caribbean countries.

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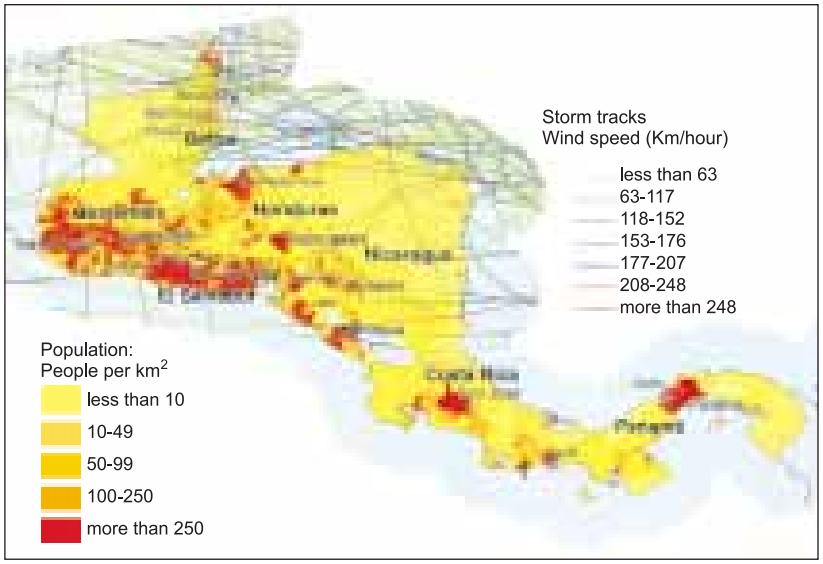
The typical environmental degradation pattern is not a continuous process: it is the gradual accumulation of small damages and transformations that increasingly compromise the ability of natural systems to respond. They do not produce an immediate deterioration of the system operation until an already vulnerable area is hit by a major disaster. Then, the host system cannot recover, and the previous system is quickly replaced by a new regime or ecosystem, less resilient, less diverse, and less able to provide basic environmental services such as water purification, sediment containment or protection against weather inclemency.

Most countries in the Greater Caribbean and Central America are located within the hurricane belt and are prone to be hit by frequent and very severe weather systems. The distribution of these weather hazards, as in the case of earthquakes, volcanic eruptions and avalanches, arises from common geological, geophysical, and climatological conditions. Given this, and the enormous economic, social and ecological costs that result from these events, much more attention has been given in this decade to disaster preparedness, evaluation and mitigation.

Hurricanes Georges and Mitch, the most recent in a long sequence of disasters, claimed thousands of lives and caused billion-dollar losses in infrastructure. In Honduras, the country most severely affected by hurricane Mitch, more than 7 000 people lost their lives and more than 12 000 were injured, while the number directly affected (displaced or forced to take refuge in shelters) reached 618 000. Economic and environmental damage has been calculated to be US$3.8 billion (CEPAL 1999e). In Nicaragua, there were over 3 000 deaths and 65 000 people directly affected, while the economic and environmental damage was estimated at US$988 million (CEPAL 1999f). Deaths and serious economic and environmental damage were also suffered by El Salvador, Guatemala, Dominican Republic and Costa Rica (CEPAL 1999g, 1999h, 1999i, 1999j). In Venezuela the intense rainfall in December 1999 resulted in an unprecedented national emergency, principally affecting the state of Vargas and the north-western part of the city of Caracas. Preliminary estimates are that some 120,000 persons were affected, 15 000 lost their lives or are missing, and 35 000 hectares of crops were lost (PNUMA 1999a).

Tropical storms (Central America)



Source: Colorado State University and NOAA Tropical Prediction Center: http://weather.unisys.com/hurricane

More than 100 tropical storms have hit Central America in the last century, and more than one third of them were hurricanes (sustained winds at more than 119 km/hour). Dangers associated with tropical storms include heavy seas, strong winds and floods. Belize is the country most affected by heavy seas, strong winds and floods, while Guatemala, Honduras and Nicaragua are affected by floods and landslides.

Among the most important problems arising from natural disasters are:

- the irrecoverable physical destruction of resources caused by fires, avalanches and floods;
- habitat destruction during emergency response efforts immediately after a large-scale disaster;
- resource poisoning by leaking pollutants after a disaster (oil spills, broken sewage pipes, chemical spills, etc.);
- the huge amounts of waste that result from clean-up and reconstruction operations after a disaster.

To a large degree, the damage caused by natural events is directly related to decisions made, activities undertaken and technologies utilized during the development process. Among the main concerns we can identify:

- shortcomings in disaster prevention, including zoning of vulnerable areas during the development planning process;
- weak mitigation mechanisms;
- deficient regulation, knowledge and use of appropriate construction methods, and inadequate

administrative arrangements and human resources to guarantee enforcement;

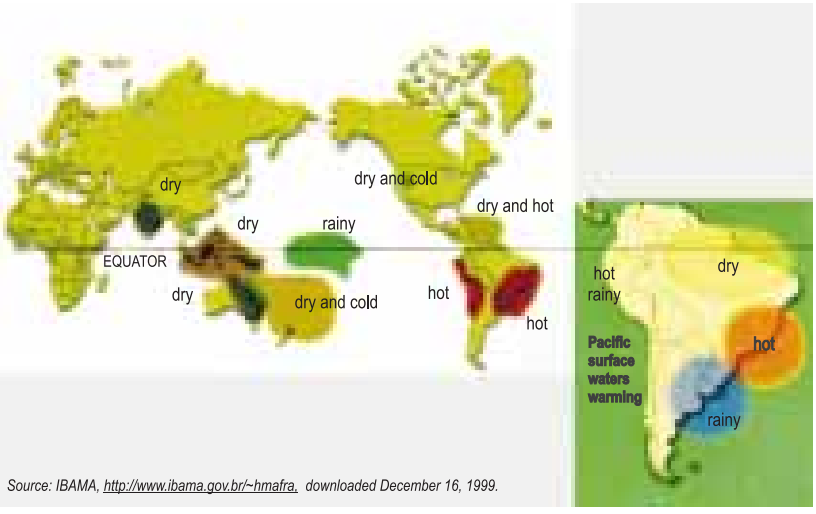
- absence of adequate insurance policies for low-income households;

- inadequate support systems for affected communities.

Climate change

Current global warming models indicate that the higher temperatures now being experienced worldwide can affect many atmospheric parameters, including precipitation and wind speed, with a consequent increase in both the frequency and severity of extreme climatic conditions such as storms, heavy rainfall, cyclones, floods and droughts (Munich Re 1997). Some of these natural phenomena – particularly floods – are exacerbated or triggered by man-made environmental degradation, and by disturbance of previously stable ecosystems. Rural and urban populations are becoming more and more vulnerable to natural disasters because of demographic growth and inadequate city planning. In many developing areas, demographic pressure and poverty force farmers to plant in marginal and vulnerable terrain, in flood-prone areas or on steep slopes. Deforestation can, in the short term, lead to a dramatic increase in run-off and soil erosion, as well as to mud slides and floods.

Global weather impacts associated with the *El Niño* phenomenon



Source: IBAMA, http://www.ibama.gov.br/~hmafra, downloaded December 16, 1999.

According to the Intergovernmental Panel on Climate Change (IPCC), the thermal expansion of sea water could result in a fivefold increase in the rate of sea level rise, leading to a sea level rise of one metre in the next 100 years. In addition, the possible melting of polar ice could add a further increase of five or six metres. Furthermore, temperature increases could foster the spread of infectious diseases carried by vector insects, pushing up the incidence of malaria, dengue, cholera and other diseases (Cunningham and Saigo 1999).

Climate change poses a threat to Latin America and the Caribbean because of the ecological and socio-economic vulnerability of most of the region – not least its vulnerability to a rise in sea level. Although climate change is a world-wide concern, there are issues to be dealt with from the regional perspective, including:

- the magnitude and rate of climate change in different parts of the region;

- its relative vulnerability and the possible impacts of climate change on its ecological and socio-economic systems;

- the identification and implementation of viable response options, and

- the effective role of countries of the region in promoting regional and international actions.

Most of the region's cities, towns and settlements – including the most important ports of Latin America and the Caribbean – have developed along the coast and are therefore particularly susceptible to any rise in sea level. The following are some of the possible environmental impacts of sea level rise:

- Coastal settlement flooding and contamination, with increased precipitation and storm frequency.

- Loss of the many fertile fish breeding-grounds that exist along the coasts.

- Destruction of coral reefs, due to a combination of slower growth caused by temperature increase, excessive bleaching caused by sea level

rise, and physical damage caused by stronger wave action during storms. This could expose many coastal areas to the direct action of waves, something never experienced before.

Climate change could affect agriculture and water resources, as well as the ecosystems and fisheries in tidal areas. Other potential health impacts of global temperature increase include heat-related morbidity and mortality and the propagation of tropical disease vectors. Regional public health programmes must be ready to fight such diseases as malaria, schistosomiasis, dengue, yellow fever and cholera.

The *El Niño* phenomenon

One of the most important symptoms of the global climate change process in recent years has been the unusual frequency and duration of the so-called *El Niño* events. *El Niño* is the term used to describe a phenomenon that begins with the warming of the sea surface near the Equator in the Eastern Pacific Ocean, and whose effects cover practically the whole globe. This is not a natural disaster – in fact some of its effects can be beneficial – but it is a very significant climatic variation. *El Niño* events normally occur every three to five years, last between six and

Coral bleaching

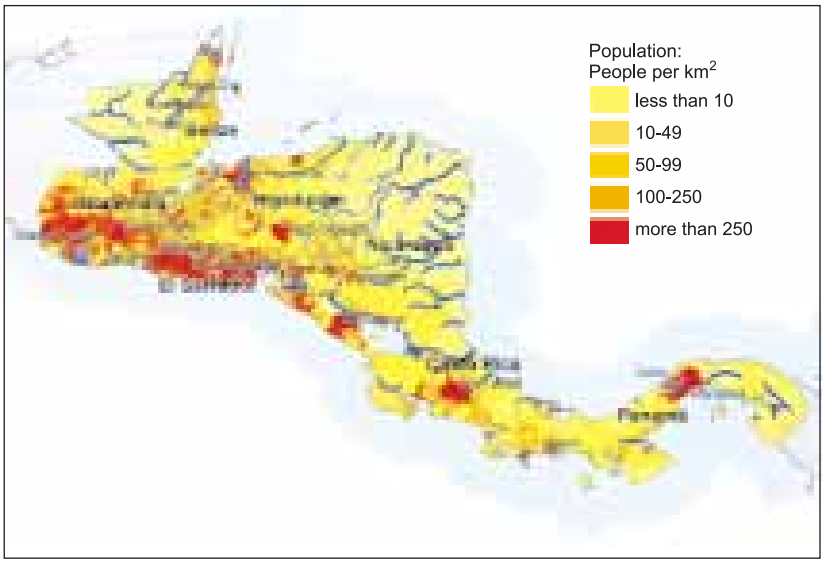
The year 1998 was a difficult one for coral reefs around the world due to abnormally high sea surface temperatures which caused widespread coral bleaching. Coral-forming animals, or polyps, contain minute algae that live symbiotically inside their tissues. The brown or yellow colouring of coral colonies is due to the presence of these algae.

High water temperatures (and sometimes other environmental conditions such as pollution) make these algae leave the coral, which turns white or 'bleached' as a result. The bleached coral is still alive, but it is not healthy since it is not receiving the energy it normally obtains from the close symbiotic relation with the algae. Bleached corals do not grow much and usually do not reproduce. If sea-water temperatures return to normal after a short period of time, the algae will recolonize the coral and the colony will probably recover. Nevertheless, some coral colonies die as a result of these bleaching events.

A severe and extensively documented coral bleaching event took place in the Caribbean between June and November 1998. During this period, sea surface temperatures were higher than average. The map shows the anomalies in sea surface temperatures, or 'hot spots', taken from satellite data recorded on 29 September 1998. Coloured areas indicate the regions where sea surface temperatures were higher than normal. It has been speculated that coral bleaching is a response to global climate change. Data are still insufficient to evaluate whether this is really the case: however, recent very extensive bleaching events at the global scale are causing concern among coral reef specialists.

Source: UNEP, 1999b.

Floodplains (Central America)



Source: USGS EROS Data Center GTOPO30, HYDRO1K - http://edcwww.cr.usgs.gov/landdaac/dataproducts.htm

Impacts are stronger on the Pacific floodplains than on the Atlantic

eighteen months, and show a peak around Christmas – which is why Peruvian fishermen named the phenomenon *El Niño* (The Child). The occurrence of this event often alternates with a cooling of the sea surface temperature known as *La Niña*. During an *El Niño* episode, atmospheric pressure fluctuations occur, similar to the fluctuations of the sea surface temperature in the equatorial eastern Pacific. The complete cycle is called the *El Niño* Southern Oscillation (ENSO).

This phenomenon has some far-reaching effects. An increase in the volume of warm surface waters along the western coast of South America hinders the normal upwelling of cooler waters from the deep ocean. In the western Pacific, cloud systems – usually loaded with rain – move east, towards the central and eastern Pacific, producing significant rainfall in these areas but causing droughts in the western Pacific countries.

The 1997–1998 *El Niño* was one of the strongest ever recorded, developing much faster and showing greater temperature increases than any other. It was even stronger than the 1982–1983 *El Niño*, with temperature increases ranging from 2 degrees Celsius to 5 degrees Celsius above normal. This huge volume of warm water contained so much energy that its impacts dominated global climate patterns until the middle of 1998.

In Latin America and the Caribbean, the 1997–1998 *El Niño* caused catastrophic floods in southern Brazil and near the Pacific coast of Ecuador, Peru and Chile, as well as in Paraguay, Uruguay and north-east Argentina. In some of these countries, precipitation was 12 to 17 times greater than normal. By contrast, droughts occurred in Colombia, Guyana, north-eastern Brazil and the highlands of Peru and Bolivia, and dramatic falls in catch rates were experienced by fishermen along the Pacific coast. Sea level rose by 20 centimetres in the Colombian Pacific. After the 1983 *El Niño* event, the Peruvian gross domestic product plummeted 12 per cent, agricultural production dropped 8.5 per cent, and fishing production was down by 40 per cent. Peru needed a whole decade to recover. The 1997–1998 *El Niño* event caused economic losses that exceeded the total non-military, non-reimbursable international development aid for that same period (see 'Forest fires' section).