Reading

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Department of Humanitarian Affairs (1993, January/February special edition). Natural disasters. DHA News,pp. 26-53.

Natural Disasters

"Natural disasters are part of the environment in which we live. We cannot eliminate them, but if we work together, both locally and internationally, we'll be able to limit the loss of life and the destruction they cause."

Jan Eliasson
Under-Secretary-General for Humanitarian Affairs

Pompeii and Herculaneum were once beautiful cities in Italy just off the coast of the Bay of Naples. In 79 A.D., a colossal volcanic eruption of Mount Vesuvius destroyed them completely, killing hundreds of people. For over 1,600 years, these cities lay buried under cement-like volcanic matter. Then, in 1709, a well-digger accidentally broke his spade in what used to be a theatre in Herculaneum, and the world rediscovered the long-lost cities.

Volcanic eruption is just one of the many kinds of natural disasters that hit the world from time to time. Cyclones, earthquakes, floods, forest fires and other natural disasters claim hundreds of thousands of lives each year and damage property worth billions of dollars. In 1931, more than 3.7 million people lost their lives due to floods of the Hwang-ho River China. In 1989, more than 60,000 people became homeless when a hurricane lashed across the Caribbean Sea. And in March 1992, more than 36,000 buildings were destroyed after an earthquake struck Turkey.

In the past, many people believed natural disasters were sent by gods to punish them for their sins and there was very little they could do about such disasters. Now we do have enough experience and ability to reduce the impact of natural disasters by taking early precautions. We know years in advance which regions are likely to be hit by natural hazards. Satellites, for example, can forecast the approaches of floods and cyclones; seismographs can record the force and direction of an earthquake. As you will see from this leaflet, countries which take precautions in time are able to reduce greatly their loss and suffering from such disasters.

Through the United Nations, the countries of the world are working together to minimize the harm caused by natural disasters. With this end in mind, they have declared the 1990s the International Decade for Natural Disaster Reduction (IDNDR). During this Decade, a concerted effort is being made to reduce the loss of life and destruction caused throughout the world by the violent forces of nature.

Estimates of the major disasters which occurred worldwide (excluding the United States) from 1900 up to 1988, indicate that, in these 9 decades, about 339 million people have been affected by floods, with a total of 36 million rendered homeless; 26 million have been affected by earthquakes, with similar numbers affected by typhoons and cyclones, creating another almost 10 million homeless people; finally, 3.5 million have been affected by hurricanes, resulting in 1.2 million people without homes. From 1970 to 1981, floods were the most frequent disaster, comprising more than one-third of all disasters occurring in that decade. Windstorms were the next most frequent disaster (one fourth of the total number), while earthquakes caused the greatest number of deaths and monetary loss.

The 'actual numbers killed in disasters is estimated to be some 3 or 4 times higher in developing countries than in the developed. The striking difference however is in the number of survivors who are affected, which is estimated to be some 40 times higher in the developing countries. One must presume that this indicates a massive psychosocial as well as physical need for the latter group.

The geographical distribution of disasters between developed and developing countries deserves attention, as there seems to be a relationship between the location of a disaster on the one hand, and the severity of its consequences on the other. Out of the 109 worst natural disasters which occurred between 1960 and 1987, as selected and studied by Berz (1989), 41 occurred in developing countries; however, the number of deaths caused among the affected populations was far greater in the developing countries (758,850 deaths in developing countries as compared to only 11,441 in developed countries).

A list of disasters for the period 1960-81 resulting in the greatest numbers of people killed indicates that all occurred in countries characterized by a low-income economy: Bangladesh 633,000 deaths, China 247,000 deaths, Nicaragua 106,000 deaths, Ethiopia 103,000 deaths.

The extent of risk among many populations, especially in developing countries, has increased over the last few decades due to increasing population size, greater population density in vulnerable areas and the strong tendency of large populations towards urbanization. There has also been a concurrent increase in the magnitude of certain types of man-made disaster. Very little however is known about the stress-related disorders caused by such events, which represent an important area in need of investigation.

In disaster situations certain vulnerable groups tend to exist. High mortality may be seen among elderly people and young children. Children up to 2 years old may show lower mortality than their elder brothers or sisters, perhaps because parents protect their youngest children but cannot afford to help older ones. Pregnant or lactating women and persons already suffering from existing disease are also more vulnerable, as are the poor or certain minority groups who might for instance, have no choice but to live in flood-prone areas.

Source: WHO - Psychosocial Consequences of Disasters, 1992.

"No part of the world is completely free of the risk of natural disasters, but there are certain zones where, and for some disasters, certain times of the year when catastrophes are much more likely to happen. It is also the poorer segments of society that are generally the most vulnerable."

■ AFGHANISTAN
River Floods

The country is surrounded by high mountains and the culminant peaks of the Hindu Kush, the so called "Sky's theater" reach 7,690 m. The geographical and climatic conditions often render relief efforts very difficult.

On 3 September cloudbursts struck the mountainous Hindu Kush region creating mud flows that caused the overflowing of three rivers, devastated the Salang, Ghorband and Shutul valleys and severely affected the town of Gulbahar 70 km north of Kabul. Four hundred and fifty people died and more than 500 were missing as a result of this disaster, which mainly affected refugees who had returned from Pakistan after 14 years of civil war.

UNOCA/A. Donini Photo

Transport was one of the major problems facing the relief effort, with large parts of the countryside under water.

Previous disasters:

On 1st February 1991 an earthquake struck Northern Afghanistan. More than hundred people died and some 2,000 families were made homeless. The following days severe floods were reported in the Southwest of the country. 415 people were killed and 27,000 families affected.

■ ALBANIA
7,000 families and 17,000 ha of land severely affected by floods

Albania, one of Europe's poorest countries, could well have done without the floods which affected the northern parts of the country, a particularly deprived area where living conditions are already very harsh and where most basic commodities, such as food, clothing and fuel are in short supply. In mid-November, three days of exceptionally heavy rains caused the Mat and Drin rivers to overflow and break their embankments, creating flash-floods in the river valleys and low-lying agricultural areas down-stream, where these rivers join the Adriatic sea. Six districts were affected by the floods: Kruja, Lac, Lezha, Shkodra, Tropoja and Mirdita. The water washed away the belongings of many families, and destroyed food stored for the coming winter. Although only 11

people died in the floods, 7,000 families were affected. Over 450 houses were damaged or destroyed. Damage to infrastructure and institutions included schools, health posts, bridges, irrigation canals and electric supply lines. In the low fertile area along the Adriatic coast, 17,000 hectares of agricultural land were inundated and it is feared that next spring's harvest will have been compromised in a country which needs every grain it can produce. The value of the direct damage caused by the floods was estimated at approximately US $7 million.

Previous disasters:

In 1991, 3.2 million Albanians were severely affected, following a 3-year drought and the disruption of medical services.

Albania: A Profile

Albania is bounded by the former Yougoslavia to the north and east, by Greece to the south and by the Adriatic Sea to the west. The population of the country which has an area of 28,748 sq. km is composed of 3.18 million people, including a minority of Greeks (approx. 59,000) and Macedonians (approx. 4,700). The capital is Tirana. Albania gained independence in 1912 after 450 years of Turkish rule. It was occupied by Germany and Italy during World War Two but liberated by Albanian partisans in 1944. During almost fourty years of stalinist rule under the leadership of Enver Hoxha, Albania sided with the former Soviet Union (relations broke down in 1961) and then with China (relations broke down in 1977/78). Proclaimed by Enver Hoxha as the "only true communist country", Albania lived in total isolation from the rest of the world for many years. In April 1985, following Hoxha's death, Ramiz Alia, President of the Presidium of the National Assembly, pledged to follow the same path as his predecessor, although the country showed signs of breaking its almost total isolation. Two extra border crossings to Greece opened in 1985 and freight transport to Italy was expanded. The popular revolutions that spread through East and Central Europe in 1989 appeared to have passed Albania by, but in July 1990, following the Government's decision to boost the role of the market in setting wages and prices, thousands of Albanians seeking to leave the country stormed embassies, and were permitted to leave for West Germany, Italy and elsewhere (the right for Albanian citizens to apply for a passport was announced in May 1990).

The country's economy, one of Europe's poorest, relies on the processing of agricultural raw materials, textiles and oil products, and exports of ore, ferro-chrome, copper wire, tobacco and cigarettes, timber, textiles and foodstuffs. Industry was completely nationalized under the Communist regime, but since July 1990, individuals have been permitted to own craft business. The former Yugoslavia used to be Albania's main trading partner.

Source: Reuter; The Statesman's Year-Book 1992-93.

■ ALGERIA faces heavy rains and earthquake

After a long and disturbing period of drought, central and western Algeria, in particular the departments of Alger, Ain-Defla, Blida, and Tipaza, were affected by torrential rains between 21-29 January. Roads and at least 50,000 ha of land were extensively flooded and several houses destroyed. 18 people were reported dead and three missing. In addition, a medium-size earthquake occurred in Ain-Defla, affecting more than 450 families.

Previous disasters:

In 1989, a strong earthquake measuring 6.0 on the Richter scale, rocked northern Algeria, killing 22 people and injuring 184. The quake was caused by a release of energy following a shippage at the boundary between the African and the Euro-Asian continental plates. Algeria's most destructive earthquake occurred on 10 October 1980, when two major tremors (7.3 and 6.4 on the Richter scale) completely destroyed more than half of the city of El-Asnam, in the central-northern part of the country, killing or injuring close to 11,000 people, and rendering 300,000 people homeless.

Earthquakes

Magnitude and Intensity

The severity of an earthquake can be expressed in several ways: the magnitude of an earthquake, as defined by the Richter magnitude scale, is a measure of the energy released at the point of origin, and is a fixed value for each earthquake.

The intensity, on the other hand, describes the damage done at any point of interest, and will obviously decrease to progressively lower values with increasing distance from the origin of the earthquake.

Economic Losses Inflicted by Major Recent earthquakes*

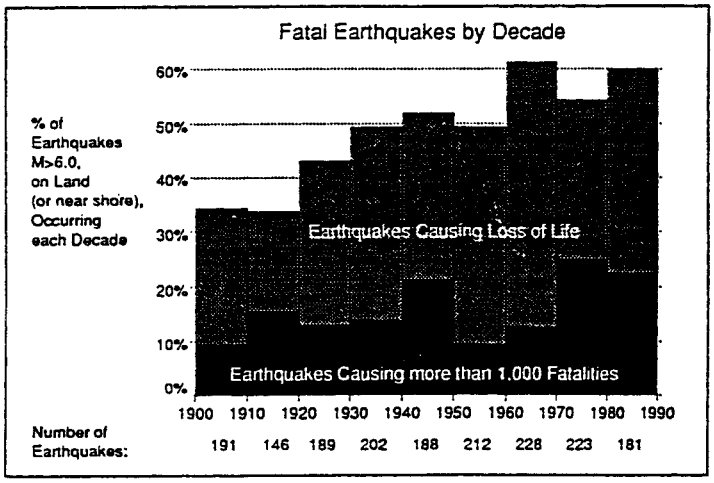
Country	*Earthquake*	*Year*	*Loss ($bn)*	*GNP that year ($bn)*	*Loss (%GNP)*
Nicaragua	Managua	1972	2.0	5.0	40.0
Guatemala	Guatemala City	1976	1.1	6.1	18.0
China	Tangshang	1976	6.0	400.0	1.5
Romania	Bucharest	1977	0.8	26.7	3.0
Yugoslavia	Montenegro	1979	2.2	22.0	10.0
Italy	Campania	1980	45.0	661.8	6.8
Mexico	Mexico City	1985	5.0	166.7	3.0
Greece	Kalamata	1986	0.8	40.0	2.0
El Salvador	San Salvador	1986	1.5	4.8	31.0
USSR	Armenia	1988	17.0	566.7	3.0
USA	Loma Prieta	1989	8.0	4,705.8	0.2
Iran	Manjil	1990	7.2	100.0	7.2
Philippines	Luzon	1990	1.5	55.1	2.7

**Source: Martin Centre Earthquake Database - in Coburn and Spence; Earthquake Protection, 1992.*

A quake of magnitude 2 on the Richter scale is the smallest quake normally felt by humans. Earthquakes with a Richter magnitude of 7 or more are commonly considered to be major. Richter magnitudes are not used to estimate damage.

An earthquake in a densely populated area, which results in many deaths and considerable damage, may have the same magnitude as an earthquake that occurs in a barren, remote area, that may do nothing more than frighten the wildlife.

The World's Earthquake Problem is Increasing*



On average, about 200 large magnitude earthquakes occur in a decade - about 20 each year. As the world's population increases and areas previously almost uninhabited become increasingly settled, the propensity for earthquakes to cause damage increases. At the start of the century, less than one in three large earthquakes on land killed someone. The number has gradually increased throughout the century, roughly in line with the world's population, until in the 1990s, two earthquakes in every three now kill someone, as shown in this table. ■

**Source: Coburn and Spence:* Earthquake Protection, 1992.

Dr. Charles Richter, the seismologist who set up the scale now generally used to measure the force of earthquakes, died in Pasadena, California, on September 30, 1985, at the age of 85. Richter had a great influence on the development of instruments of measurement and the engineering measures needed to withstand earthquakes.

The scale was first set up in 1932 in order to distinguish between large and small earthquakes in California, an area particularly prone to them. It was then extended to catalogue and classify earthquakes all over the world.

When Richter began his work, there were difficulties in measuring the force of the 300 or so earthquakes detected in Southern California each year, because a large earthquake some distance away from the seismometer could appear to be of the same strength as a smaller, nearer one. Richter solved this by devising a method of measuring an earthquake at three or more points, so that the point of origin could be established. By comparing the distance with the recorded strength, it was then possible, by means of a law which he devised on the attenuation of energy, to work out the strength of the tremor at the epicentre.

On the Richter scale, each whole number represents an amplitude of ground movement 10 times greater than the one below it. He himself insisted that there was no upper limit, though in practice there has not been a reading above nine.

■ ARGENTINA state of emergency in three provinces following floods

Heavy and continuous rainfall since April caused a substantial rise in the Parana and Paraguay rivers and their tributaries. This lead to extensive floods, not only in Paraguay and Brazil, but also in northern Argentina where the level of waters reached historical records. A state of emergency was declared in the provinces of Formosa, Chaco and Corrientes. As of 25 June, over 100,000 people had been evacuated from the provinces of Formosa, Corrientes, Misiones, Chaco, Santa Fe, Entre Rios and Buenos Aires. The majority of the affected population came from the poorest strata of society, including people who already suffered from unsatisfied basic needs as well as poor sanitary and health conditions. In early July, the overall situation was gradually improving in many parts of the stricken areas, allowing part of the evacuated population to return home.

On 6 January, an avalanche of mud, rocks and trees, caused by flash floods and the collapsing of a dam, swept through the town of San Carlos Minas and its 2,000 inhabitants, in Cordoba Province, 960 km Northwest of Buenos Aires. 200 houses were destroyed and 30 people died.

Previous disasters:

In 1985, heavy rains which started in October and continued to pour down throughout November, caused extensive flooding in Buenos Aires province, affecting an area of 6,400,000 ha, and rendering 50,000 people homeless. While the number of dead and injured was minimal, the overall damage inflicted to agriculture, livestock and infrastructure (roads, bridges) was estimated at more than US $1 billion.

■ BAHAMAS AND THE UNITED STATES swept by Hurricane "Andrew"

On 23 August, despite warnings issued in the Bahamas, Cuba and south-eastern Florida, "Andrew", the most violent hurricane of the last 50 years, with winds of up to 240 km per hour, struck the Bahamas, causing 4 deaths, making 1,700 people homeless, destroying 800 houses and causing serious damage to infrastructure.

On 24 August this tropical cyclone struck the south-eastern coast of Florida south of Miami and, although losing speed, pursued its deadly course over Louisiana on 26 August, after having spared New Orleans. The hurricane then became a no less destructive tropical storm, with torrential rain which caused serious damage to coastal towns. The cost was heavy: 35 dead, many people missing and material damage estimated at US $15 to 20 billion, with 63,000 houses destroyed in Florida and $400 million to $2 billion worth of damage and 8,000 houses destroyed in Louisiana. One hundred and eighty thousand people were left homeless. Florida had not previously experienced a natural disaster of this magnitude. Many shelters organized before the arrival of hurricane "Andrew" were kept open for those seeking refuge. Three million people were deprived of electric power for several days and schools had to close.

In 1988 hurricane "Gilbert" devastated Jamaica and in September 1989 hurricane "Hugo" struck the South of Carolina and the Caribbean. These violents hurricanes could be the results of global warming. "Andrew" could be compared to "Hugo" and to the storm that struck Miami in September 1926.

Century of Deadly Storms

Following is a list of the worst Atlantic hurricanes of the 20th century. Hurricanes were given names in 1954.

Sept. 8, 1900 - Galveston Tex., 6,000 dead.
Sept. 16-22, 1926 - Florida and Alabama, 372 dead.
Oct. 20, 1926 - Cuba, 600 dead.
Sept. 12-17, 1928 - West Indies and Florida, 6,000 dead.
Sept. 3, 1930 - Dominican Republic, 2,000 dead.
Sept. 21, 1938 - Long Island and New England, 600 dead.
Sept. 12-16, 1944 - North Carolina to New England, 389 dead.
Aug. 30, 1954 - **Hurricane Carol**, north-eastern United States, 68 dead.
Oct. 12-13, 1954 - **Hurricane Hazel**, Haiti and eastern United States, 347 dead.
Aug. 18-19, 1955 - **Hurricane Diane**, eastern United States, 400 dead.
Sept. 19, 1955 - **Hurricane Hilda**, Mexico, 200 dead.
Sept. 22-28, 1955 - **Hurricane Janet**, Caribbean, 500 dead.
June 27-30, 1957 - **Hurricane Audrey**, Louisiana and Texas, 526 dead.
Sept. 4-12, 1960 - **Hurricane Donna**, Caribbean, eastern United States, 148 dead.
Oct. 31, 1961 - **Hurricane Hattie**, British Honduras, 400 dead.
Oct. 4-8, 1963 - **Hurricane Flora**, Cuba and Haiti, 6,000 dead.
Oct. 4-7, 1964 - **Hurricane Hilda**, Louisiana, Mississippi and Georgia, 38 dead.
Sept. 24-30, 1966 - **Hurricane Inez**, Caribbean, Florida and Mexico, 293 dead.
Aug. 17-18, 1969 - **Hurricane Camille**, Mississippi and Louisiana, 256 dead, US $3.8 billion in damage.
July 30 - Aug. 5, 1970 - **Hurricane Celia**, Cuba, Florida and Texas, 31 dead.
June 19-29, 1972 - **Hurricane Agnes**, Florida to New York, 118 dead, $4.7 billion damage.
Sept. 19-20, 1974 - **Hurricane Fifi**, Honduras, 2,000 dead.
Aug. 20 to Sept. 13, 1979 - **Hurricane David**, Dominican Republic, Dominica and Florida, 1,200 dead. **Hurricane Frederic**, the Bahamas, Alabama and Mississippi, 7 dead, $2.5 billion damage.
Aug. 4-11, 1980 - **Hurricane Allen**, Caribbean and Texas, 272 dead.
Sept. 1988 - **Hurricane Gilbert**, Caribbean and Mexico, 400 dead.
Sept. 1989 - **Hurricane Hugo**, Caribbean and
Aug. 1992 - **Hurricane Andrew**, (most destructive) Bahamas, USA.

The Associated Press

■ BOLIVIA
5,000 people rendered homeless by floods

In mid-March a state of emergency was declared in the northeastern department of Beni, where approximately 100,000 square kilometres of pasture were flooded following the overflow of rivers in the region. Heavy losses were inflicted to cattle (92,000) and crop (80%) in the disaster stricken area where 8,700 families are living. More than 1,000 houses were damaged and 5,000 people made homeless.

A mudslide, caused by torrential rains buried the gold mining camp of Llipi on 8 December, in Larecaja Province, 285 km north of La Paz. 49 people died.

Previous disasters:

In January 1986, during the rainy season, a state of emergency was declared in five Bolivian provinces, including Cochabamba and La Paz. As the rains continued to pour down, the level of Lake Titicaca had risen considerably by the end of February and the lakeshore provinces were extensively flooded. On 3 April, the level of the lake was rising by 2 cm per day and the shoreline had expanded by 400 meters horizontally. 50,000 families lost their homes and/or their fields during these floods, considered to be the worst in Bolivia this century.

■ BRAZIL
also affected by overflow of Paraguay and Parana rivers

The Southern States of Santa Catarina, Parana and Rio Grande were also affected, at the end of May, by the overflow of the Paraguay and Parana rivers which caused extensive flooding in Argentina and Paraguay this year. About 4,000 people were made homeless and 41 people were killed.

One of the major concerns, in emergency situations, caused by extensive floods, is the immediate provision of drugs and medicaments to reduce the risks of water borne diseases, such as cholera, and leptospirosis infections (disease affecting the kydney system and which spreads through contaminated water).

■ CHINA
1992 marked by typhoons and hailstorms

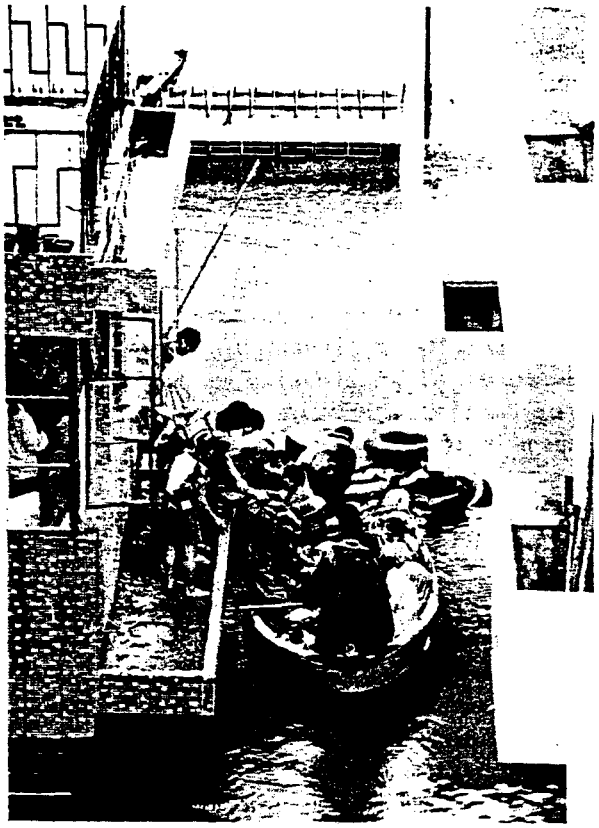
In September, "Polly", a typhoon of exceptional violence, caused 146 deaths, destroyed 10,000 houses and caused damage estimated at 2.4 billion yuan.

Between 18 and 21 April, the Hunan and Sichuan provinces were affected by rains and hailstorms causing 109 deaths.

Previous disasters:

The People's Republic of China frequently experiences natural disaster -floods, drought, typhoons and earthquakes- of considerable magnitude. Some of them, like the Tangshan earthquake in 1976, the heavy rainfall in 1980 which flooded the Hubei Province in southern China - while at the same time drought struck the northern Hebei province close to Beijing affecting all together more than 21 millions of people - have become well-known. Historically, the Valleys of China's most important rivers, the Yangtze, Yellow, Huai and Hai, were liable to flooding. Between 1644 and 1911, the Yangtze river experienced more than 200 severe floods. In 1987 forest fires in the Daxinganling region, destroyed over 700,000 ha of timberland and rendered many thousands of inhabitants homeless. In November 1988 an earthquake struck the province of Yunnan causing 930 deaths and affecting one million people. The 1946 drought was the world's

The entrapped flood victims were being evacuated by rescue boats.



Jiangsu Provincial Flood Control Headquarters Photo

The Social Welfare House of Wuxi City urgently transfer the masses

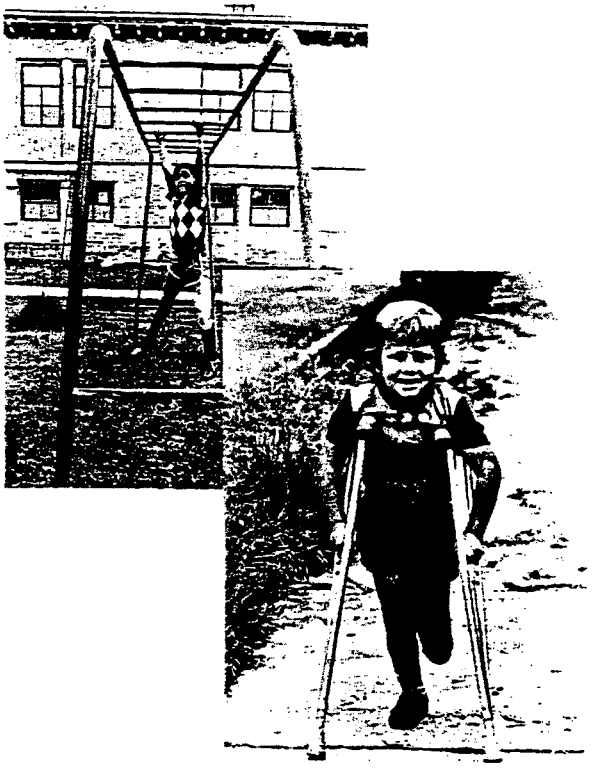
worse. The floods which began on 18 May 1991 and swept across 13 of China's 30 provinces, were the worst in over fifty years and affected 220 million people.

■ COLOMBIA
Three cataclysms in less than 48 hours

On 17 October a violent earthquake measuring 6.6 on the Richter scale shook the province of Antioquia, some 140 km north-west of Medellin and 370 km north-west of Bogotá. Hundreds of people had to be evacuated to safer areas. On 18 October a second earthquake followed by several after-shocks struck Colombia, this time causing no deaths but considerable material damage. Due to this seismic activity, the Cacahual mud volcano erupted, spilling flows of hot mud over dwellings. Several people were injured and 700 were left homeless. Murindo, one of the poorest villages of the region, was 90 per cent destroyed.

Previous disasters:

The Cacahual eruption, in the Uruba area, near the village of San Pedro, brings back to memory the tragedy of Nevado del Ruíz on 13 November 1985. The tragic destruction of the little town of Armero, that was swallowed up in enormous mud flows, will always be remembered. More than 23,000 people died in this disaster and the damage caused totalled some US $212 million.



DHA Photos

Injured children following the volcanic eruption of Nevado del Ruiz

Volcanoes

The Rabaul volcano eruption in Papua New Guinea.

Volcanic eruptions are among the most awesome and most feared of natural phenomena. Myths, legends and recorded history abound in testimonies to their destructive power, and the geological record shows that volcanic processes have been important throughout the earth's history. These processes continue at the present time, often with profound effects on human life and activity.

More than 500 volcanoes have been active in historical times. There are also many hundreds of others now dormant which show evidence of eruptive in the recent pre-historic past. Some of these will undoubtedly erupt again; eruptions have also occurred at volcanoes previously thought to be extinct. In addition, entirely new volcanoes are formed time to time within volcanic zones.

Eruptions vary widely in magnitude and duration, not only from one volcano to another but even at the same volcano. The frequency of eruptions also varies, from volcanoes which are in almost continual eruption to those which erupt only at intervals of hundreds or even thousands of years.

Volcanoes affect the lives of people in both negative and positive ways. Any volcanic eruption, whatever its degree of violence, can be dangerous to people in its neighbourhood. Yet, during their periods of inactivity, volcanoes attract human settlement because of the fertility of volcanic soils and the often spectacular beauty of volcanic landscapes. Large numbers of lives and large economic investments may therefore be at risk when an eruption occurs.

Most eruptions are preceded by premonitory signs which, if recognized and heeded, can give timely warning of the impending events. However, these signs may be subtle or complex, and may demand careful and detailed study before they can be interpreted correctly. Some of history's greatest catastrophes have been caused by eruptions whose early signs were unrecognized, misunderstood or ignored.

One cannot abandon or prevent all settlement of the areas where volcanic hazards exist; what is important is to learn to live with them as safely as possible. For this, it is essential to know each volcano's history, the frequency and character of its eruptions, and to understand the process which leads up to them.

Source: Volcanic Emergency Management (UNDRO/UNESCO Publication, 1985).

Sociologically, a disaster is an event, located in time and space, that produces the conditions whereby the continuity of the structure and processes of social units becomes problematic. Disaster agents may differ as to their cause, frequence, speed of onset, length of forewarning, duration, scope of impact, and destructive potential.

The term "disaster" continues to be used in a variety of ways. In general usage, a "disaster" implies a misfortune or calamity, hard luck, or anything of a ruinous or distressing nature and an "emergency" implies a sudden or unexpected event requiring immediate action. However, the words "disaster" and "emergency" are used so diversely as to provide no universally accepted understanding of particular characteristics, or necessary actions. In part, the different conceptions of disaster stem from different uses by users. Thus a seismologist will define a disaster in relation to tectonic movements, relief administrators in relation to relief needs and political officials in relation to political consequences.

The concept and definition of a "disaster" has altered over time, in accordance with changing ideas concerning cause and effect. Prior to AD 1700 for example, infectious diseases were considered inevitable natural disasters and in many societies what were once seen as unavoidable "acts of God" are now understood to be controllable physical phenomena.

Even since the 1950s conceptions of "natural disaster" have changed. Earlier conceptions were based largely on the characteristics of the physical forces and the resulting impact or damage. For example, most disaster preparedness efforts were then concerned with improving warning equipment and with scientific study of physical phenomena. With the increasing attention given to the social science study of emergency situations, the perception of "natural disaster" has shifted from consideration of the technical aspects of the physical phenomenon as the primary focus, to a perception that the extent of deleterious effects is predominantly a social issue based on whether the people are aware of the potential threat and take the necessary actions to minimize physical destruction and social disruption. The definitions of "disaster" have reflected this change, with increasing attention being given to the social aspects of disaster situations.

First, disasters are social phenomena (rather than mere physical events) and, secondly, while the physical event may cause social disruption it is not likely to cause social disintegration. Individuals and groups within a community can be expected to continue to function after a disaster in approximately the same way they functioned prior to a disaster. This rather positive perception of social processes in emergency situations differs from what is commonly assumed to occur, and has significant programme and policy implications in all aspects of disaster planning, preparedness and reconstruction.

Source: Social and Sociological Aspects, Disaster Prevention and Mitigation, Vol. 12, DHA/UNDRO publication.

■ CUBA
Evacuation of 7,000 people following floods and quake

Sea waves with up to 90 km per hour winds which flooded the north-western coast on 6 February, damaged housing, factories, schools, in Havana and Matanzas. In some buildings, water reached the height of 1.5 m. 2,000 people were evacuated. Rains and waves were due to a side effect of the warm El Niño Ocean current. *(see "El Niño Phenomenon".)*

A strong earthquake occurred on 25 May at 12:56 hrs (local time) near the coast of Southeastern Cuba in Granma province. Over 300 aftershocks were registered. Over 50 persons were injured and 5,000 evacuated.

■ ECUADOR
El Niño Floods

In early March, 10 provinces, victims of the "El Niño" Phenomenon, were flooded. The most damaged cities were Milagro and El Triunfo. Hundreds of kms of roads were completely destroyed, rendering the traffic between the coastal region and the *sierra* very difficult. 100,000 families were affected by the floods which lasted until early May, due to continuous rains. 22 people died. Many schools being used as emergency shelters when not flooded, the opening of the school year was seriously hindered. 25,000 ha of agricultural land were devastated. Health measures had to be taken to prevent risks of epidemic due to stagnant waters (many cases of cholera.)

El Niño Phenomenon

Each year, from December to about the end of March, a weak southward-flowing warm ocean current develops in the Pacific, along the coast of Ecuador, Peru and northern Chile where it causes sea surface temperatures to rise. Because it begins around the Christmas season, the local residents named the current "El Niño de la Natividad", "The Christ Child". A sudden shift in the normal weather pattern between summer 1982 and spring 1983, intrigued scientists and weather experts alike. Severe floods in many countries in South America, prolonged droughts in parts of Australia and most of Indonesia, the mysterious appearance of large shoals of dead fish off the Peruvian coast, the unusually low level of the shrimp catch off Colombia and the discovery that mackerel were surviving by eating their own eggs, are all believed to be due to the El Niño Phenomenon. The term now refers to periods where extensive warming takes place, on average once every five years, although these events are far from regular. During these exaggerated warmings, the disruption to the local environment is enormous.

Tsunami

The tsunami, a Japanese word meaning harbour wave, is a tidal wave created in the ocean by a powerful movement of the sea-bed such as an earthquake or volcanic eruption. The waves spread in all directions with several hundred kilometres between their crests. Out in the Ocean the wave is no more than a metre high and is scarcely noticeable, whereas by the time it approaches the costs it has grown enormously and may be 20 metres high. Tsunamis, which occur frequently around the Pacific, travel very rapidly and cause major damage. In May 1960, for example, the very violent earthquake in Chile gave rise to a tsunami which caused a hundred deaths in Japan and some 40 in the Hawaiian Islands and demolished the largest statue site on Easter Island.

■ EGYPT
Cairo in mourning after strong earthquake

On Monday 12 October at 3 pm local time, an earthquake measuring 5.9 on the Richter scale struck Egypt with its epicentre located 30 kms southwest of Cairo. In the Egyptian capital, a busy city with 12 million inhabitants, and another 4 millions transit population commuting everyday to their jobs, the quake shook buildings in the residential quarter of Heliopolis and the more popular districts of Zaher, Sharabeya, Bulaq and Gamaliya. Residents in old buildings were buried in the rubble before they had time to flee. The population was seized with panic and school children (some 40 died), were particularly frightened. Cairo's underground railway and the Aswan dam were fortunately unscathed. The ancient sites, which include of course the Pyramids and the Sphinx - that were thought to be immune from destruction, were unfortunately not spared. Repairs to the Sphinx will take more than a year. Other monuments, such as the Saqqarah Pyramid and the temple of Qom Ombo, as well as the roof of Cairo's Egyptian Museum, were damaged. Despite significant loss of life (561 dead), the earthquake did not create a major disaster like, for example, the 1988 Armenia earthquake. The immediate damage in Cairo, although serious and of incalculable value in the case of cultural monuments, was limited to punctual collapses of buildings, mostly two or three storey houses in the older parts of the city. One tall 14 storey building collapsed in Heliopolis, close to central Cairo, killing several people. In the rural areas, on the outskirts of Cairo, the damage was more severe and many families were made homeless due to the collapse of their homes. People did not dare to go back to their houses in fear of after-shocks. 10,000 people were injured and 3,000 families lost their homes. Although strongly shaken and having to deplore several hundreds of fatal casualties, the citizens of Cairo and of Egypt as a whole, could have faced a much worse

DHA/O. Almgren Photo

Although not considered as an earthquake prone area, Cairo is exposed to this risk.

situation if the intensity of the earthquake had been more than 5.9. This disaster might serve as a reminder that although not considered as an earthquake prone area, Cairo is exposed to this risk.

Previous disasters:

Back in 1262 the famous Lighthouse of Alexandria was destroyed by a violent earthquake. The last major earthquake to occur in Egypt was the 1847 one which caused some 100 deaths.

■ EL SALVADOR
Floods

Since 28 September continuous heavy rain caused floods in wide areas of the South East region of the country, affecting the already precarious economic situation of the inhabitants. More than 8,000 people were evacuated and crops and housing were seriously damaged.

Previous disasters:

On 10 October 1986 a violent earthquake killed 1,000 persons. 10,000 were injured and up to 30,000 families rendered homeless.

■ FRANCE
Torrential rain in the south-eastern region. Departments of Vaucluse, Ardèche and Drôme declared disaster areas and ORSEC Emergency Plan set in motion

The "black Tuesday" of 22 September, when continuous thunder storms struck South Eastern France, flooding the ancient town of Vaison-la Romaine, transformed the region into a scene of desolation. The Ardèche, a rushing tributary of the Rhône, frequently rises to high levels: 11.20 metres in 1982, 12 metres in 1977, 12.20 metres in 1958 and 15.80 metres in 1900. The Ouvèze, coming down as a 15-metre wall of water, crashed into Vaison-la-Romaine, destroying everything in its path. Some of the victims experienced the tragedy of being unable to rescue their relatives or neighbours while they were carried away by the waters. Thirty-two people died and several were missing, including tourists trapped in their caravans or camping tents. As Commandant Yves Cavalier, who was in charge of the rescue operations explained, there was no "technical possibility of finding people alive", despite the use of 16 helicopters and 1,500 rescuers.

Both in the United States and in France such tragedies have re-opened the debate on the prevention of natural disasters.

■ INDIA
Suffers from floods and cyclonic storms

Floods in the states of Uttar Pradesh and Jammu and Kashmir killed almost 500 people and damaged 14,000 homes. Torrential rains gave rise to severe flooding in Kerala, in Southern India, causing at least 50 deaths.

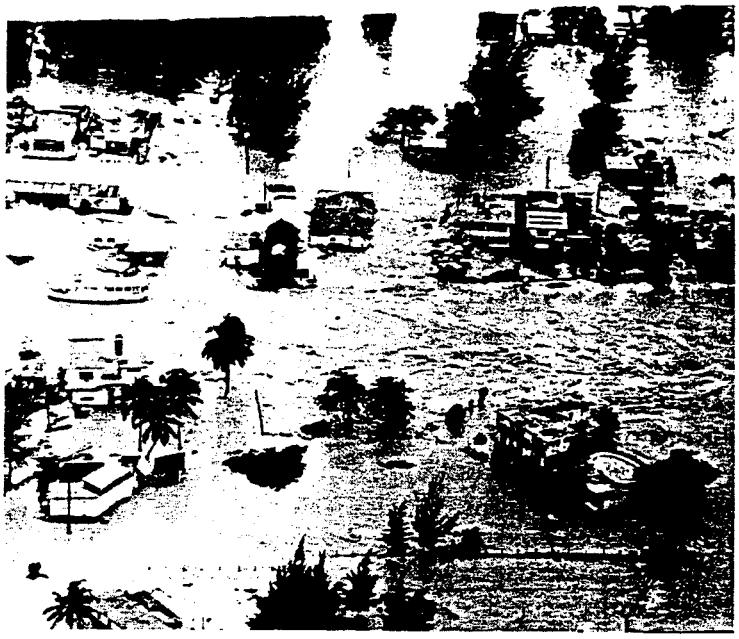
On 12-14 November, the Southern tip of India was struck by a cyclonic storm which devastated Northern Sri Lanka. In Tamil Nadu alone, 170 people were killed and 600 reported missing. In Kerala State 41 people died and 70 were missing. The State of Karnataka was also seriously affected by this disaster.

Previous disasters:

A major earthquake occurred in India, in the north-east Bihar region, on 15 January 1934, and was claimed at that time to be "one of the biggest seismic disturbances in the history of the world". It was severe enough to be felt 1,000 miles away from the epicentre and to cause massive destruction over an area of 15,000 square miles, with the loss of at least 7,000 lives.

Floods

(A glance at the year 1991)



In 1991, there have been 7,485 deaths and missing persons in the world due to this phenomenon occurring in 32 events with 10 or more deaths, according to our estimates. If it had not been for the cyclone "Gorky" that ravaged Bangladesh, floods would have been the worst disaster of the year 1991.

Asia, with 6,524 people killed mostly due to the monsoon rains has been the continent most affected; Africa follows with 530, America with 298 and Europe with 133. The countries that have been most affected are China and India. In China, floods from the middle of June to the end of July have killed 2,295 people, affected 200 million people (10 million have been left homeless) and resulted in damage estimated at US $12,900 million.

In India, the most severe floods took place on 20 October. They affected the State of Uttar Pradesh and others with 1,600 victims and US $60 million worth of losses. The floods in Andra Pradesh on 30 July were also very destructive with 524 deaths, followed by those on: 16-28 August with 57, in Karmataka on 30 October with 30, in Kerala on 1 June and 9 July with 99 and in Bombay on 8-13 June with 44.

Afghanistan's worst floods were those in Jowzjan on 2-3 June with 728 deaths, in Takhar on 13 April with 50 and from 1 February to 24 March with 100.

Other major floods in Asia were those in: Viet Nam with 174 death, South Korea with 70, Cambodia with 100, Bangladesh with 130, Sri Lanka and Maldivas with 27, Pakistan with 200, Iran with 128 and Turkey with 45. In Indonesia, Kalimantan, floods caused 97 deaths from 6 to 9 June.

In Africa, the most serious floods were those in Malawi with at least 472 deaths and 150,000 people left homeless from 10 to 14 March. Camerun and Tchad were also hit by this disaster with 41 deaths, and Algeria with 17.

In America, the greatest floods were those of Chile in Antofagasta, with 141 people killed, 2,558 wounded and 30,000 injured by a flood of 5 million tons of mud due to rains on 18 June. In Mexico, there were 70 deaths in Veracruz and other states and 15 in the U.S.A., in Texas.

In Europe, there were 107 deaths in NE Romania, especially in the watershed of the Tazlu river where a dam broke on 29 July; the losses were estimated at US $50 million. In Italy, especially in Sicily, there were 26 deaths on 12-13 October.

Source: Natural Disasters in the World - Geo-Mining Technological - Institute of Spain, 1991.

■ INDONESIA
2,080 died in Flores Island struck by earthquake

On 12 December a violent tectonic earthquake (magnitude 7.5 on Richter scale) struck the island of Flores at 13:29 local time, immediately followed by a strong tidal wave which affected the Northern coast of the district of Sikka, East Flores, Ende and Ngada, killing 2,080 persons and injuring 2,103. Damaged houses: 15,223. Damaged hospitals: 11. Damaged schools: 120. Total number of buildings damaged: 305. Total estimation of physical damage/losses: approximately US $100 million. The joint DHA/OFDA mission reported 17,000 families homeless. The islands of Babi and Pomana Besar located in the Flores sea and inhabited by 2,000 people were severely struck by the tidal wave. Flores, with a population of approximately 700,000 persons is located 1,750 km east of the Indonesian capital, Jakarta. 90% of the town of Maumere (approx. 70,000 persons) were destroyed affecting tens of thousands of people obliged to camp in tents for fear of strong aftershocks. Most of the buildings on the island are made of wood and brick. Those made of brick were entirely destroyed or severely damaged. Mudflow occurred in Ndoda on 28 December following severe rainfall over landslide caused by the earthquake. The rainy season which

Earthquakes in a Changing Society

Earthquakes have been a growing threat from the time people began congregating in large communities and building houses out of brittle and heavy materials. One of the first known attempts at forecasting earthquakes was made 1900 years ago, by the Roman historian, Plinius the Elder, who provided an exhaustive list of phenomena which he claimed to occur before large earthquakes. It is quite likely that Plinius drew largely from selected popular knowledge. Most of these phenomena are now intensely studied as promising short-term precursors, and in a few cases have led to successful prediction, for example that of the 1975 Haicheng earthquake in China by which an estimated 100,000 people were saved. However, this earthquake had much stronger precursors then normally occur before major earthquakes, and in this respect was an unusual event.

Why Earthquakes?

The interior of the earth is continuously deforming. In more brittle outer layer (lithosphere) this deformation is partly accompanied by sudden shear movements (ruptures) along fractures (faults). The strain energy released by these ruptures accounts for the earthquakes, the seismic energy that propagates away from the ruptures. The largest of these ruptures can be 1000 km long, as in the 1960 Chile earthquake, or a few meters long as in the smallest earthquakes that can be recorded. The size (magnitude) of the earthquake is closely linked to the length of the rupture.

Source: Excerpts from an article by L. Seeber, UNDRO News.

started in December has but added misery to those living in the open. The rehabilitation/ reconstruction phase officially started in January 1993.

Previous disasters:

Indonesia with its 13,677 mountaneous islands is the greatest archipelago of the earth, and counts more than 100 active volcanoes. Some of them were particularly destructive. In 1883, the Krakatoa, between Java and Sumatra, killed 36,000 people. During the 10 years prior to 1983 there were 31 eruptions. For example, the Galunggung, West of Java. The earthquakes are frequent in the southern islands. In June/July 1976, within a period of 3 weeks, two severe earthquakes occurred in the province of Irian Jaya (420 persons killed) and on the densely populated island of Bali (573 dead, 250,000 homeless). On 19 August 1977 an earthquake followed by tsunamis rocked the Nusa Tengarra Islands of Eastern Indonesia: more than 95 dead and 20,000 homeless. Volcanic eruption : Mt Kelud in East Java erupted on 10 and 12 February 1990 killing 30 persons and 43,000 were evacuated.

■ IRAN
110,000 ha of farmland inundated in the North and North-East

Floods caused by heavy rains around the Gorgan and Atrak rivers in Northern Iran close to the Caspian Sea damaged more than 4,000 housing units and 110,000 ha of farmland. Again on 4 and 5 June torrential rains caused 25 deaths and also heavy material losses in the North East of Iran. Fifty millimeters rain in less than 24 hours resulted in extensive inundations.

Previous disasters:

On 28 July 1981 a major earthquake struck the area east of Kerman, killing 1,200 people. Three years earlier the Tabas earthquake, some 350 km to the north along the same fault zone killed 15,000 people. On 21 June 1990 another quake struck the provinces of Gilan and Zanjan: 40,000 dead, 60,000 injured and 500,000 homeless. In 1962 an earthquake of similar magnitude which occurred in the same area killed 12,000 people.

■ KYRGYZSTAN
Rain, hail and quakes shatter the country

In May, Kyrgyzstan suffered simultaneous blows from torrential rain and hail and an earthquake that measured 7 on the Richter scale. The damage was estimated at some US $31 million. The number of victims reached 20,000.

While still suffering, economically in particular, from these recent disasters, Kyrgyzstan was struck on 19 August by an even stronger earthquake which consequences can be compared to those of the 1988 Armenia earthquake. More than 50 people died in this disaster and the damage exceeded $130 million.

Previous disasters:

Earthquakes in 1977, 1983 and 1985.

Kyrgyzstan, a Muslim Republic with some 4,258,000 inhabitants, covers an area of 199,000 square kilometres. Together with Uzbekistan and Tajikistan, it is one of the Republics with the lowest per capita income. It is a mountainous country, rich in coal and gas deposits. Since 1926 irrigation of the Fergama Valley has enabled the country's agriculture to expand.

Kyrgyzstan declared its independence on 31 August 1991 and became a Member of the United Nations on 2 March 1992. The Government's headquarters are in Bishkek.

River and Coastal Floods

River floods

The basic cause of river flooding is the incidence of heavy rainfall. Not all serious inundation of land or damage from floods, however, is due to this hydrological phenomenon alone. Often other factors operate either to exacerbate an already occurring flood problem or to create a flood problem entirely of their own manufacture. These factors are associated most often with the promotion of hydraulic surcharge in water levels. They include the presence of natural or man-made obstructions in the flood path such as bridge piers, floating debris, weirs, etc. Also included are the generally unforeseen river-surge events caused by sudden dam failure, land slip or mud-flow.

Coastal floods

In many cases, the most devastating flood-producing rainfall event is that associated with the typhoon, hurricane, or other tropical cyclone, the name given to this meteorological phenomenon being dependent on the region in which it occurs. The Indian sub-continent, countries of Asia, the Pacific, Caribbean and Atlantic seaboards of the United States are all regions typically subject to such events. Catastrophic flooding from rainfall is often aggravated by wind-induced surcharge along the coastline. Rainfall intensities are high and the area of the storm is broad based; these two factors together are capable of producing extreme flood discharges in both small and large river basins.

Source: Mitigating Natural Disaster, DHA Publications, March 1991.

■ LEBANON
Snowstorms

In February, snow and rain storms, considered to be the worst in nearly fifty years, left many areas of the country devastated and totally isolated during more than two weeks, particularly in mountainous regions located above 400 meters altitude where the snow accumulated up to 10 meter drifts. The situation culminated on 29 February when very heavy snowfall caused numerous casualties, considerable further disruption of power supply and telecommunications, and destruction of private property (dwellings, agricultural land and forest cover). 25 people were killed, 75 were injured and 3,000 people were made homeless. In early March, the improvement of weather conditions allowed the re-opening of roads and the re-establishement of contact with the isolated population, estimated at 100,000.

■ MONTENEGRO
Overflow of River Tara turns into threat of an ecological disaster

In October, heavy rainfall caused flash-floods in northern Montenegro, one of the Republics of former Yugoslavia. More than 6,000 people lost their homes, roads and bridges were washed away, and large parts of the electrical and communications networks were destroyed. While the first assessment of damages was being made, the threat of an even worse disaster appeared: Northern Montenegro is known for the unique scenery of its high mountains, rivers, canyons, and almost 100,00 hectares of natural parks. The river Tara, listed by the World Biosphere Reservation network of UNESCO as one of the world's cleanest rivers, flows within this parkland. It is right on the banks of this river, in the small town of Mojkovac, that a tailing dam holding back some 3.5 million cubic

Montenegro: A Profile

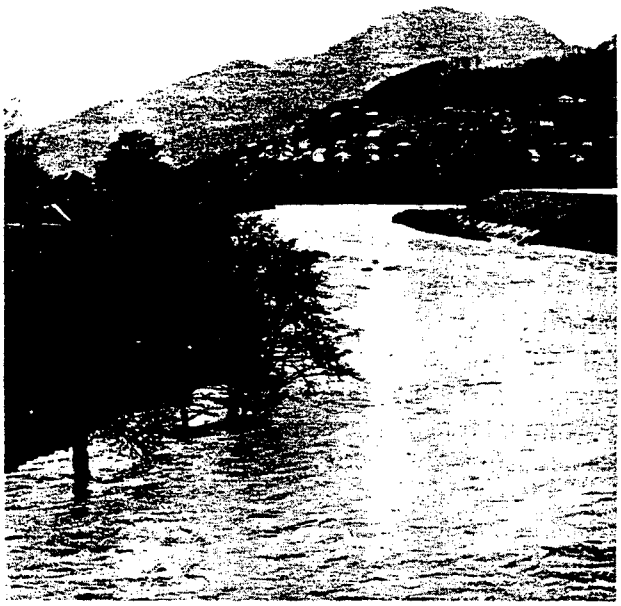
Montenegro, bordering Serbia to the south, is the poorest and least developed of the Republics of the former Yugoslavia. Its weak economic situation has been exacerbated by the process of economic transition, war sanctions and a decline in tourism. Only 134,183 persons are employed, as compared to 189,925 who are either unemployed, retired, or on social security. The 85,000 refugees and displaced persons have added further burden to the country's weak economic situation.

The country at a glance

Montenegro, with an area of 13,812 km^2 and a population of 616,000, is situated in the southwestern part of the Balkan Peninsula, on the southern coast of the Adriatic Sea. Going inland, not far from the coastal strip, mountains peaks close to 2,000 meters high soar towards the sky. The country abounds in lakes. There are over 30 of them. Lake Skadar is the biggest in the Balkans. The territory of present-day Montenegro has been inhabited since prehistoric times. The Slavs settled in this area at the end of the 6th century, penetrating through Roman roads and slowly blending with ancient tribes, thus assimilating various ethnic groups. The first Slav state called Dukjla, was formed there. In the 11th century, the name Zeta appears. By the end of the 12th century, Zeta became part of the Serbian state. By mid-15th century, Turks arrived in Zeta. By the end of the 15th century, the Turks had conquered all the Zeta territories, and this marked the end of the state of Zeta. From the 18th century onward, Montenegro progressively freed itself from the Turkish rule and entered the international scene. Montenegro became a Principality during the reign of Prince Danilo (1815-1860). It acquired independence in 1878, at the Berlin Congress. In 1910, under the rule of Nikola I it became a Kingdom. In 1918, Montenegro became part of Yugoslavia.

As a relatively small Principality and Kingdom, Montenegro made its first steps towards an industrial economy only at the end of the 19th century. The causes for this delay lie in the small population, lack of raw materials, under developed transport, reduced investments, and also in the national effort to ensure independence as well as survival of the state and its history. The first factories were built during the first decade of the 20th century. This brief industrial and economic evolution was interrupted by new wars - the Balkan War (1912-1913), followed by World War I and World War II. Between the two world wars, agriculture remained the main economic source, while industrial plants were limited to wood mills, tobacco factories, breweries and salt-works. The economy made major progress after World War II only. Once more destroyed and plundered, Montenegro made greater strides in its economic policy and development. ■

meters of slimes from lead and zinc mines was severely damaged by the floods If the highly toxic slime leaked into the river, horrendous damage all along its course could not be averted. Zinc is poisonous for all plants, and lead is highly toxic for animal and human life. The area threatened was unpredictable because the Tara is, through the Drina and the Sava rivers, a tributary of one of Europe's greatest river, the Danube.



A. Krumdieck Photo

Overflow of River Tara

■ NICARAGUA
Earthquake and tsunami strike the country

On 1 September a powerful earthquake measuring 7.2 on the Richter scale, followed by a tsunami with waves reaching 15 metres high, struck the Pacific coast of Nicaragua, some 120 kilometres south-west of Managua. 116 people were killed, 489 injured and 63 missing. 40,500 persons were directly or indirectly affected. The chain of 40 volcanoes stretching across Nicaragua constitutes a continuing eruptions' threat.

Previous disasters:

The country's history is marked by earthquakes (the quake of 23 December 1972 killed about 10,000 people) and volcanic eruptions. Nicaragua suffered from civil war from 1980 to 1989, and was struck by hurricane "Joan" in October 1988. The country was then struck by a tsunami, with damage estimated at US $25 million. The coastline was devastated, as the winds and more than 100 aftershocks knocked down everything in their path. Most vulnerable of all were the children, many of whom were carried away by the waves. Those who survived suffered from respiratory problems and diarrhoea.

■ PAKISTAN
Destructive monsoon

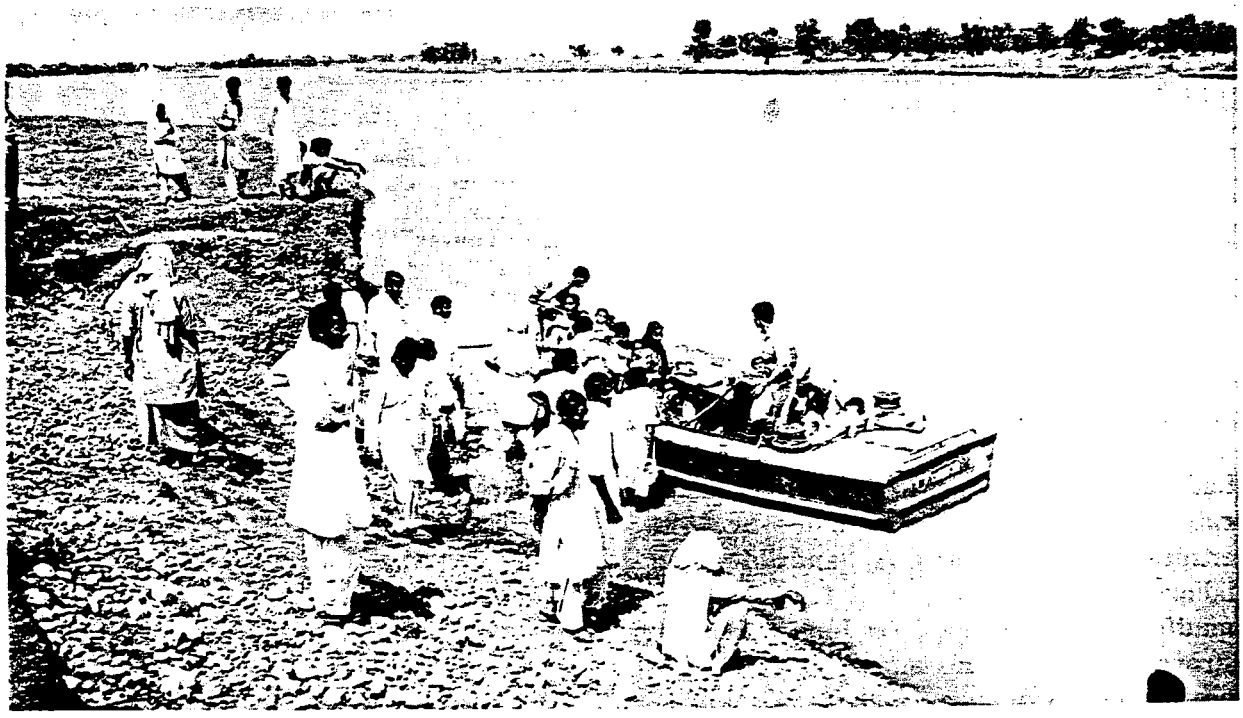
Since August Pakistan has been the scene of a series of natural disasters: torrential monsoon rains in the province of Sind in the south-east of the country; an earthquake on 28 August 100 km south-west of Quetta and floods in the Azad Kashmir region in the north-west. Most of the territory was affected and 1,500 people died. 6,722,950 people were victims of the floods. 12,048 villages suffered extensive damage. 1,192,000 houses were destroyed or damaged and more than 2,400,000 hectares of land were devastated. The loss in crops and infrastructure was estimated at US $80 million and forests were also damaged.

The unprecedented violence of the monsoon rains (the worst since Pakistan achieved independence in 1947) caused rivers to overflow in the province of Punjab resulting in heavy loss of life and serious economic

consequences for the region, which is Pakistan's main agricultural area. In the province of Kashmir thousands of people had to abandon their homes which were threatened by landslides and mudflows. The violent cresting of the Jhelum and Cheneb rivers which join the Indus in the Punjab seriously affected the North-West Frontier Province and the southern province of Sind.

Pakistani Press Photo

Pakistani officials visiting a house ruined by the floods in Panhar district Gujrat



Pakistani Press Photo

Evacuation by the army of marooned people in Jhelum city

■ PANAMA
Tornado

Schools, houses, factories and electricity system were damaged by a tornado which struck the suburban areas of Panama city with winds up to 200 kilometres per hour on 6 July at 4 pm local time. 12 persons were killed and over 50 injured.

■ PAPUA NEW GUINEA
Eruption of a volcano

In mid-October, a volcano erupted in the Island of Manam, 800 km northwest of Port Moresby. Stage alert 3 (on a scale from 1 to 4) was declared and disaster preparedness measures adopted in view of the possible evacuation of the 6,000 residents of the island.

■ PARAGUAY
Floods

As a result of the overflow of the Paraguay river, a state of emergency was declared. 15,500 families had to leave their houses. Flood waters severely damaged crops and farmland.

In 1990, Parana's river floods affected 120,000 persons.

■ PHILIPPINES
The Mount Pinatubo eruption continues to cause destruction in central Luzon

Inactive for 600 years, Mount Pinatubo erupted again on 16 June 1991, causing the death of more than 800 people. Over 250,000 had to be evacuated. Since July 1992 heavy rain combined with the ash of the 1991 eruptions caused flooding, landslides and lahars (an Indonesian word for enormous mudflows) up to 1.6 metres high which destroyed bridges, roads and dwellings in the provinces of Pampanga, Tarlac and Zambales, north of Manila. Since last August the region faced the threat of a further eruption. Continuous torrential rains over Mt Pinatubo triggered lahars and secondary explosions, particularly along the Sacobia river; ash was flung to a height of 5,500 metres. The disaster increased in magnitude, with at least 50 dead, 13 injured and 10 missing. The number of persons affected reached 942,764. In the plains of Luzon, which are often flooded during the monsoon period, the entire rice and sugar cane crops were swept away by millions of tons of ashes and rocks carried along by the violent rain, that fell during three successive typhoons, "Polly" being the most violent of the three. In addition, many historical sites were destroyed or suffered major damage. This was the most severely affected area. A total of 3,388 homes were destroyed or damaged and the overall damage was estimated at approximately US $74.2 million.

Volcanic disasters since 1700 involving a thousand or more fatalities

Volcano	Country	Year
Awu	Indonesia	1701
Oshima-Oshima	Japan	1741
Cotopaxi	Ecuador	1741
Makian	Indonesia	1760
Papandayan	Indonesia	1772
Laki	Iceland	1783
Asama	Japan	1783
Unzen	Japan	1792
Mayon	Philippines	1814
Tambora	Indonesia	1815
Galunggung	Indonesia	1822
Mayon	Philippines	1825
Awu	Indonesia	1856
Cotopaxi	Ecuador	1877
Krakatau	Indonesia	1883
Awu	Indonesia	1892
Soufrière	St. Vincent	1902
Mt. Pelée	Martinique	1902
Santa María	Guatemala	1902
Taal	Philippines	1911
Kelud	Indonesia	1919
Merapi	Indonesia	1930
Lamington	Papua New Guinea	1951
Agung	Indonesia	1963
El Chinchón	Mexico	1982
Nev. del Ruíz	Colombia	1985
Nyos	Cameroon	1986

Sources: Volcanic Emergency Management, UNDRO/UNESCO, 1985, Publication. (Updated by DHA).

■ SRI LANKA
Cyclone

The Eastern coast of Sri Lanka was struck by a cyclone on 12 November. Heavy rainfall poured down throughout the country. Three persons were reported dead. Houses and communication lines were damaged, as well as railway and road networks, particularly in the Ratnaourad, Badulla and Nuwara Eliya districts.

■ ST VINCENT AND THE GRENADINES

Heavy rain caused severe flooding on 29 November. The airport had to be closed because of violent tropical storms and a river burst its bank at Mesopotamia resulting in the death of three children. Coastal roads on both sides of the island were partially blocked by landslides, and housing was damaged as well. Electricity, water and telecommunications were interrupted.

■ TURKEY
547 people die in Erzincan earthquake and over 100 disappear in avalanches

Southeastern Turkey was affected by avalanches which killed 138 people on 1 February.

Since the middle of this century Turkey is one of the countries to have suffered most from seismic activity. Its location on the Alpine Himalayan sismo-tectonic belt, one of the two major world's earthquake belts, makes it highly vulnerable.

On 13 March, at 20.10 hrs local time, an earthquake measuring 6.8 on the Richter scale struck Turkey about 40 kms east of

Major Earthquakes

Major earthquakes of the 20th century: The location is followed by the Richter scale magnitude and the number of dead.

June 21, 1990, **Iran**, - 7.3 - 40,000.
Dec. 7, 1988, **Soviet Armenia**, - 6.9 - 25,000.
Sept. 19, 1985, **Mexico**, - 8.1 - 9,500.
Oct. 30, 1983, **Turkey**, - 7.1 - 1,300.
Dec. 13, 1982, **North Yemen**, - 6.0 - 2,800.
Nov. 23, 1980, **Italy**, - 7.2 - 4,800.
Oct. 10, 1980, **Algeria**, - 7.3 - 4,500.
Dec. 12, 1979, **Colombia & Ecuador**,-7.9- 800.
Sept. 16, 1978, **Iran**, - 7.7 - 25,000.
March 4, 1977, **Romania**, - 7.5 - 1,541.
Nov. 24, 1976, **-Eastern Turkey**, - 7.9 - 4,000.
Aug. 17, 1976, **Philippines**, - 7.8 - 8,000.
July 28, 1976, **Tangshan, China**, 7.8 to 8.2, official figure: 242,000. Unofficial estimates: as many as 800,000.
May 6, 1976, **Italy**, - 6.5 - 946.
Feb. 4, 1976, **Guatemala**, - 7.5 - 22,778.
Sept. 6, 1975, **Turkey**, - 6.8 - 2,312.
Dec. 28, 1974, **Pakistan**, - 6.3 - 5,200.
Dec. 23, 1972, **Nicaragua**, - 6.2 - 5,000.
April 10, 1972, **Iran**, - 6.9 - 5,057.
May 31, 1970, **Peru**, - 7.7 - 66,794.
March 28, 1970, **Turkey**, - 7.4 - 1,086,
Aug. 31, 1968, **Iran**, - 7.4 - 12,000.
Aug. 19, 1966, **Turkey**, - 6.9 - 2,520.
March 27, 1964, **Alaska**, - 8.4 - 131.
July 26, 1963, **Yugoslavia**, - 6.0 - 1,100.
Sept. 1, 1962, **Iran**, - 7.1 - 12,230.
May 21-30, 1960, **Chile**, - 8.3 - 5,000.
Feb. 29, 1960, **Morocco**, - 5,8 - 12,000.
Dec. 13, 1957, **Iran**, - 7.1 - 2,000.
July 2, 1957, **Iran**, - 7.4 - 2,500.
June 10-17, 1956, **Afghanistan**, - 7.7 - 2,000.
March 18, 1953, **Turkey**, - 7.2 - 1,200.
Aug. 15, 1950, **India**, - 8.7 - 1,530.
Aug. 5, 1949, **Ecuador**, - 6.8 - 6,000.
June 28, 1948, **Japan**, - 7.3 - 5,131.
Dec. 21, 1946, **Japan**, - 8.4 - 2,000.
Dec. 26, 1939, **Turkey**, - 7.9 - 30,000.
Jan. 24, 1939, **Chile**, - 8.3 - 28,000.
May 31, 1935, **India**, - 7.5 - 30,000.
Jan. 15, 1934, **India**, - 8.4 - 10,700.
March 2, 1933, **Japan**, - 8.9 - 2,990.
Dec. 26, 1932, **China**, - 7.6 - 70,000.
May 22, 1927, **China**, - 8.3 - 200,000.
Sept. 1, 1923, **Tokyo, Japan**, - 8.3 - 100,000.
Dec. 16, 1920, **China**, - 8.6 - 100,000.
Jan. 13, 1915, **Italy**, - 7.5 - 29,980.
Dec. 28, 1908, **Italy**, - 7.5 - 83,000.
Aug. 16, 1906, **Chile**, - 8.6 - 20,000.
April 18-19, 1906, **San Francisco**, - 8.3 - 503.

The Associated Press

Erzincan (560 kms east of Ankara). A thirty-second tremor shook the city and surrounding villages, bringing devastation in its wake: 547 dead, over 2,000 injured, and 5,000 buildings destroyed or damaged beyond repair. DHA recorded relief contributions of over US $10 million. Many people whose dwellings were not structurally affected by the earthquake were traumatized and refused to return to their homes. This situation is not new: for fear of aftershocks many people prefer temporary shelter outdoors despite, as it was the case in Turkey, sub zero temperatures, down to minus 20 Celsius at night. In 1939, Erzincan, had already been struck by a catastrophic earthquake, which killed 45,000 people.

Previous disasters:

On 24 November 1976 an earthquake occurred in the Van Province, Eastern Turkey. It was the world's 15th major earthquake of the year with a magnitude of more than seven on the Richter Scale, and the worst earthquake in Turkey since 1939 (3,837 killed, 4,800 injured, over 50,000 homeless). On 25 March 1977, four months after Van, Turkey was again struck by a strong earthquake in Palu. On 30 October 1979, Northeastern Turkey was struck by the 32nd major earthquake in the country this century: 1,346 dead, 1,137 injured, 5,084 houses damaged and 33,000 homeless. The area between Erzurum and Kars was the most affected one.

DHA/O. Almgren Photo

Disaster Relief Team in the streets of Erzincan hours after the earthquake struck

■ VANUATU
Tropical cyclones

The impact of cyclone "Betsy", in January, was not as devastating as originally feared. Public information before and during the cyclone seems to have significantly reduced the number of casualties (only 10 people injured). The greatest damage was inflicted on traditionally constructed housing and food crops. The traditional farming system of planting food crops in forest clearing

Cyclones, Hurricanes, Typhoons

A weather event, of the same type and force, may be called a cyclone, a typhoon or a hurricane depending on its location (although the generic name for all such events is tropical cyclone). But many people may have wondered why the hurricane which howled across the Caribbean basin in October 1988 changed its name from Hurricane "Joan" to Tropical storm "Miriam". This is because as the hurricane swept from the Atlantic through the Caribbean Sea and began to dissipate as it crossed the Central American isthmus, it was downgraded to a tropical storm and renamed "Miriam" in line with the list of names for such weather events in the Pacific.

Notification of the approach of a tropical cyclone is provided to hundreds of widely-scattered weather stations, airports, coastal bases, ships at sea, and the general public. Therefore its identification needs to be short, easily pronounced and remembered, and quickly recognizable by the people most likely to be affected. The cumbersome latitude-longitude description is the oldest method of identifying tropical cyclones. The practice of giving them personal names began several hundred years ago in the West Indies, when they were called after the particular Saint's Day on which they occurred, e.g. Santa Ana and San Felipe, which struck Puerto Rico in 1825 and 1876 respectively.

Towards the end of the last century, an Australian meteorologist, Clement Wragge, began naming tropical cyclones, often after political figures whom he disliked! The assigning of feminine names became widespread during World War II, when air force and navy meteorologists, plotting the movement of storms over the Pacific Ocean, used the names of their sweethearts, wives or favourite pin-ups for identification. In 1953, the practice of giving feminine names, in alphabetical order, to Atlantic hurricanes was initiated by the United States Weather Bureau. With the passage of time different countries adopted different sets of names, until in 1978 the international co-ordination of names became formally accepted under the auspices of the World Meteorological Organization.

The identification of tropical cyclones in the world's eight cyclone basins is now based on varying systems; the majority of them being alphabetical lists using masculine and feminine names alternately. For instance, in 1988 the first storm in the Atlantic region was called Hurricane "Alberto", which was followed by Hurricane "Beryl". The Atlantic region and the eastern Pacific each use six permanent but not identical lists of names, one for each year in a six-year period. The lists are then repeated. In most regions the only exception to the repetition of this cycle of names is that occasionally a country which has been severely affected by a storm will request that the name not be used again.

Source: UNDRO News, Sep./Oct. 1988.

protects them from strong winds because the surrounding trees act as windbreaks.

Cyclone "Fran" struck Vanuatu on 9 March with winds of about 90 knots gusting to 120 knots. Efate Island and Port Vila were the most affected areas. However, preparatory measures mitigated the destructive effects of the cyclone: i.e. all schools were closed, and the National Disaster Management Office broadcasted preparedness messages to the population every hour.

■ VIET NAM
Floods, typhoons and tidal wave strike the country

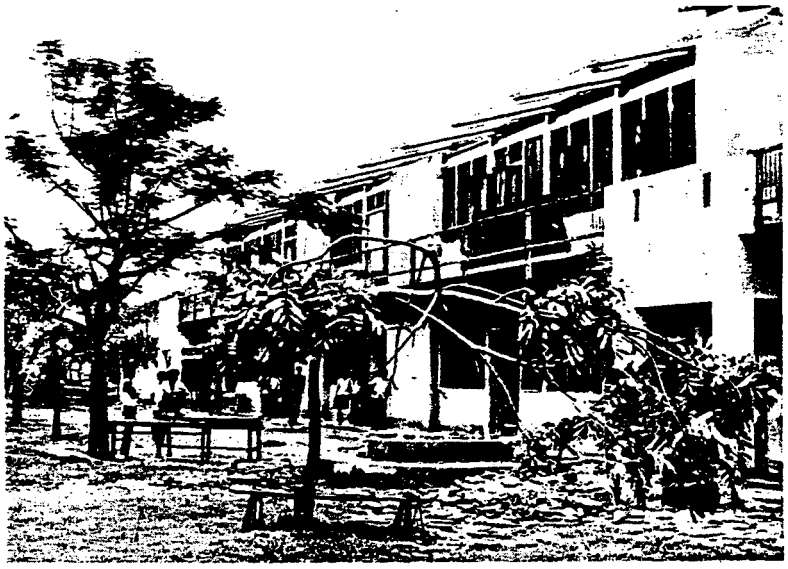
Torrential rains poured down throughout the central provinces between 5 - 9 October killing 55 persons. 68,360 houses were flooded as well as 13,000 ha of rice and 12,000 ha of other crops. Further floods from 28 to 31 October affected 58,000 persons. The most affected districts were again Quang Ninh and Le Thuy. The average rainfall was of about 400 mm and the highest recorded one was of 616 mm in Truong Son Commune, where nearly 3,000 people already rendered homeless during the previous floods were displaced. Many areas were between 2.5 m and 3 m deep under water.

The country suffered from the effects of the October floods and of typhoon "Angela" which affected 230,000 people in the Mekong delta. In addition, a tidal wave swept over two provinces affecting a further 14,000 people who lost most of their property.

The financial damage amounted to US $18 million. On 29 June the country was again struck by typhoon "Chuck".

Previous disasters:

The country was repeatedly struck by typhoons and floods in 1984 (five typhoons killed hundreds of people) and in 1985. Viet-Nam is one of Asia's poorest countries and life is a perpetual fight for most of its 62 million of inhabitants. The country is symbolized by two rivers: the Song Hong (the Red River) and the Mekong. The Red River, accumulated silt washed away from the northern mountains, elevating its banks throughout the years. Therefore the river flows 12 m above the level of the valley, thus threatening the population in case of inundations.



Following the passage of a typhoon in Viet Nam

■ ZAIRE
Earthquake

An earthquake, measuring 6.7 on the Richter scale, the most violent ever to have occurred in this region, shook the province of Shaba some 1,300 km east of Kinshasa. The losses resulting from this disaster were relatively minor: 9 dead, 61 injured and more than 50 houses destroyed. ■

Deaths in Historical Disasters by Geographic Area from the XVII Century to the Present

Disaster	Year	Deaths
Earthquake in Shensi (China)	1556	830,000
Earthquake in Calcuta (India)	1737	300,000
Earthquake in Messine (Italy)	1908	120,000
Earthquake in Kansa (China)	1920	180,000
Earthquake in Kuranto (Japan)	1923	143,000
Cyclone in Bangladesh	1970	400,000
Earthquake in Tangshan (China)	1976	240,000*
Cyclone in ***Bangladesh***	1991	133,000

Since the beginning of this century, 55 cyclones have hit Bangladesh, wreaking havoc and destruction in their path. The latest cyclone of 30 April 1991, one of the most destructive on record, devastated the entire coastline of the Bay of Bengal, from Cox'Bazaar and Chittagong in the East to Khulna in the West. A tidal wave, over 20-feet high, submerged a number of small and large offshore islands. The estimated death toll exceeded 138,000 by mid-May.

*Official figures. Other evaluation: Between 650,000 and 800,000. (Compiled by DHA).

The fate of many parts of the world is very often determined by particular climatic conditions, such as occurrence of the monsoon, which can bring disaster - as was the case in Pakistan - or which can bring an end to drought, as in India where the lives of 70 million people have been threatened. Although we are on the eve of the twenty-first century, and great progress is now being made in the areas of science and technology, human kind has not yet fully succeeded in taming the forces of nature and is sometimes powerless to deal with natural disasters, despite the existence of sophisticated alarm systems and the availability of highly skilled rescue teams. As proof of this it is only necessary to recall the sudden floods which occurred in south-eastern France and the devastation caused by hurricane "Andrew" in the Bahamas and in Florida in the United States. ■

Sources: DHA-Geneva Publications and Situation Reports, articles from the newspapers *Le Monde, The European Times, Herald Tribune, Journal de Genève* and *Le Nouveau Quotidien. Other sources have been compiled by the DHA- Geneva Office, Information and Resource Mobilization Branch.*

The boundaries and names on the maps do not imply official endorsement or acceptance by the United Nations.

This Special issue will also appear in French and Spanish.