PREVENTION BETTER THAN CURE

Report on human and environmental disasters in the Third World

prepared for the Swedish Red Cross

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with
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FOREWORD

Relief work is becoming increasingly difficult. "Natural" disasters are rapidly increasing and so are armed conflicts. In addition, we are forced to deal with new types of disasters. In spite of all our efforts to bring people back to normal with relief assistance, an increasing number of disasters appear to be endless processes that grow only larger and larger. It is like trying to bandage a wound that is constantly growing - frustrating indeed!

The major theme of this report is to draw attention to the alarming tendencies that can be seen in disasters affecting the very poorest countries in the world. The problems confronting us are frightening, to say the least, and one may wonder what the future will look like if these trends are allowed to continue.

When I say allowed, I mean that many disasters in the Third World take place because appropriate measures have not been taken to prevent them. We often ignore the fact that man-made elements play a large part in most types of disasters. Many new disasters occur as a result of human activities.

My highly esteemed friend, Henrik Beer, who was Secretary General of the Swedish Red Cross for 13 years and worked in the same capacity in the League, tells me: "I may have the somewhat dubious merit of having signed more disaster relief appeals than anybody else. A lot of progress has been made during the post World War II period, notably on short range, technical matters. But I have felt a growing frustration over the fact that what has been done has had, in many cases, only superficial effects; more cosmetic than profound."

"Some things seem to be necessary: to look at the suffering human being as the centre of our thinking, to acknowledge that disasters hit mostly at those who are poor, and to accept that many so-called natural disasters are caused by man. Thus, more disasters can be prevented than we thought before. The fact that broader approaches are now under serious study is a good sign for the future."

We want to emphasise disaster prevention in this report, as far too little is being done in this field. We are convinced that it is possible and, indeed, necessary to prevent many disasters in the Third World. In our opinion, it is urgent.

The term "natural disaster" is misleading. Forces of Nature, such as earthquakes, tropical cyclones and extreme variations in climate, do play an important role in triggering disaster events, but these natural hazards are not the most important causes of disasters. In the Third World, the major factors in the disaster processes are:

* human vulnerability resulting from poverty and inequality

* environmental degradation owing to poor land use

* rapid population growth, especially among the poor.

Earthquakes and tropical cyclones occur regularly in many poor countries, but these natural phenomena are not disasters in themselves. Disasters occur and increase because an increasing number of people become exposed and vulnerable to these natural phenomena.

Drought and flood disasters belong to a different category of disasters, in which the trend is most alarming. The root cause of the increasing frequency, severity and effects of droughts and floods are not to be found in climatic variations but in environmental degradation, caused by human activities. More environmental hazards are created by people at the same time as more and more people become exposed and vulnerable to them. Deforestation, inappropriate cultivation and overgrazing upset the ecological balance to such an extent that floods and droughts, paradoxically, may affect the same areas within a period of a few months.

It is not difficult to understand why short-term disaster relief cannot provide the adequate answer to these types of disasters.

The appropriate response must be a development process that improves the conditions of both the natural environment and many millions of poor people. Disaster assistance has to go hand in hand with development assistance, as it would be futile alone. It has to be a development process that improves the conditions of both the natural environment and many millions of poor people - a mass movement; literally at grassroots level.

This report marks a stage in our own learning process concerning disasters in the Third World, but we believe that some of the observations we have made will interest and hopefully also influence, other organisations and individuals who take interest in disaster problems.

Observations similar to ours have been made by others. Environmentalists, for instance, have pointed at the serious deforestation and desertification processes. Some organizations involved in relief as well as development have taken an active interest in environmental issues and undertaken work aimed at protection and rehabilitation of the environment.

UNEP has recently estimated that simply to stop further desertification would require a yearly investment of 4.5 billion US dollars over a 20 year period. However abstract such a figure may appear it gives a clear indication of the magnitude of the problem. Not even 10% of the required amount is presently being allocated to fight desertification. Whatever projects there are in the fields of protection, rehabilitation and prevention must be multiplied.

We are aware, as we try to show in this report, that some of the disaster

assistance in which we ourselves have been involved needs to be critically examined. The mere fact that the Red Cross is a very old organisation makes it necessary for us to guard against old-fashioned and conservative approaches to new, large problems. We see the need to improve our own disaster response and to link it up with disaster prevention whenever possible.

It is, however, evident that not only relief agencies like the Red Cross must critically analyse their policies and practices. The way disasters are increasing in many Third World countries makes us also question some present development practices. In fact, some of the increasing disaster tendencies bear evidences of development programmes that have gone wrong. We think it is important that Governments responsible for their countries' development, and organisations involved in development assistance, also take note of the alarming trends in disasters, and join hands in a battle against them.

To conclude, we are convinced that disaster trends are not irreversible - not yet. But if we delay our actions the day may soon come when this world can no longer cope with disasters.

Many disasters can be prevented simply by not creating them. We want to highlight priority areas that connect to environment, development and population problems. We also want to identify the roles of various "actors" who may take responsible actions to prevent Third World disasters. In this context we want to point out in particular the important roles that can be played by non-governmental organisations and among them, the Red Cross.

And, since we represent a humanitarian organisation, we want to stress the needs for human approaches. Disaster prevention must first of all aim at improving the conditions of the poor. The human side of disaster prevention is as important as the purely technical or environmental side.

ANDERS WIJKMAN
Secretary General
Swedish Red Cross

Note:
This study does not deal with situations of armed conflicts. The reason for this is not that we consider these disasters of minor importance. On the contrary, it is indeed alarming that the number of armed conflicts is increasing year after year, particularly so as many of the conflict situations are of a civil war nature. However, it was necessary to put limitations on our work.

ACKNOWLEDGEMENTS

On behalf of the Swedish Red Cross, we wish to express our profound gratitude to the Swedish International Development Authority (SIDA). Without its generous financial support, the study could not have been undertaken. We are grateful to SIDA not only for the financial support, but also for the very active interest shown during the process of our work.

We would like to acknowledge the League of Red Cross and Red Crescent Societies, which gave its support in many ways, not the least by making its reports and statistics available to us. The Office of US Foreign Disaster Assistance (OFDA) has been another major source of facts and figures on disasters, and the United Nations Disaster Relief Co-ordinator and his staff have been equally helpful with material and advice.

Among the other members of the United Nations system which have helped us with documentation services and advice are the United Nations Environment Programme (UNEP), the United Nations Childrens Fund (UNICEF), the World Bank, the Food and Agriculture Organization (FAO) and the World Food Programme (WFP).

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In Sweden, several institutions and individuals made considerable contributions to this report. The contacts with the Swedish University of Agricultural Sciences, through the Head of its International Department, Sven Pellbäck, have been particularly fruitful. His Colleague, Dr. Ashok Dar, provided us with two reports on the causes of famines - one on droughts and another on floods.

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A close working relationship was established with Earthscan, the

information service of the International Institute for Environment and Development (IIED) in London. Lloyd Timberlake prepared a Press Briefing Document on disasters, and Earthscan also took on the task of arranging a special press seminar in Stockholm, and presenting the results of our study in a paperback.

We are particularly grateful to the members of the Steering Group which has been guiding the preparation of this report:

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- Mr. Sverre Kilde, the International Department of the Norwegian Red Cross;

- Mr. Ulf Rundin and later Mr. Kurt Kristiansson, SIDA;

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GUNNAR HAGMAN

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PROLOGUE

A struggle for survival

Ethiopia's steep highlands were once covered with forests. Now, there are few trees left. As the increasing millions of Ethiopian's struggle for survival, vegetation and soil vanish, and the land cannot support its population. The same predicament can be seen in many countries in the Third World. Recurrent disasters are the most striking symptoms of these human and environmental ailments.

Some disasters seem to have become almost permanent fixtures that only grow larger and larger. Ethiopia has been chosen here to illustrate this predicament, but similar problems can be seen in many other countries. Ecological degradation, hunger, poverty and disaster vulnerability can be found in most parts of Africa south of the Sahara and in large areas of Asia and Latin America.

"NATURAL DISASTER"

At the begining of 1983, Ethiopia became the subject of a wave of international publicity. Like ten years earlier, many thousands of Ethiopians were again without food and water. Three million people in the four worst affected northern Regions did not have enough to survive. As many as five million people in a total of 13 Regions were affected in some way, according to the Ethiopian Government.

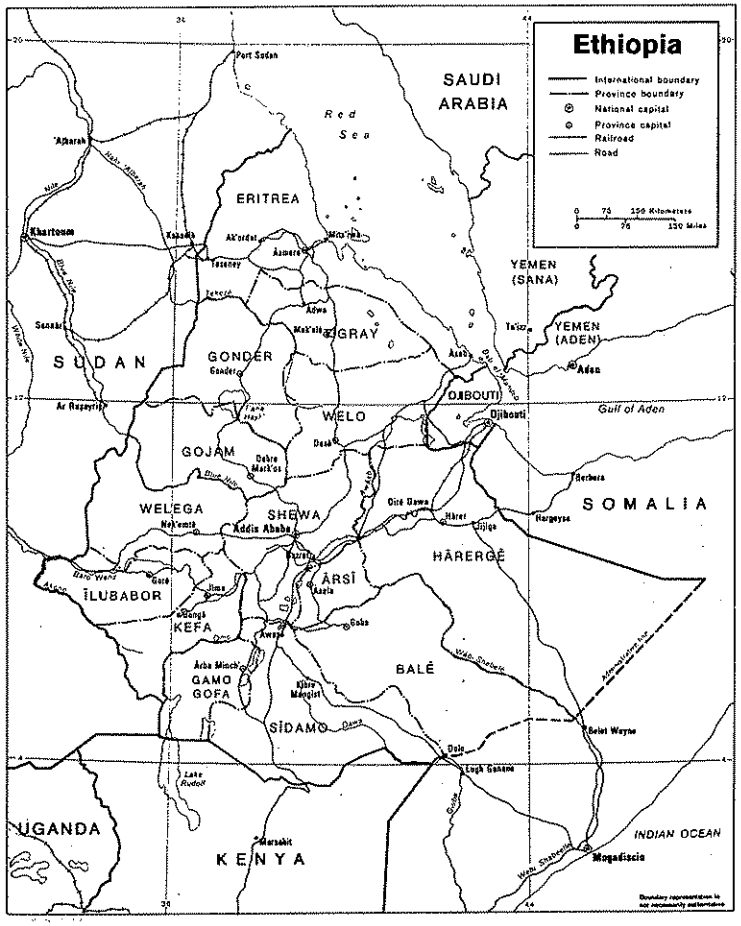

Figure 1. Map of Ethiopia. (From "Ethiopia, a Country Profile", Office of US Foreign Disaster Assistance, 1978/Base 504020 1-79)

According to early observations, it had not attained the status of a famine, but it was undisputedly termed a "severe drought", frequently a "natural disaster". As if by a strange whim of Nature, some places had not had any rain in the past 3 or 4 years. Consequently, no food, no grass, nothing was growing. Animals were dying by the thousands. People who suffered from hunger and thirst had to walk long distances to get help.

Ethiopia's Relief and Rehabilitation Commissioner (RRC) had asked repeatedly for increased food aid. 90,000 tons of extra food grain were needed for a six month period, and transportation had to be improved so that the victims could be reached. At last, the international community started to respond to government, United Nations, Red Cross and church appeals for emergency assistance.

LIKE CHINESE BOXES

On a visit to Ethiopia in May, 1983, a relief centre at Ebenat and its surroundings, located in an affected area of Gondar Region, was an eye-opener in many ways. Not one, but three, perhaps four distinct disasters seemed to unfold - one contained in the other, like a set of Chinese boxes.

The latest, smallest disaster was easiest to see and had therefore attracted most attention. It was the Ebenat relief centre itself, or "shelter", the term used in Ethiopia. This was encompassed by a larger and more diffuse problem - the shortage of water and food. The third and most widespread disaster was the severe ecological deterioration, the decline in Nature's resources. It would not have been fair to Nature to ignore a fourth disastrous issue: PEOPLE. Each smaller disaster had evolved from the next larger in a series of causes and effects.

This was the order in which at least some of the problems had attracted attention. We can look at them this way, although it is a bit like starting to peel an onion from inside.

A DISASTROUS "SHELTER"

In desperation, some victims of food and/or water shortage had left their remote homes and walked up to 100 km to crowd into a few distribution centres to get access to help. It must have been a very hard decision to leave home, but lack of roads and transportation, inadequate relief supplies and security problems would otherwise have left them starving.

The distribution centres had been established to serve people who came once or twice a month to collect free food grains, and as such were not designed to cope with people remaining there. Ebenat, a little town in the interior of the Gondar Region, had one of these centres.

A gradual concentration of affected people had already started at Ebenat by the end of 1982. In response, a few relief agencies began to provide aid. This exposed area near the town became a "shelter", although no real shelter was provided, as it was believed that this would have encouraged

people to settle more permanently and become too dependent on aid.

The relief services apparently attracted more affected people, who in turn attracted more relief agencies, journalists and other observers, who were able to reach this place quite easily thanks to a fairly good road. Ebenat became a sort of measuring point for the general drought condition in Ethiopia - a visible disaster, but not very typical of the unseen general situation.

The relief supplies did not keep up with the need for them at Ebenat. What was called basic food distribution did not amount to more than a supplement to other possible food sources. The weakest people grew more vulnerable and needed supplementary food. In spite of the establishment of a feeding centre, the number of severely malnourished children who needed intensive, therapeutic feeding grew from 3 to 12 per cent in two months. And in spite of the intensive care that these children received, some of the weakest died.

The result of these interacting factors started to resemble an emergency, and it was described as such to the world. It came to a head in May, 1983 when about 8,000 temporary settlers were reported at Ebenat. Something very unexpected happened then: abundant rain fell for 12 hours, at a time when normally no rain should have come.

The unusual rain had a pushing as well as a pulling effect on the "shelter" population. Pulling in the sense that people felt an urge to return home to cultivate their long idle land. But, as they had come an average of 50 km, they were not sure whether it had rained at home as well. Moreover, many of them had no oxen left for ploughing and no seeds to plant.

The pushing effect of the rain was explained by the instinct of self-preservation. People suddenly wanted to escape the unhygienic "shelter" environment. There was no drinking water, the sanitary conditions were miserable, and violent outbreaks of disease made the crowded relief camp a serious hazard. All of a sudden, 140 patients had to be treated in primitive hospital tents, and long, winding queues of out-patients kept an exhausted clinic staff fully occupied eleven hours a day.

Most of the temporary inhabitants did choose to leave Ebenat in a few days, in spite of no assurance of food at home, and no assurance of more rain or a normal harvest in November.

The Ebenat experience drew attention to the larger problems of the disaster but, at a high price. Luckily, it involved only a small fraction of the total population in need of help.

"Prevention is better than cure", ought to be the golden rule in every disaster context. The situation at Ebenat was a most unfortunate attempt to cure; it was not so much the effects of the drought that were treated as it was the consequences of the relief centre itself.

Undoubtedly a considerable portion of the precious resources that were spent at Ebenat on relief activities could have been used for more constructive purposes if preventive efforts, administered and organised in a different way, could have started earlier and in a wider context.

This leads to the next in size in the set of Chinese boxes: the widespread shortage of food and water.

SHORTAGE DISASTER

The disaster in Ethiopia in 1983 has been labelled a drought. It is worthwhile to take a close look at this and a few other terms.

Drought is usually a slow process without the sudden impact of a cyclone or an earthquake; it is more like an absence of impact. At least theoretically, no emergency phase would need to occur. As we have seen, circumstances sometimes create an emergency-like situation when there is a drought, but it depends on how it is handled and what possibilities there are for action.

In Ethiopia it was a long period without rain that led to a gradual shortage of water and a subsequent drought. Absence of rain does not necessarily produce a drought - there may be water reserves to avert it - but in Ethiopia, large areas had no reserves.

Drought prevents food crops and other vegetation from growing, but it does not necessarily result in lack of food, hunger and starvation. The United States also had a widespread drought in 1983, but none of these problems accompanied it. Vast surplus production in the past, large grain reserves, a developed market system, roads, transportation, financial reserves, insurance, etc., made the idea of an emergency very remote in the US.

Not so in Ethiopia, a poor country beset by shortages and deficits. National food production shows an increasing deficit, the market is not well developed, vast areas have no roads, means of transportation are inadequate, national finances are troubled by debts, crop insurance does not exist, etc. On top of this, the country suffers from drought quite often.

For want of a better term, we may call the wide emergency-like situation in Ethiopia in 1983 a "shortage disaster". The drought was a prominent ingredient in it, but not the only one.

The situation that developed in Ethiopia ten years earlier also went under the heading of "drought", but it differed in some fundamental ways. That time, the process had continued unabated for so long that at least 100,000 people were believed to have died in a virtual famine before it was "discovered" in 1973. There is no doubt that this was a factor in the fall of the Emperor in 1974. To make a distinction, we may call the process that emerged in 1973 a "neglect disaster".

Shortage of water is, of course, the most imminent cause of drought. In

early 1982, Government officials had already noted that people in Gondar had to walk for up to 12 hours to fetch a gallon of water. Continued lack of rain aggravated the problem and was the main cause for some people leaving their homes.

Even at Ebenat the shortage of water was a major problem. An old well in the vicinity appeared to be dry, and new wells had been dug with the same poor results. Even the attempt to drill a deep well had been disappointing. Here, the sudden rain added to the problem rather than solved it, as children started to drink polluted surface water from shallow puddles within the crowded area.

A daily limit per individual of about 2.5 litres of muddy, rank water was brought in by a Government truck. A puddle at the bottom of the nearby riverbed was the only source of water at hand. In some places, clearing and deepening of existing wells and digging of new water holes in dry river beds provided the possibility of obtaining drinking water, but for large areas water had to be brought from far away. Suprisingly this was not organised on a large scale.

The lack of water in general seemed to be regarded as an irretrievable Act of God. Water distribution over wide mountain areas did not appear to be realistic, whether by means of pipelines, air transportation, or caravans of trucks - not even by caravans of donkeys.

The food shortage was the subject of much greater attention, but in no way easier to understand or tackle. Here are some examples:

Amartya Sen, in his book, Poverty and Famines , expands on access to food in terms of what he calls "entitlement". It is an interesting angle from which to look at things.

Relief workers and journalists were "entitled" to all the food they wanted while they stayed in Ebenat - because they had money in their pockets. They just went into town and ate in a local restaurant. Their fellow human beings in the "shelter" were not "entitled" to that food, because they had no purchasing power. Should they have had that power, food might have been adequately available.

The neighbouring Region of Gojam was not affected by drought. From the Region of Gojam big trucks carried food grains hundreds of kilometres away from the needy in Gondar. The destination was the capital city of Addis Ababa, where people who never produce any food nevertheless were "entitled" to buy the surplus of Gojam. City-dwellers usually have that privilege. The unlucky grain producers of rural Gondar could claim no "entitlement" to the surplus relatively near them. They had to rely on imported relief supplies, which were brought 700 kilometres the other way, from Addis Ababa.

To an innocent eye, it appeared as if enormous resources in terms of trucks, fuel, manpower and time were spent on just moving grain back and forth. To refuse to accept this state of things, however, would have been to refuse the reality of "entitlement". It was in this context that the

Relief and Rehabilitation Commission (RRC) asked donors to help strengthen its fleet of trucks. Some donors apparently agreed that the RRC was entitled to this. It might not have been necessary if the imported food could have remained in the capital city and the local surplus had been redistributed in the neighbouring rural areas.

Another aspect of "entitlement" was illustrated at a meeting arranged by the United Nations Disaster Relief Co-ordinator (UNDRO) on 3 June 1983 in Geneva. The Ethiopian Relief Commissioner was there to persuade donor agencies to come forward with larger food contributions. To support his arguments, he produced some interesting figures. About three million people were counted as equally affected in Wollo, Eritrea, Gondar and Tigre Regions. They might therefore, one would assume, have been equally entitled to food aid. But only one million were "reachable", so the Commissioner asked for 90,000 tons of grains for the "reachable" only. The remaining two million hungry people had no "entitlement" to international aid as they were living too far away in the mountains and/or were encompassed by the security problems in the northern regions.

It should be mentioned that the RRC demonstrated a policy of equal entitlement in areas where people could be reached or were able to come and collect food grains. To follow this policy when the reserves are limited can result in very meagre rations. One RRC report states that 164,467 persons were assisted in the Gondar Region between July, 1982 and January, 1983. They received 2,924 tons of food, mainly grains, which means an average of no more than 2.5 kg per individual in a month - less than 300 kilo-calories per day or 13 per cent of daily requirements. Observers agree, however, that this action averted a famine.

The equal distribution can even help to explain why a calamity like the Ebenat "shelter" could occur. It was not only the few thousand temporary settlers who were to benefit from the relief supplies. The limited grain reserves had to be shared with many others, reportedly 50,000 needy, who came once or twice a month from a wide area to bring home the share they were entitled to.

Drought is in fact a normal feature in Ethiopia. Droughts have occured often, and some people even believe in magical ten year cycles. In spite of this, farmers in drought-prone areas do not cope with the difficult years by securing their reserves in better years. Instead, many become increasingly vulnerable and struggle along at a subsistence level.

To find some explanation for this, we have to step into a new context, another Chinese box: the ecological predicament.

THE FORESTS HAVE GONE

A casual look at statistics may give the impression that Ethiopia's deforestation is rather modest. According to Ministry of Agriculture estimates, no more than 0.1 - 0.2 per cent of the total land area is deforested in a year, and in all likelihood the figure will come down to almost zero in the near future. Is this not a good sign?

On the contrary, the decreasing deforestation rate is a disastrous symptom of the decline in the Ethiopian environment. In actual fact, deforestation will soon amount to nothing because there will be almost no forests left to eat away.

Ethiopia's steep highlands and parts of the lower areas were once covered by various types of dense forests. Less than a century ago, about half of the country still had forest cover. Twenty years ago, this had dropped to about 15 per cent of the land area. By now, only slightly more than 3 per cent of Ethiopia's surface is covered by forests. In just a few more years the country will have lost all remaining forests if the trend continues unabated.

Deforestation is an old problem in Ethiopia. This has been illustrated throughout history by the repeated movement of the capital city. Addis Ababa (Amharic for "New Flower") was founded in 1887 by Emperor Menelik II. Its immediate predecessor, Entoto, like earlier capitals, had to be abandoned partly because of acute shortages of fuel wood and building timber. As the population increased in Addis Ababa, the new capital experienced the same problem less than 20 years after its foundation.

Addis Ababa still remains the capital, and has expanded considerably, owing to Emperor Menelik's decision in 1905 to introduce Ethiopia's first reforestation programme. Several varieties of fast-growing eucalyptus trees were imported from Australia and planted in the vicinity of the city. The trees took root and spread to the extent that Addis Ababa still has a vital supply of wood from the exotic forest cover of the surrounding hills.

However, the Emperor soon realized that the trees were a mixed blessing. He is said to have put a ban on further import and spread of exotic trees when he was told that the deep roots of the eucalyptus consumed so much ground water that farming was virtually impossible near the new forests.

THE SOIL RUNS OFF

Nor did the exotic forests keep the soil in place. Absence of ground cover left the area more or less bare between the trees and prone to water runoff. The little river that cuts through the city past the former imperial palace in Addis Ababa shows striking evidence of this after the frequent torrential rainfalls. When the rainwater comes rushing down the hillside forests and overflows the river, its reddish-brown color is due to the soil that it rapidly washes away.

The characteristics of this little river are not unique to Addis Ababa (or Ethiopia as far as that goes). It has been estimated by FAO that almost all Ethiopian rivers carry 10-15 per cent of solid earth in their volume of water. Most of this mud originates in the highlands where there is little or no vegetation left to stop the erosion. It ends up in Sudan, Egypt, the Mediterranean Sea, Somalia and the Red Sea.

The annual removal of soil from the denuded Ethiopian highlands is believed to amount to almost one billion tons per year, or an average of

32 tons each second. Try to visualize it: a slice of earth, one meter thick and five by five meters across, that disappears in the twinkling of an eye, again and again...

How long can this go on?

Actually, there are indications that these estimates of the erosion are no longer correct, with the result that the erosion ought to be less today - and the problem much worse. The estimates were made by FAO in the 1960 s, and have been quoted ever since in reports, books and newspapers, even in Ethiopia.

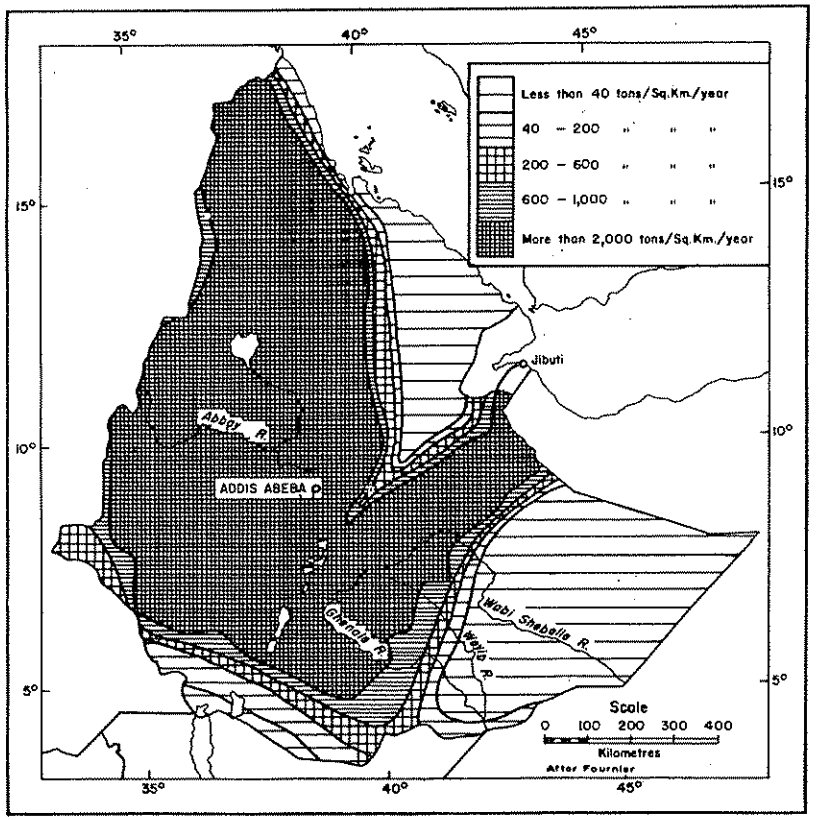

Figure 2. This map is taken from Carte du Danger d'Erosion en Afrique au Sud du Sahara by F. Fournier. The danger of erosion and its effect on the agricultural potential is evident. Note that more than 52% of the area of the country loses an estimated amount of more than 2,000 tons of soil/sq.km. every year. Source: Mesfin Wolde-Mariam, "An Atlas of Ethiopia", 1969.

Since the time of the FAO estimate, at least 15 billion tons of soil would have been removed from the Ethiopian highlands - in addition to all the erosion that must have taken place before. 15 billion tons spread out evenly over the entire highland area would have made a 25 cm thick layer of soil overall - gone in only 15 years! Was there ever such a thick layer on those steep mountains?

Like deforestation, the rate of erosion ought to decrease because less and less soil remains. This is in fact how it appears in many places. The worst "drought-affected" farmland in the Gondar Region has only bare rocks left. Most soil, including all topsoil, is already gone. This land has indeed "reached quite an irreversible condition", to quote the Ministry of Agriculture.

In his Introductory Geography of Ethiopia , the Ethiopian Geographer Mesfin Wolde-Mariam wrote in 1972:

> "The northern parts of the country, Eritrea, Tigre, and parts of Wello and Beghemdir (Gondar) are almost completely lost to agriculture because of the removal of the soil by the agents of erosion. It is not at all surprising that these northern parts where farming has been practised longest and deforestation completed earliest should now have exhausted their agricultural potential. It is surprising, however, that this same process should be allowed to continue without any measure of control in the southern parts of the country. The problem of erosion must be regarded as a serious and catastrophic problem to this agricultural nation...as a nation we must be able to foresee and show concern for future generations."

The cause of this ecological disaster can be traced to one single phenomenon with two components: people - how many there are, and what they are doing.

MORE PEOPLE, LESS FOOD

Population estimates have been made from time to time in Ethiopia, but there has never been a national census. The estimates for 1984 range from 33 to 40 million. The average annual growth rate is about 2.5 per cent. There are indications that the growth rate is falling slowly - in percentage but not in total year-to-year figures.

About 90 per cent of all Ethiopians are farmers, and most of them live in the sensitive highlands that make up about 40 per cent of the total land area. Along with people, 80 per cent of the country's 77 million head of livestock, which constitutes Africa's largest stock of domestic animals, are also crowded into the highlands.

Population pressure has led to such destructive land use practices as cultivation of steep slopes until the soil is washed away. Clearing of

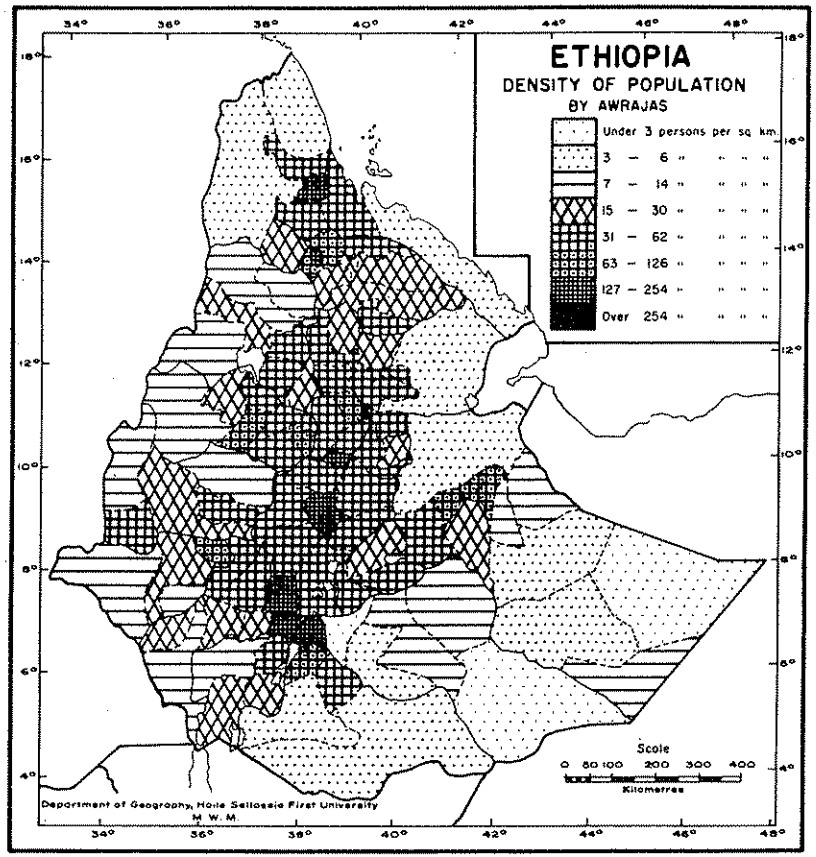

Figure 3. This map shows the approximate density of population towards the end of the 1960s. By 1984 the population had probably doubled with the effect that the density should be advanced one step in the map. Source: Mesfin Wolde-Mariam, "An Atlas of Ethiopia", 1969.

forests for firewood and building timber has depleted the forests. Over-grazing of steep mountainsides and semi-arid rangeland to support the increasing animal population has been equally destructive.

Erosion is only one of the problems destroying the fertility of the land in northern Ethiopia. In much of the countryside, firewood supplies have run out and animal dung and the straw from the harvest are being used for domestic fuel. Very little organic matter is returned to the soil, which is therefore becoming poorer, more exhausted and less capable of supporting its human and animal population.

In the lower rangelands erosion is less severe, but there is also less water. In these semi-arid regions the pastoralists have expanded their

herds to support the growing human population - and as a sort of insurance, or preparedness for drought.

Partly due to ecological decline Ethiopia is no longer self-sufficient in food. Since World War II the country has gone from being a net exporter of cereals, to self-sufficiency, to having a cereal deficit. The per capita production is falling by almost two per cent each year, making the country more and more dependent on imports and outside assistance. In the last ten years the volume of annual cereal imports doubled and the food aid in cereals quadrupled to constitute equal shares of the nearly half a million tons that were added to the annual domestic production of 5.7 million tons of cereals. It was far from sufficient. The gap between the needs and the supplies only widened. (see Figure 4)

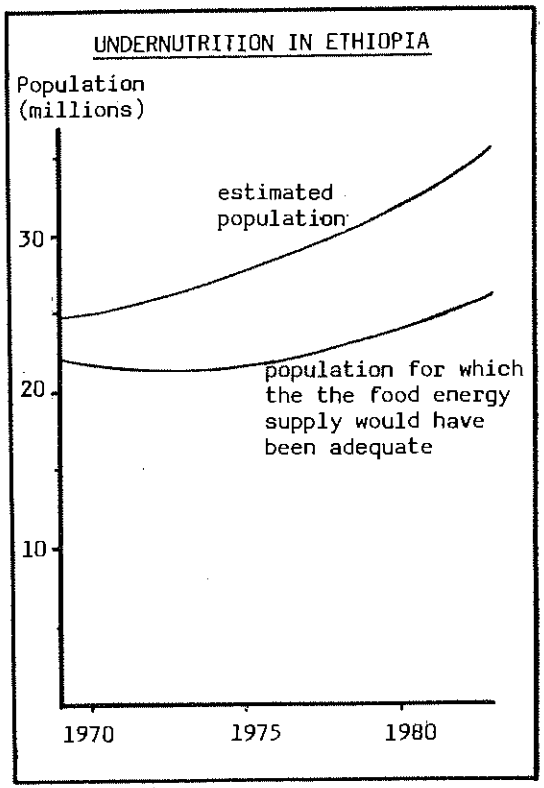

Figure 4. Undernutrition in Ethiopia.

The symptoms can be seen in a very large number of individuals. An increasing number of farmers never reach subsistence level, which makes them exceedingly vulnerable to crop failures and dependent on the inadequate supplementary aid.

As a result of constant food shortages, the Ethiopian population is among the most undernourished in the world. FAO statistics show that the average daily per capita intake of food energy dropped 13 per cent in the 1970s. In 1980 the supplies of food energy met only 74 per cent of the requirements. The average Ethiopian consumed only 1,724 kilo-calories daily. This was exactly half of the average intake in Denmark the same year, where people consumed 30 per cent above their requirement.

It has been estimated by the Ethiopian Government that about 3.7 million people are vulnerable to acute food shortage in any given year. In 1983 as many as 5 million suffered actual shortage due to the drought, according to the same source. Even under favourable climatic conditions,

the country would have had adequate food supplies for only 26 million people, leaving 9 million more to be fed. If West Germany's 60 million people, for example, could have shared half of the excess food they consumed with these 9 million Ethiopians, both countries would have had adequately fed and healthier populations.

The Ethiopian dilemma can be described as an extreme example of the interaction between man and the environment that has turned into a vicious circle:

In his struggle for survival, the undernourished farmer, along with his animals, aggravates the destruction of the sensitive environment upon which his existence depends, with the result that his chances of survival diminish further. This process is accelerated by a continuing population growth, both in terms of people and livestock, and it is aggravated further by armed conflicts and political unrest. It gained momentum long ago and is sweeping down from the north towards the south, leaving desperate people and a barren, useless landscape behind.

With this, the metaphor about disasters and Chinese boxes is complete.

In 1983, at least 300 million people were reported affected by drought in various parts of the world. This outnumbered, in only one year, the known drought victims of the whole decade of the 1970s and it was almost double the number in the 1960s. A similar trend was noted in floods, which also occurred on an unprecedented scale in 1983. Even disasters triggered by high winds, earthquakes and other natural hazards are increasing, as are wars and armed conflicts.

What are disasters? Why does the occurrence of disasters increase? What are the causes? How can we minimize the effects of disasters, and how can we prevent them? - These questions will be discussed in what follows. The focus is on causes, effects and possible preventive actions related to human vulnerability, environmental decline and disaster processes of the Third World.

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I. REPORT OBJECTIVES

Concern about the unchecked advances of severe disasters in the Third World, and frustration with the mounting difficulties in helping the victims recover formed the background to this report. This introductory chapter describes the report's focus, limitations and objectives, and explains why it emphasises disaster prevention.

CONCERN AND FRUSTRATION

The idea of making this report grew partly out of concern and frustration - concern about the unchecked advances of severe disasters in the Third World, and frustration with our own inability in the more affluent industrial countries to help the disaster victims recover. Often, disaster relief simply did not work.

Some important observations had accumulated within the international Red Cross movement at the beginning of the 1980s. It had become increasingly difficult for international relief agencies like the Red Cross to act only as emergency "fire-brigades" in the dominant types of disasters in the Third World. Some disasters, particularly droughts and floods, had become seemingly endless processes that grew only larger and larger. The number of affected victims in Africa, Asia and Latin America had begun to reach tens of millions per year, and in many places the victims were affected by wars and conflicts as well. The need for disaster assistance had grown rapidly, but it had become more difficult to reach the victims or to distinguish any particular emergency phases in the major disaster areas and decide when to start a traditional relief operation and when to stop.

It seemed questionable, even, whether the usual fast, short-lived emergency assistance, aimed at helping the victims back to the status quo, was an adequate answer anymore. How would the proper status quo be determinded in situations where the "normal" conditions were extremely unsatisfactory and continued to deteriorate at a high rate?

Would increased disaster preparedness, with additional warehouses, stockpiling of more relief goods, more trucks, ships and aircrafts, advanced communication techniques and expanded rosters of trained emergency specialists assure adequate, cost-efficient and meaningful responses in the long run?

FOCUS ON ROOT CAUSES

This was the starting point in June, 1982, when the Swedish Red Cross decided to undertake the study that is the basis of this report. In addition, to the concern and frustration, there were also strong elements of critical thinking and curiousity that influenced the work. These led to different directions from the traditional context within which the Red Cross has dealt with disasters.

Eventually, it was found necessary to dig deep into the subject to find out what actually caused major disasters and what possibilities there were to attack the root causes. The links between disasters and human vulnerability, environment and development were focused on.

This has certainly been very useful, although sometimes embarrassing, as some of the earlier Red Cross relief practices have indeed emerged as rather strange and erratic. The whole concept of previous disaster relief, preparedness and prevention - the very foundation of former action - has begun to look a bit doubtful to us.

JARGON AND PERCEPTIONS

Valuable remarks, which we feel have put us on the right track, have often come from people who do not normally work with disasters. Even the current disaster jargon has come under attack For example, the environmentalist Mats Segnestam pointed out serious misnomers when he asked "What do you mean by 'natural' and 'man-made' disasters?" This pushed the work in a new direction - we started to investigate how disasters were generally perceived, and what implications the perceptions had on disaster interventions in the Third World.

Such elementary points as definition and nomenclature seem to have major influences on governments' and relief agencies' approaches to disaster problems. What are called "natural disasters" are usually treated as inevitable phenomena, for example. To make things worse, even such misleading terms as "Act of Nature" or "Act of God" often add to the confused picture of disasters. Such terms do not invite action. It may even be felt that it would be a sin to try and prevent "Acts of God".

In fact, disaster prevention has not been directed much towards the root causes of disasters. According to a current definition, prevention deals principally with "physical and urban planning, public works and buildings". This only indicates measures to avoid some damaging effects from violent impacts such as earthquakes, high winds or floods. Nothing indicates an awareness of ecology as the means to prevent causes of floods and droughts, for example, or rural development as the means to prevent poverty and human vulnerability to major disasters, which would prevent many disasters altogether. Or, that access to food, employment and land, economic use of fuel and other natural resources, conservation of soil and forests, family planning, education, improved health and better nutrition could also offer major components of disaster prevention. We will expand on this in what follows.

EMPHASIS ON PREVENTION

The discovery that disaster prevention had been too little explored finally gave us the idea of where we ought to put the emphasis of this report. The title "Prevention Better than Cure" is not original, but we use it to emphasize our conviction that it is indeed possible, and necessary, to prevent many disasters.

In our opinion, the alarming increase in disasters is not irreversible - not yet - but there is definitely an urgent need for massive action to curb it. It seems as if it is almost a race against time, and if action is delayed, the day may soon come when there is no longer a chance of coming to grips with disasters in the Third World.

The report gives a great deal of weight to the environmental links to so-called "natural disasters" - a questionable term, the use of which we want to discourage. Such disasters are usually the combined effects of forces of nature and acts of man. One can even say that they are extreme failures in the interactions between man and environment. The increases in these disasters, which are illustrated by the statistics in the

following chapter, depend almost entirely on human activities.

Environmental degradation, or the process of the destruction of natural resources, and mismanagement either cause such hazards as floods and droughts or magnify the impact of others such as earthquakes and tropical cyclones. All disasters connected with those hazards have many man-made causes. Consequently it ought to be possible to counteract them with other, more intelligent, human actions.

ENVIRONMENT AND SECURITY

The term "man-made disasters" has a specific, limited , meaning in the current disaster jargon. It usually refers to political failures such as wars, armed conflicts and civil strife, which produce refugees and displaced persons. This particularly complex type of disaster is for the most part not addressed by this report.

However, it is worth noting that there are obvious environmental links even to this type of disaster.

Take Ethiopia. The Prologue to this report describes how the process of environmental degradation and catastrophic soil erosion gained momentum in the northern highlands and swept southward. Starting in Eritrea and subsequently appearing also in Tigre, Wollo and Gondar, the direction of the country's rebellious movements began to clearly follow this process over 20 years ago. As the northern lands wore out, the imperial government's interest turned south to more prosperous farming areas, not paying enough attention to the needs of the population remaining in the north.

Similar problems have caused the start of an international military crisis in Central America. The US Agency for International Development (US A.I.D.) issued an environmental profile in 1982 which concluded that "the fundamental causes of the present conflict are as much environmental as political, stemming from problems of resource distribution in an over-crowded land." This was said about El Salvador, but it was typical of the whole region. In Central America the tropical forests and the soil are apparently eaten away by large cattle ranches for the purpose of hamburger-meat export to the United States. This has been called the "hamburger-connection", and it obviously connects to both the environmental and the political crises of the region. The peasant-based guerillas in Nicaragua and El Salvador, directly or indirectly supported by one superpower each, appear to have been fighting principally for the same cause. It may be described as an environmental war, on the verge of turning into a superpower confrontation.

The decline in the environment thus means mounting security problems. Conflicts that are as much environmental as political are emerging in many countries of the Third World. As long as the environmental deterioration continues under growing population pressure, and much of the best land is kept away from the poor, conflicts and revolutions are likely to increase.

With or without armed conflicts, ecological deterioration has already

produced scores of refugees and displaced persons. In a 1984 publication by Earthscan, the international news service of the International Institute for Environment and Development, Jon Tinker writes that hundreds of thousands of people, perhaps as many as a million, have fled illegally from Haiti to other islands and to the United States. Some were probably political refugees, but most were environmental refugees, leaving an island whose ecological base has been so damaged that it can no longer support its growing population.

The refugees and displaced persons themselves are creating new ecological damage. Even disaster relief may be partly responsible. The pushing effect of the Ogaden war between Ethiopia and Somalia in 1977, and the pulling effect of the amount of international relief that was offered on the Somali side, lead to permanent refugee camps that are now surrounded by growing circles of new deserts in Somalia. Through their concentrated pressure on water, grazing and fuelwood, refugees from Afghanistan have created similar problems in Pakistan.

It goes without saying that many of the neglected basic components of disaster prevention which were indicated earlier would serve the purpose of preventing not only "natural" but also "man-made" disasters. The attempts so far to prevent wars, conflicts and security problems by international conventions and high-level negotiations have indeed had very poor results. They have usually been theoretical and have not recognized the links between environment and security.

Earthscan, in collaboration with the Swedish Red Cross, is presenting a special study in 1984 designed to focus media and NGO attention on the neglected subject of the links between environment and security.

LIMITATIONS OF THE REPORT

There are many important aspects of disasters and disaster assistance that are discussed only briefly in this report, and many possibly relevant connections have not been included. Such limitations are inevitable. Let us just mention some guidelines which ought to be kept in mind.

A vast amount has been written on the enormous problems of poverty. We have chosen to treat poverty mostly as an exogenous factor (growing from outside) in disasters. However, it is obvious that there are many links between poverty and disasters, some of which will be discussed in the following chapters.

Disasters usually strike hardest at the poor. Most victims belong to the poorest sections of the population, and many new disaster problems are due to the impact of the poor on the environment. This has led many to argue that poverty is the principal cause of disasters. Frederick Cuny, for instance, in his book, Disasters and Development, suggests that poverty should be recognized as the primary root cause of vulnerability and disasters in the Third World. But to say that poverty is the root of all problems would be, as we see it, to leave aside half, perhaps more of the real problem. It might even encourage such empty phrases as "poverty is the worst pollution", which have unfortunately been used in some

environmental debates, to the extent that most of the blame has been put on the poor themselves.

The problem of poverty points inescapably at the problem of inequity in resource and power-sharing. The fact that there is a marked imbalance in resource distribution and consumption between rich and poor, both at regional North-South and individual levels, has a strong bearing on disasters. In some areas where disasters are growing as the result of environmental mismanagement, the influence of the poor on the environment seems to be relatively small. How could the poor be the major cause of the large-scale destruction of the natural environment and the fast increase in floods and droughts in Latin America, when as much as 93 per cent of the lands are controlled by the richest 7 per cent of the population?

The problem of inequity indicates that there are political links even to "natural" disasters and their prevention, but we are not making an issue of these links here.

MAJOR DIFFICULTIES

One of the dangers that we discovered in the preparation of this report, is a tendency to focus too much on the technical side of disasters and too little on their human side.

This became evident when we started to discuss a "plan of action". As Mårten Bendz a forestry professor, exclaimed when we had talked at length about the vital role of trees and vegetation in flood and drought prevention: "We know what ought to be done from an environmental point of view, but we don't know how to make people do it. The biological techniques are fairly well known, but we lack the social techniques."

Many aid agencies, international organisations, and even governments in Third World countries may face the same problem.

We all have to learn from the poor themselves before we can design any specific project or plan of action which is appropriate for their needs.

This is why our suggestions in the concluding section are more general than specific. We are giving technical examples only to illustrate the vast potential that exists when it comes to physical implementation of disaster prevention. They are of little use, however, if the human side of environmental improvement is not considered. To find out exactly what a particular community needs, we have to get down to earth and learn together with the people in that community.

OBJECTIVES OF THE REPORT

This introductory overview has illustrated that disasters in the Third World are large, complex problems. Good intentions are necessary prerequisites for helpful actions, but they are not enough. Meaningful intervention has come a long way since it began with charity and alms. Today it requires commitment, a lot of knowledge, good understanding and

careful judgement. This report is made in the hope that it will contribute to the understanding of disasters and also inspire new action.

The Steering Group, which has been guiding the two-year project of which this report is the result, has agreed on the following objectives:

> The main objective of the report is to encourage action to prevent disasters in the Third World, thereby taking note not only of their effects but also of their causes, and to promote incorporation of disaster prevention in disaster assistance as well as development activities.
>
> To this end, the particular objectives of the report are:
>
> * to make a conceptual analysis of disasters, disaster response, disaster preparedness and disaster prevention related to Third World countries,
>
> * to point out major weaknesses in the present system of disaster management,
>
> * to call attention to the alarming increase in frequency and magnitude of Third World disasters,
>
> * to contribute to the understanding of the main causes of so-called natural disasters and their increasing severity, frequency, and consequences, with the focus particularly on human vulnerability to them and the part that environmental factors play in them,
>
> * to give the history and descriptions of the major types of so-called natural disasters occurring in Third World countries, and to call attention to the foreseeable effects of the present trends,
>
> * to stress the need for a widened disaster prevention concept, which includes components of the present disaster prevention and preparedness concepts and, in addition, takes note of the preventable causes of disasters,
>
> * to highlight priority areas for disaster prevention that connect to environment and development activities, illustrated by positive and negative experiences in the past, and
>
> * to identify the roles of various "actors" who may take responsibility for actions to prevent disasters in the Third World, thereby emphasising the need for their co-operation with each other.

II. TRENDS AND PERCEPTIONS

1. Increasing tendencies

A marked increase, both in frequency and in the number of victims, can be seen in recent disaster records. The sudden types of disasters associated with earthquakes and tropical cyclones create the highest death tolls, but floods and droughts appear to cause the fastest increase in affected populations. The majority of all victims belong to the poorest countries of the world.

NOTE ON DISASTER STATISTICS

Reliable disaster records on a world basis barely exist, and those available are usually not comprehensive. Most sources limit themselves to certain geographical regions or certain types of natural phenomena that are involved in disasters - the so-called disaster agents. Impacts of a sudden nature dominate all statistics.

Earthquake disasters are thus best covered, owing to the fact that the impacts are so easily detected with the help of seismographs. Other sudden events are also fairly well covered, as they usually make headlines in the newsmedia. Such is the case with disasters related to volcanic eruptions, high winds, large sea waves (tsunami and storm surges) and, to a lesser degree, floods. Droughts, famines and epidemics on the other hand are not very well covered, as those usually have slow onsets and may pass without being widely known.

The statistical analysis in this report is based mainly on two sources:

List of Major Appeals and Relief Actions, kept by the League of Red Cross and Red Crescent Societies ("League"), and

Disaster History List, produced by the United States Office for Foreign Disaster Assistance (OFDA).

These have some major advantages over other disaster records in that they

-include the biggest variety of events,
-cover relatively long periods of time,
-are being up-dated regularly.

The League

The League's records take note only of those events that were subject to major Red Cross actions. The data start from the year 1919 but are limited to: name of affected country, date of occurrence or of appeal, type of disaster, number of Red Cross Societies that responded to the appeal, and the value of the donations expressed in Swiss francs.

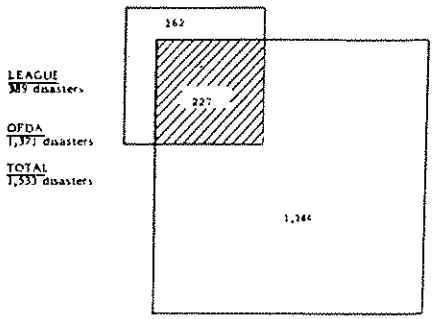
The list has no information concerning the disaster victims; neither about the number of killed or affected, nor the number of people that could be helped or any other results of the relief actions.

In spite of these limitations, the League's statistics are useful for comparative purposes. All the recorded events may be taken as reliable, "true" disasters, as they gave cause to international Red Cross actions. The reliability of other sources can thus to some extent be checked against these records. This has been done here with the OFDA statistics.

OFDA

The OFDA Disaster History List is probably the most comprehensive disaster data collection that exists in compiled form as far as volume is concerned. Starting from the year 1900, no less than 1,622 disasters had been listed until 1981 by OFDA. Like the League, OFDA continously updates its records.

True to its name, the Office only includes such events that are "foreign" from its own point of view. The list thus contains no events at all in the United States. The Disaster History List provides information (as available) on date of occurrence, type, location, number of people killed, affected, injured and homeless, as well as sporadic estimates of damages expressed in US dollars. The most complete figure column is the one concerning number of lives lost.



Correlation

A cross-examination reveals that, before 1964, more than 80 per cent of the "true" disaster events recorded by the League had been left out by OFDA. Since that year, which marks the inception of OFDA and its data compilation, the League disasters that are missing in OFDA's statistics are down to 42 per cent. The type of event where the two sources differ most is civil strife/conflict. Until 1981 the League had listed 109 such events against OFDA's 79. In total, however, OFDA had taken up three times more disaster events than the League up to the year 1981.

Owing to the poor correlation between the two sources in the earlier decades, the statistical analyses have been made here only on disasters that have occurred since 1960. It can be seen in the figure above to what degree the two sources coincided between 1960 and 1981. Of the 389 disasters recorded by the League, 277 (58.4%) had also been listed by OFDA. In addition, OFDA gives data on 1,144 disasters that passed without international Red Cross actions.

Tendencies

Both sources show a clear upwards trend in most types of disasters that have been recorded. To a certain extent this may be explained by factors related to the sources. The donors' ability to respond to Red Cross appeals has improved over time, and the League has been able to reach out to an increasing number of countries with assistance. Improved worldwide communication and information networks might have increased the flow of data to OFDA.

Trends in the statistics should therefore be viewed with a critical eye and not be taken as absolutely accurate. Some are, however, so marked that they may be considered as strong, fairly reliable indications.

GENERAL OBSERVATIONS

The earthquake that struck Tangshan in the People's Republic of China in July, 1976 was labelled the world's largest disaster event. Chinese authorities reported that 242,000 people were killed. Disaster statistics show that, in addition to the Tangshan catastrophe, earthquakes took almost 150,000 lives worldwide in the 1970-s, adding up to a total of 389,700 people killed in only one decade. In the 1960-s, the number of deaths attributed to earthquakes was about 53,000.

A tropical cyclone accompanied by a storm surge killed more than 200,000, possibly 300,000 people in Bangladesh in November, 1970. This single event caused at least twice as many deaths as all tropical cyclones during the 1960s. But apart from the Bangladesh disaster, tropical cyclones killed one and a half times more people in the 1970s than in the 1960s, when the death tolls totalled about 108,000.

Flood statistics show more modest numbers of people killed, but they also showed a tendency to increase: the number doubled, from about 24,000 in the 1960-s to 47,000 in the following decade. The frequency of flood events, however, increased fastest of all. There were 151 internationally recognized flood disasters in the 1960s. In the 1970s the figure rose to 222.

The annual flood losses in India have increased 14 times since the 1950s. In the 1970s, the losses due to floods averaged 845 million US dollars per year. The number of Indians who were prone to floods had reached about 250 million in the early 1980s. Throughout history, China and India have been known for their frequent floods, but South America is also becoming known for its floods. In 1983, the League of Red Cross and Red Crescent Societies launched international appeals on eight occasions to assist flood victims in South America. More than 1.6 million people were reportedly affected in five countries.

Statistics show that about 10,000 people died in drought disasters in the 1960s. In the folllowing decade the figure increased at least 23 times. In Ethiopia alone, an estimated 100,000 people died in the 1972-73 drought. At least as many as that were believed to have died due to the same cause in the Sahelian countries in the early 1970s.

In 1983, in only one year, as many as 300 million people in Africa, Asia and Latin America were reported to be affected by severe drought situations. In early 1984, newspapers reported 100,000 deaths caused by a combination of drought, food shortages and security problems in Mozambique, with another 100,000 people likely to die within six months. In the second quarter of 1984, when this report was written, over 30 African countries were still classified by FAO as drought-affected.

Statistics are obviously unreliable regarding wars and armed conflicts, but there is a notable increase also in these events. The number of people killed in armed confrontations or affected by them is seldom accurately reported, but at least one aspect of the problem is measurable: the number of refugees and displaced persons created. These numbers have

increased in recent years. Involving at least 46 countries, the total number of refugees and displaced persons in early 1981 amounted to about 10 million. In 1984 the reported estimates had increased to at least 15 million.

Disaster statistics seem to suggest that the global environment is becoming more hazardous and that people are getting more aggressive. Before we start to discuss the probability of these tendencies, it may be useful to consult the statistics in more detail in order to compare different types of hazards. Which hazard seems to be most dangerous, and which appears to affect most people?

STATISTICAL TRENDS

The following statistics are based primarily on records kept by the Office of US Foreign Disaster Assistance (OFDA) which have been checked against those kept by the League. The statistics start in 1960, since before this the sources differed too much from one another to be considered reliable (see Note on disaster statistics). Reliability since 1960 may satisfy the requirements necessary for at least some conclusions about the trends in disasters.

The statistics deal with the causes of certain types of events or disasters; that is, the so called "disaster agents". Five major types of events can be identified:

Drought
Flood
Civil strife/conflict
Tropical cyclone
Earthquake

All other events have been included in a sixth group, called "Other disasters". This includes epidemic, storm, landslide, avalanche, fire, extreme temperature, volcanic eruption, insect and rodent infestations and a non-specific type of events called "accidents" (usually industrial, mine, train, plane and major traffic accidents, widespread poisonings, etc.).

Civil strife/conflict includes wars, armed or other violent internal conflict, refugees and displaced persons. For many reasons, these records are not accurate. They have been included here in order to give a full account of the statistics available.

Tropical cyclone includes typhoon, cyclone and hurricane, which are essentially the same phenomena with different names in different parts of the world.

Drought, flood, tropical cyclone and earthquake disasters are often called "natural" disasters, while those included in civil strife/conflict have been termed "man-made" in disaster jargon. It should be noted that within the group "natural" disasters, earthquake is the most sudden and unpredictable hazard, while tropical cyclone is sudden but predictable,

and flood is slower and often predictable in its impact. Drought is a slow process without any sudden impact, and its course can therefore be closely observed.

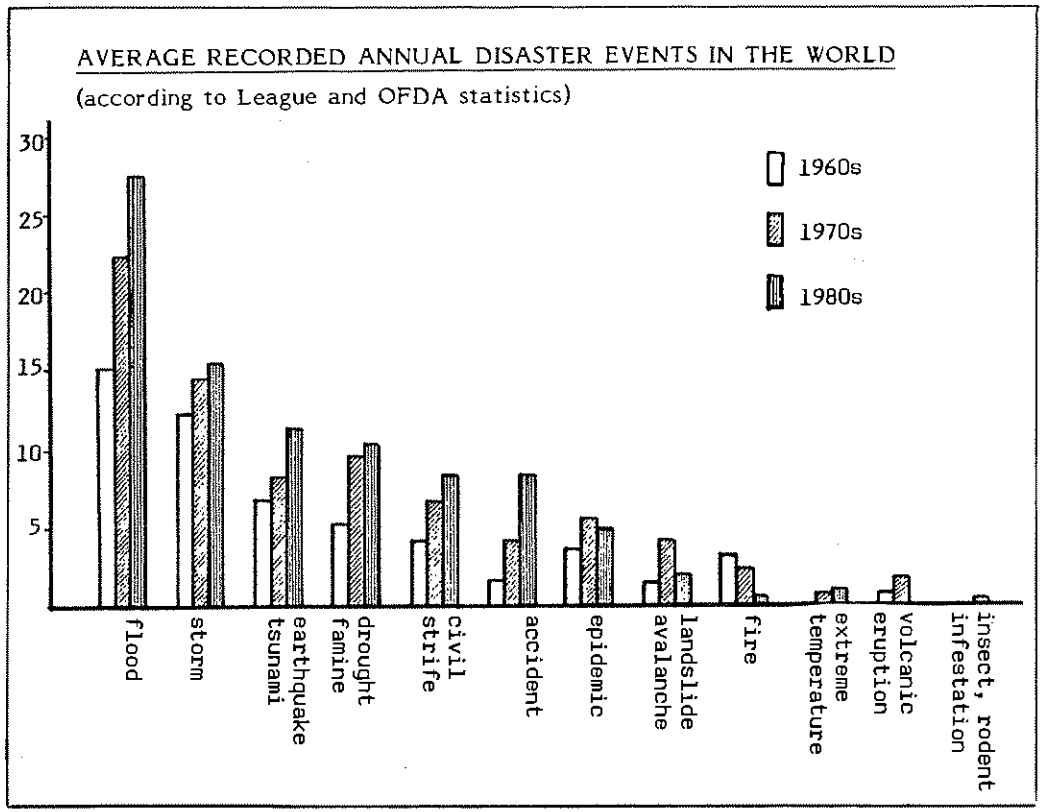


Figure 5.

Figure 5 shows the average number of disaster events per year (the 1980s cover only 1980-81). In this figure, 12 different categories of events have been distinguished. The number of recorded events can also be seen in Table 1 on the next page.

Flood was the most frequent disaster impact during the period, and the occurrence of flood increased most. Tropical cyclone (Fig. 5: included in storm events, of which it constitutes the major part) was the second most common disaster agent. All major types of events appear to have increased in frequency during this period.

TYPE OF EVENT	1960s	1970s
Drought	5	10
Flood	15	22
Civil strife/conflict	4	7
Tropical cyclone	12	15
Earthquake	7	8
Other disasters	11	20
Total disasters	54	82

Table 1. Average number of recorded disaster events per year.

Table 2 and figure 6 (on next page) show the average annual death tolls for each type of disaster event. Here a very marked increase can be seen in all types of events. In the 1970s, earthquakes surpassed tropical cyclones as the most deadly hazard, according to these records. The earthquake statistics for the 1970s were heavily influenced by the fact that 60 per cent of all the earthquake victims were killed by the devastating event in Tangshan, China, in 1976. (The official Chinese figure of 242,000 has been used here. OFDA gives its own estimate of 665,237 in its Disaster History List.)

TYPE OF EVENT	1960s	1970s
Drought	1,010	23,110
Flood	2,370	4,680
Civil strife/conflict	300	28,840
Tropical cyclone	10,750	34,360
Earthquakes	5,250	38,970
Other disasters	2,890	12,960
Total people killed	22,570	142,920

Table 2. Average number of people killed per year in disasters.

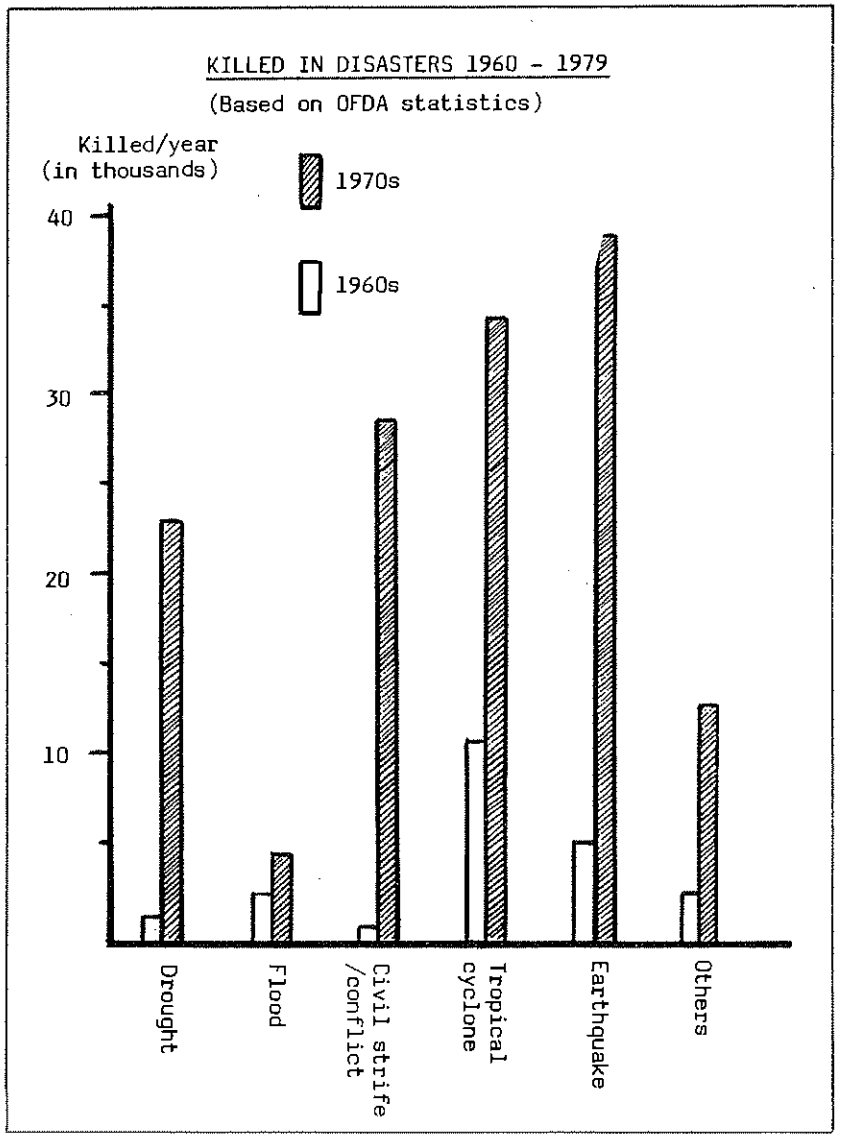


Figure 6.

Tropical cyclones were also dominated by a single event. This was the 1970 cyclone that took 200,000 to 300,000 lives in Bangladesh. (The lower number has been included in Table 2 and Figure 6.)

The predominate drought event in the '70s took place in the Sahelian countries and Ethiopia. OFDA is using a conservative estimate of 200,000 deaths in that disaster. This event, together with other drought

disasters, caused the death figure in the '70s to rise 23 times higher than it was in the 60s.

TYPE OF EVENT	*1960s*	*1970s*
Drought	*18,500,000*	*24,400,000*
Flood	*5,200,000*	*15,400,000*
Civil strife/conflict	*1,100,000*	*4,000,000*
Tropical cyclone	*2,500,000*	*2,800,000*
Earthquake	*200,000*	*1,200,000*
Other disasters	*200,000*	*500,000*
Total people affected	*27,700,000*	*48,300,000*

Table 3. Average number of people affected per year by disasters.

For most of the disaster events where US assistance was given, OFDA's records contain information about the size of the affected population. Although the term "affected" is vague, this part of the records presents a very interesting picture. Table 3 gives the average annual number of people affected per year for the different types of disaster events. It is shown graphically in Figure 7, and this explains the order of the six categories of disasters in these tables. This might indicate the order in which relief agencies ought to give their priorities.

Drought affected the most people both in the '60s and the '70s, and it was not in Africa that people were victimized most, but in India. Even in the '70s, a decade known for the Sahelian drought, 80 per cent of the drought-affected populations were living in India, according to OFDA's records. At that time Africa had less than 70 per cent of India's population. The degree to which the victims were affected might have differed considerably, of course.

It was not until 1983 that Africa surpassed India in the number of drought affected. 150 million Africans were being affected by droughts in 1983, according to FAO. India had 120 million affected in that year. This drastic increase in the number of drought victims in the 1980s, which is not illustrated by Figure 7, will be discussed in Chapter 10.

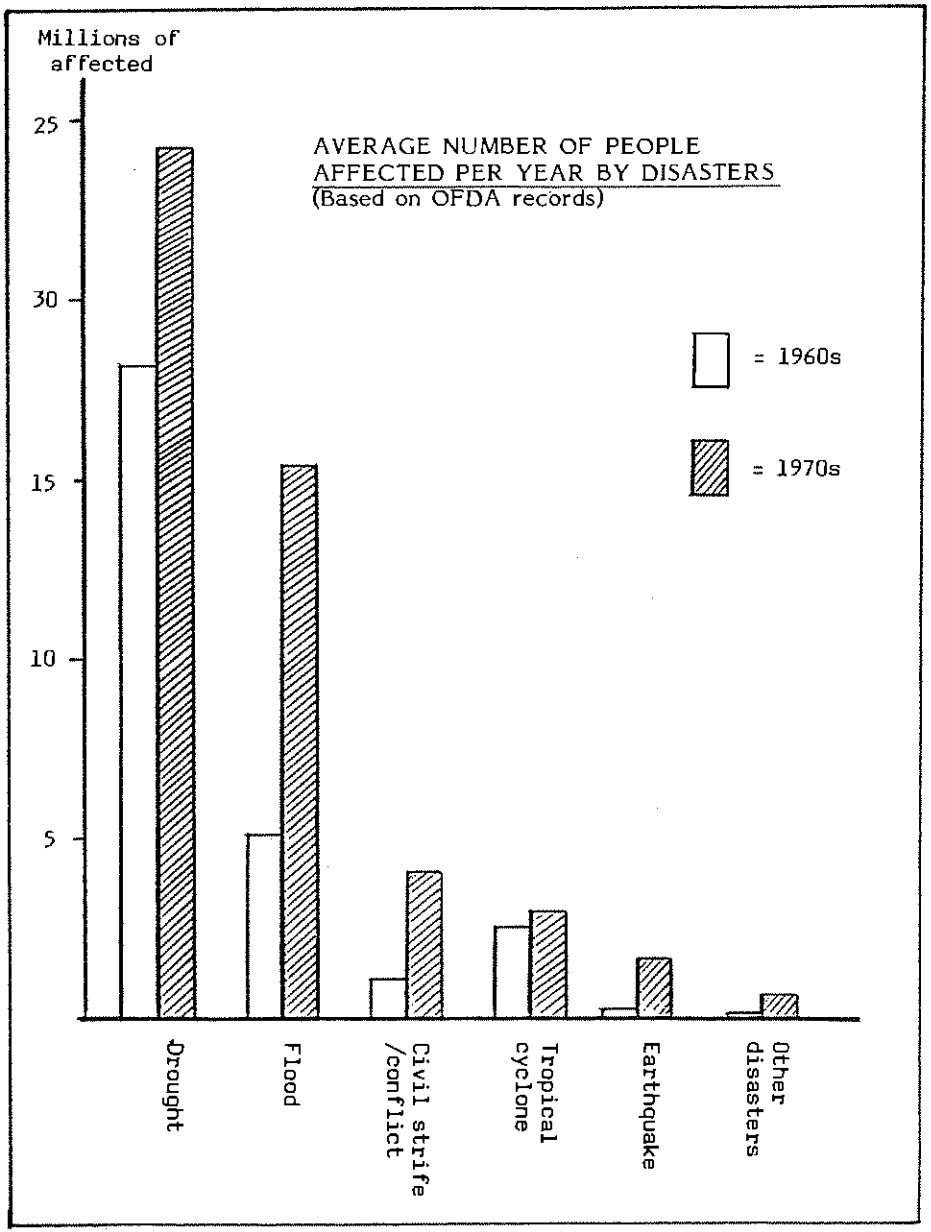


Figure 7.

It can be seen from Figure 7 that drought and floods are the major hazards affecting people. There are ecological as well as population and development links to these problems, as the following chapters will demonstrate. The fastest increase appears to be in floods, both in terms of frequency and number of people affected.

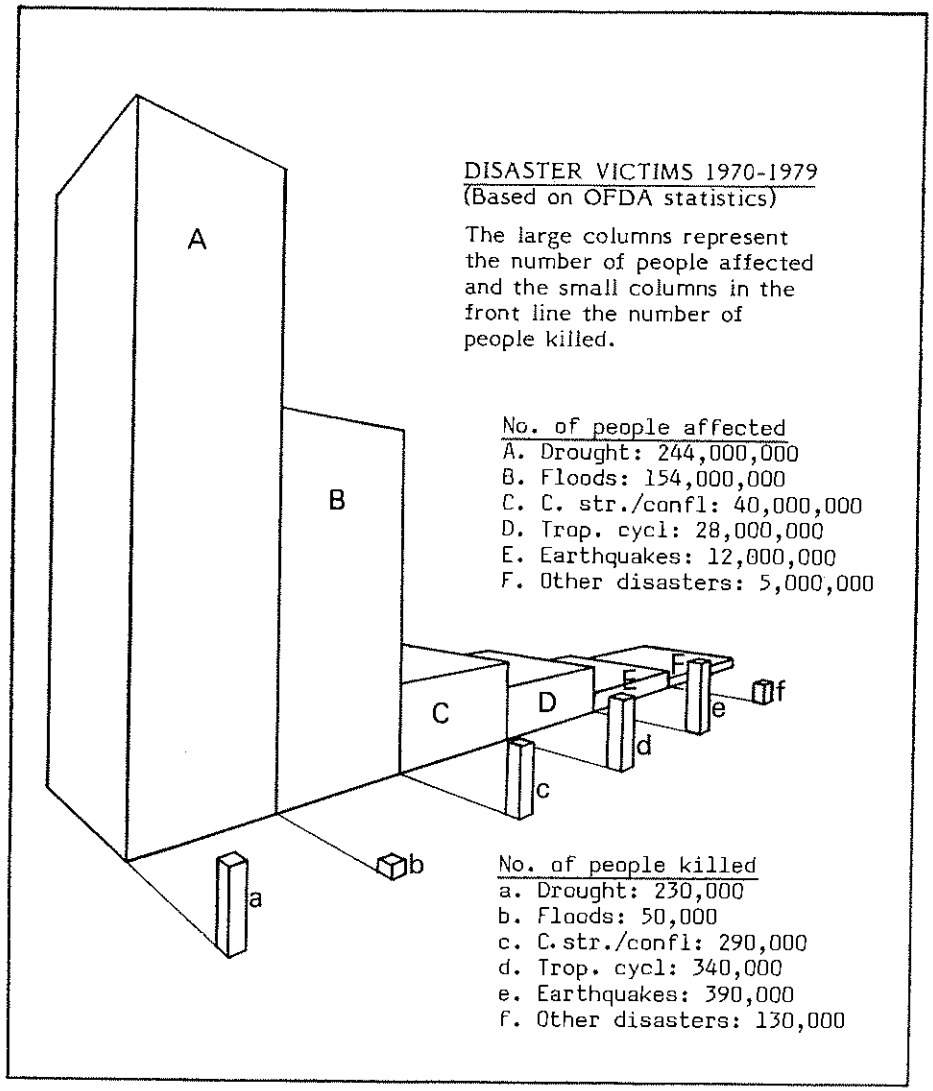


Figure 8.

Figure 8 gives an idea of how, for each hazard, the number of people killed related to the affected populations in the 1970s.

Table 4 is a list of those countries for which ten or more disasters were recorded between 1960 and 1981 by OFDA and the League. It also classifies the countries into low, middle or high-income categories. This list is a rough indication of those countries which are most prone and most vulnerable to disasters.

Country	Disaster events 1960 - 1981	People killed	Low-income economy	Middle-income economy	High-income economy
India	96	60,000	x		
Philippines	76	17,000		x	
Bangladesh	63	633,000	x		
Indonesia	59	17,000		x	
Japan	43	2,700			x
Brazil	39	4,100		x	
Iran	38	48,000		x	
Mexico	37	2,600		x	
Turkey	33	12,000		x	
Peru	31	91,000		x	
Korea, Rep. of	27	2,900		x	
Burma	26	1,500	x		
Colombia	26	1,800		x	
Italy	24	6,100			x
Vietnam	22	8,800	x		
Bolivia	21	530		x	
Ecuador	21	640		x	
Pakistan	21	7,400	x		
Algeria	20	3,800		x	
China, Peopl. Rep.	20	247,000	x		
Nepal	19	2,900	x		
Morocco	18	13,000		x	
Sri Lanka	18	1,900	x		
Argentina	17	650		x	
Chile	17	8,000		x	
Haiti	17	6,400	x		
Nicaragua	17	106,000		x	
Costa Rica	16	70		x	
Ethiopia	16	103,000	x		
Senegal	16	70		x	
Upper Volta	16	870	x		
Greece	15	190		x	
Chad	14	2,300	x		
Yugoslavia	14	1,500		x	
Honduras	13	8,400		x	
Madagascar	13	420	x		
Mali	13	540	x		
Mozambique	13	1,100	x		
Afghanistan	12	540	x		
Niger	12	320	x		
Spain	12	1,900			x
Tanzania	12	590	x		
Gambia	11	200			
Laos	11	400	x		
Mauritius	11	20			
Panama	11	100		x	
Somalia	11	19,000	x		
South Africa	11	830		x	
Sudan	11	310	x		
Dominican Rep.	10	3,300		x	
Hong Kong	10	680		x	
Malaysia	10	310		x	
Thailand	10	1,300		x	

Table 4.

There is a certain Latin American bias in these data, and an under-representation of African countries (the Sahelian drought in the 1970s has not influenced the list). The U.S.S.R. does not appear in the table. Disasters in the U.S.S.R. are rarely reported in the West and may have escaped the attention of the statistical sources. It should be noted that disasters in the United States have not influenced these statistics, due to the fact that neither OFDA nor the League keeps records of US disasters.

Figure 9 is a series of graphs, based on the data provided in Table 4, which clearly indicates that the poorest countries have the highest death rates in disasters. They have:

A. The highest death rate per disaster event
B. Most casualities due to disasters per 100,000 people
C. The largest number of people killed per 1,000 square kilometres

Note that the pattern shown by the death rates in disasters corresponds almost exactly to:

D. The density of population
E. The number of people who share the equivalent of 10,000 US dollars of the countries' GNP (the inversion of the GNP per capita)

Compared with the low-income countries, there is not a significantly higher death rate in the middle-income countries than in the high-income countries. But the sources have listed the highest number of disasters in the middle-income countries.

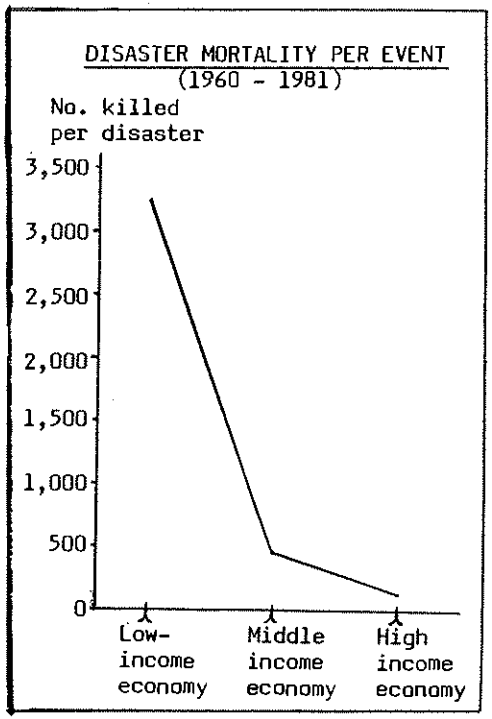
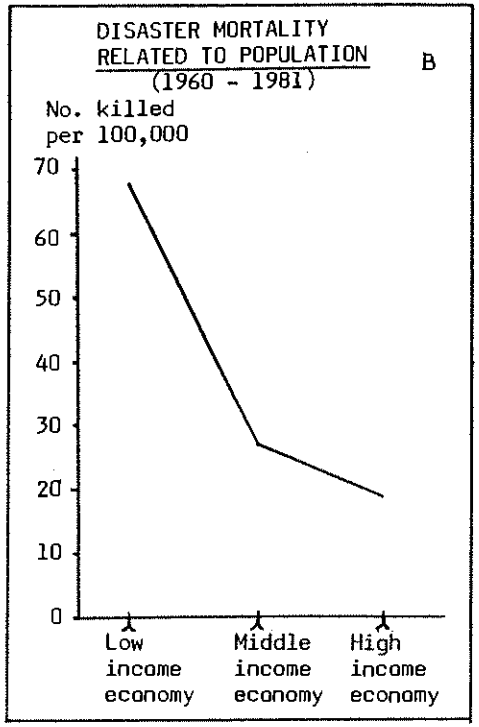
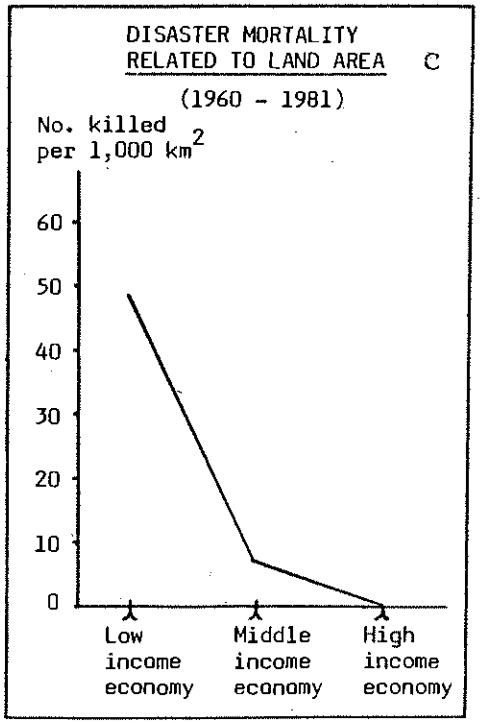
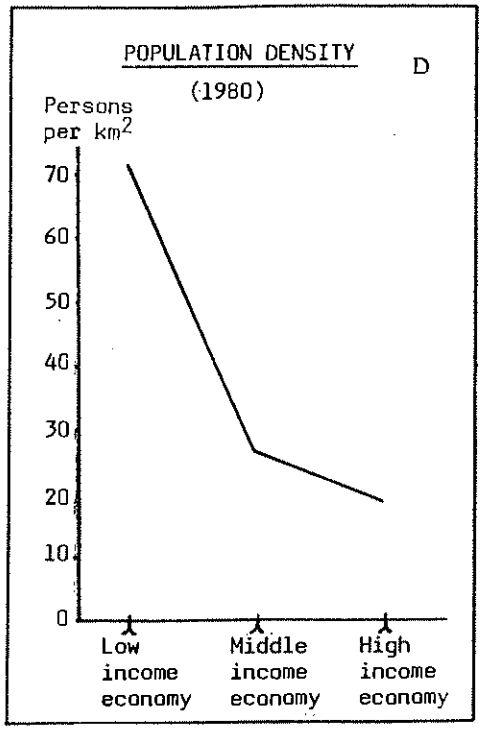


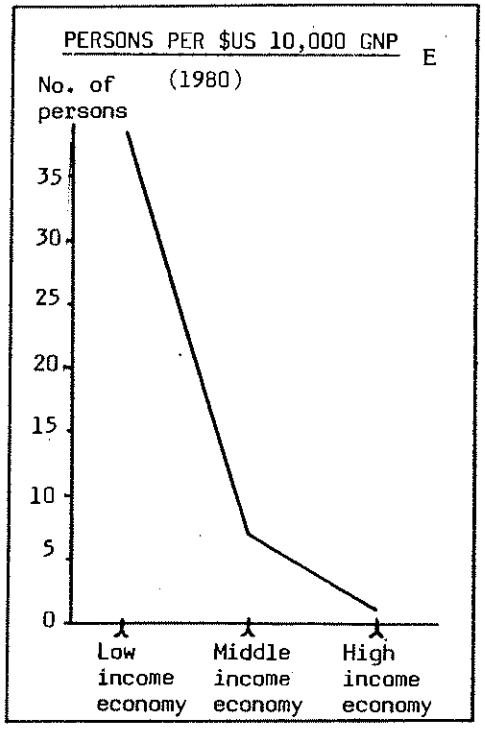
Figure 9. A - E

Relationship between disaster mortality, population density and economy.
(It should be noted that these diagrams give a rough picture. The economies of the countries vary within each income group.)









SUMMARY OF OBSERVATIONS

The statistics presented here are sketchy and should not be accepted uncritically. We do not know to what extent the upwards trends are due to improved data collection and increased recognition of disasters in the Third World. The Office of US Disaster Assistance has recognised this problem itself, and makes the following comment: "The absence of data does not necessarily mean the lack of disasters. The lack of reporting particularly in earlier years quite obviously biases the statistics, so that, until recent years neither Africa nor the South Pacific appeared to be disaster prone. The media's increased ability to cover more remote parts of the world has had a profound influence on the reporting of disasters."

Given these uncertainties, it is still worth noting the very clear indications given by the statistics. If we concentrate on the four major types of so-called "natural disasters":

* All major types of disasters seem to be on the increase, both in frequency and in the number of people killed and people affected, but droughts and floods affect far more people than tropical cyclones or earthquakes.

* Floods appear to be increasing fastest in frequency and in number of people affected by them.

* Droughts affect the largest number of people and show a marked increase in this respect.

* Earthquakes appear to be the most deadly natural hazard since the 1970s, followed closely by tropical cyclones. Of all hazards, however, earthquakes affect the smallest number of people.

* Disasters attributed to tropical cyclones show the slowest increase in frequency, number of people killed and number of people affected.

* The majority of all disaster victims belong to the poorest countries.

DISCUSSION

There are arguments both for and against the probability of these statistical indications. Some scientists who work in the field of disaster research argue that the increase may be only "apparent" due to improved communications, quicker worldwide information and a growing awareness of Third World disasters. Scientists working with seismology, meteorology and climatology maintain that there has been no marked change in the average behavior of earthquakes, tropical cyclones or in the climate over the years. However, they usually agree that population

growth may increase the effects of disasters.

Relief agencies and environmentalists, on the other hand, form their opinions on the basis of their field observations in the Third World, and they have evidence of mounting disaster problems of all kinds.

A more scientific survey of global hazards than the one presented here was described in the journal "Disasters" (No. 3, 1983). Bindi V. Shah of the London School of Economics made a global survey of disasters occurring between 1947 and 1980, in which a major disaster was defined as one which satisfied at least one of the following conditions:

-At least 3,600,000 US dollars damage
-At least 100 people dead
-At least 100 people injured

The data were compiled from the New York Times Index, Encyclopaedia Britannica Yearbook, Keesing's Contemporary Archives, and a miscellaneous collection of data such as UNDRO News, Earthquake Information Bulletin and OFDA. Nineteen natural hazards were considered, including floods, tropical cyclones and earthquakes, but droughts were not included in the analysis due to the problem of defining the beginning and the end of a drought.

According to Shah's observations, both the frequency of disasters and the number of people killed have been increasing in all sudden impact disasters since 1976. The number of major disasters due to floods was the greatest, accounting for 31 per cent of all disasters. A further 20 per cent were due to tropical cyclones (typhoons, hurricanes and cyclones) and 17 per cent were due to earthquakes. The same study revealed that, while floods made the greatest contribution to the number of major disasters, only 16 per cent of all deaths were due to this disaster agent. Tropical cyclones accounted for 40 per cent of all deaths and 37 per cent were attributed to the earthquake hazard between 1947 and 1980.

A further conclusion of Bindi Shah's report was that the death toll was highest in less developed, low-income countries. "World population pressure and hunger for land is forcing more and more people to inhabit the earth's hazardous zones. It is not major changes in the earth's climate and structure that has led to an increase in disasters, but the concentration of social and economic activity in disaster-prone areas", writes Shah.

In this document we want to show that there are additional causes for the increasing occurrences and effects of "natural disasters". It is not only population growth and people's migration into disaster-prone areas that cause the increase in disasters, but new hazards created by people. That is why droughts and floods have come to dominate the disaster situations.

Disaster statistics are not accurate but, combined with many other observations, the general tendencies of the statistics appear to be fairly realistic.

2. Conflicting perceptions

The word DISASTER means "misfortune, mishap, misadventure, calamity, hard chance", according to dictionaries, or even "a complete failure, fiasco". Many definitions of DISASTER try to limit the interpretation for certain purposes. The definitions and their consequences need a critical review. The quality of disaster response will depend on how disasters are perceived.

CAUSES CONFUSED WITH EFFECTS

Since 1966 the United Nations Educational, Scientific and Cultural Organisation (UNESCO) has provided annual summaries of what it calls "natural disasters". In 1969, for example, as many as 759 disasters were recorded in the UNESCO summary. This outnumbered any other disaster record for that year, despite the fact that UNESCO listed only earthquakes, tsunami, storm surges and volcanic eruptions. However, the label of "destructive" was given to only 12 of those 759 events, and none of the 12 was met by a corresponding international disaster appeal. Most of the other "natural disasters" occurred under the seas or in land areas devoid of people, which explains why they were not "destructive" disasters.

There is a marked preference for putting the blame on Nature in connection with most disasters. As we have seen in the previous chapter on statistics, disasters are usually defined as the natural phenomena that sometimes trigger disasters - the so-called disaster agents, or the hazards. Combined with these are a few other phenomea which may be the effects of one or several disaster agents. Famine is such a phenomenon.

Disaster terminology tends to confuse causes with effects. In Disasters and Development, Frederick Cuny maintains that a disaster should be defined on the basis of its human consequences rather than on its causes. He writes:

"While natural phenomena such as earthquakes, hurricanes and excessive rains can occur worldwide, their potential for widespread disaster is more a function of the ability of communities to cope with the events - in terms of their social and economic systems as well as their physical structures - than of the phenomena themselves."

Cuny suggests that poverty should be recognized as the primary root of vulnerability and disasters in the Third World. His remark is noteworthy, particularly since he wants us to look at the root of the problem. Let us see how others have perceived disasters.

THE EVOLUTION OF DEFINITIONS

In the past, a disaster was considered to be essentially a sudden natural event, limited in time and geographical range, with devastating effects on people. Earthquakes, volcanic eruptions, destructive storms, violent sea waves, floods and droughts were phenomena that most people would think of as "natural disasters". A distinction was made for wars, armed conflicts and, as time went on, major technological accidents, which became known as "man-made disasters".

To determine which events would qualify as disasters, many attempts were made to make definitions where impacts, limited in time and geographical range, were classified and quantified according to simple formulas - sudden events, or short-lived phenomena, with certain minimum numbers of people affected or killed, and losses above certain values in monetary terms. Definitions with such limitations are still being used, although

these definitions might exclude a number of disaster situations.

A narrow time limit, for example, like "sudden events" or "short-lived phenomena", may have unsatisfactory consequences. Such "creeping", long-lived phenomea as droughts, which gradually affect a large number of people and result in considerable financial loss or even death, are not disasters according to those definitions - unless or until they are suddenly discovered and measured. Such was the case in Ethiopia in 1972-73, for example, when the drought that had already caused a deadly famine started to be called a disaster after attention had been drawn to it by outside relief agencies and news media.

To use financial loss as a criterion may also have undesirable consequences. For instance, if a tornado or a flood damages expensive buildings and sensitive infrastructures in Europe or the United States, it might be regarded as a disaster, even if a very small area is affected, with no loss of life. It would be a disaster just because the damages would represent such high values. A similar event in a poor area of the Indian sub-continent might, however, not fall into the disaster category - even if a large number of people lost all they had - because the value in terms of money might be comparatively insignificant.

A much wider range of events and situations has tended to be covered in the more recent attempts to define disasters. There is, however, no universal, well established definition upon which all agree. On the contrary, definitions vary widely from one source to another with the consequence that the avaliable statistical records show numerous discrepancies in the kinds of events that qualify as disasters. The reasons may be academical, political, ideological, geographical, etc., depending on the nature of the organisations or institutions working with disasters. This also reflects the complexity of the subject.

DEFINITIONS REFLECT VARIOUS INTERESTS

An interesting study of these definitions was done by the Disaster Research Unit, at the University of Bradford in England in 1976. In their report "Some Definitions of Disaster" (O'Keefe and Westgate, 1976) the authors observed that those who define disasters were content to present the disaster occurrence - the static symbol of the disaster - rather than the disaster process emanating from man's continuing relationship with the environment.

The definitions, according to O'Keefe and Westgate, reflect the interest of their origin - the sociologist emphasises the social structure in a disaster event; the economist emphasises economic losses; the journalist emphasises the impact of a disaster event and the human conditions emanating from it; the relief agency emphasises the input of aid, and so forth. Those who work with certain aspects of disasters have worded their definitions to suit their particular interests, and they act accordingly.

These are only a few examples of definitions to illustrate the great variety that exists (taken from "Some Definitions of Disasters").

a. at least $ 1,000,000 damage, or
b. at least 100 persons dead, or
c. at least 100 persons injured.
(The Natural Hazards Research Group, University of Colorado, 1969)

ACCIDENTS- 1 - 1,000 people dead, or in imminent danger of death.
DISASTERS- 1,000 - 1,000,000 people dead, or in imminent danger of death.
CATASTROPHES- More than 1,000,000 dead, or in imminent danger of death.
(Cisins and Clark, "Man and Society in Disaster", 1962)

It is an event (or series of events) which seriously disrupts normal activities.
(Cisin and Clark, "Man and Society in Disaster", 1962)

... a condition in which the established social life of a community or other type of social organisation abruptly ceases to operate.
(Form and Nosow, "Community in Disaster", 1958)

... an event, concentrated in time and space, in which a society, or a relatively self-sufficient subdivision of society undergoes severe danger and incurs such losses to its members and physical appartenance that the social structure is disrupted and the fulfilment of all or some of the essential functions of the society is prevented.
(National Opinion Research Center, Chicago, 1952)

A disaster is an accident on a large scale.
(Walker, Studio Vista, London, 1973)

Disaster means occurrence of imminent threat of widespread or severe damage, injury or loss of life or property resulting from any natural or manmade cause, including but not limited to fire, flood, earthquake, wind, storm, wave action, oil spill or other water contamination requiring emergency action to avert danger or damage, volcanic activity, epidemic, air contamination, blight, drought, infestation, explosion, riot, or hostile military or paramilitary action.
(US Office of Emergency Preparedness, 1972)

The real quality of disaster is that it presents problems within a context which cannot be solved with the resources found within that context. This means there are different levels of disaster. One may speak of local, regional, national, or even international disaster. A local disaster would be one which cannot be handled by strictly local resources and therefore requires help from the regional level. A regional disaster would be one which would require help from the national level, and a national disaster would be one which would require help from other nations. This is the basis of a definition of disaster for relief purposes. What may be a national or international disaster in a small country with a fragile economy may not even consitute a local disaster in a rich country with a well developed internal relief organisation.
(Avdelningen för Arkitektur, KTH, Stockholm, 1974)

NOT APPLICABLE IN DEVELOPING COUNTRIES

O'Keefe and Westgate claimed that much of the existing disaster research was inapplicable to developing countries, because it was used in a pro-western, pro-technology, capital-oriented context. The authors emphasized that an understanding of the environmental context that surrounded each disaster event - the state of things - was imperative to the understanding of the disaster process. Definitions emanating from western research and western involvement would therefore not offer a correct summation of disasters in developing countries.

In conclusion, O'Keefe and Westgate themselves offered what was intended to be a set of workable definitions:

1. Disaster event. The manifestation of an interaction between extreme physical or natural phenomena and a vulnerable human group. The manifestation results in general disruption and destruction, loss of life and livelihood and injury.

2. Disaster context. The sum total of the possibilities, probabilities and frequencies of the occurrence of various disaster events, including previous disaster histories, in any given location, which render the location vulnerable.

3. Disaster environment. The combination of the disaster context and the social, political and economic conditions prevailing within any given location.

4. Disaster process. The dynamic operation over time of the distinctive elements contained within the disaster environment and their interrelationship.

5. Vulnerability. The degree to which a community is at risk from the occurrence of extreme physical or natural phenomena where risk refers to the perjorative probability of occurrence, and the degree to which socio-economic and socio-political factors affect the community's capacity to absorb and recover from extreme phenomena. The term should be applied to the disaster context, the disaster environment and the disaster process.

6. Marginalisation. The most extreme manifestation of vulnerability occurring on the margins of society and properly applied to the urban and rural poor of the underdeveloped countries with little or no absorptive capacity in the face of extreme phenomena.

This set of definitions might at first appear to be complicated and academic, but the philosophy behind it is certainly worth careful

attention - particularly if one is not merely interested in short-lived events and situations for disaster aid purposes but in prevention and preparedness. In exploring strategies for disaster prevention and pre-disaster planning where they are most needed it is essential to consider not only the risk from the occurrence of extreme phenomena but also the socio-economic and environmental conditions in a particular society. Here, the term vulnerability has a definite relevance. The degree to which a group of people has a coping mechanism to accept, absorb, reduce and change the effects of an environmental extreme is a key factor in the disaster process.

An important part of O'Keefe's and Westgate's set of definitions is the understanding that disaster impacts vary in relation to the environment of the victims and their ability to cope, and that a repetition of impacts can have a cumulative effect, particularly on the poorest groups.

THE MYTH OF HELPLESS VICTIMS

Since the study of disaster definitions was made by the Disaster Research Unit at Bradford in 1976, the concept of disasters as processes rather than events has won a number of supporters. Meanwhile, research has moved forward and resulted in a new school of thinking among those who study disaster behaviour. To illustrate this, let us first look at another disaster definition - the one which has been used by the League of Red Cross and Red Crescent Societies in its Disaster Relief Handbook. Published in 1976, this edition was still in use at the beginning of 1984, although a revised edition with a modified definition was being written.

> A disaster is a catastrophic situation in which the day-to-day patterns of life are - in many instances - suddenly disrupted and people are plunged into helplessness and suffering and, as a result, need protection, food, clothing, shelter, medical and social care and other necessities of life.

The office of United Nations Disaster Relief Coordinator (UNDRO), established in 1972 with the League as an important mainstay, did at first agree with this definition and basically adopted it as its own. This is not so anymore. In 1982, UNDRO expressed a view which clearly reflects the current opinion among leading scientists who deal with disaster behaviour. The term "helplessness" is no longer in line with UNDRO's thinking.

The League of Red Cross and Red Crescent Societies has deleted the word "helpless" from its new definition of disaster. It now reads:

> A disaster is a catastrophic situation in which the day-to-day patterns of life are - in many instances - suddenly disrupted and, as a result, people need protection, food, clothing, shelter, medical and social care, and other necessities of life.

Since the publication of the 1976 edition of the Disaster Relief Handbook and the University of Bradford study of definitions, a new tendency has emerged in research on disaster behaviour. Interest has shifted from individual behaviour to the actions taken by various organisations that are engaged in disasters. One result of these studies has been the remarkable discovery that the reactions of disaster victims are often more rational than those of relief organisations. "Helplessness" is now referred to as one of several myths attached to the survivors of a disaster.

It should be noted that organisations which act as if disaster victims were helpless may well create a sense of helplessness, dependence, and unrealistic expectations and demands from the victims. Many relief workers have experienced the frustration of dealing with the "beggar mentality" that their acts of charity created.

UNDRO's report Shelter After Disaster (1982) says that, "often, far from being dazed and distraught by the loss of their homes, the survivors are amazingly resilient - the best resource for reconstruction." Relief workers should, according to UNDRO, harness this resource.

The same opinion was expressed at the "Emergency 82" congress in Geneva in October, 1982, by Prof. Enrico Quarantelli, Director of the Disaster Research Center at Ohio State University in the United States. He stressed that potential or actual disaster victims should be more involved in predisaster planning as well as in tackling the consequences of disaster.

The essence of UNDRO's and Prof. Quarantelli's philosophy is that the survivors should be encouraged to be self-reliant instead of waiting for outside aid that may or may not come, or may or may not be appropriate for their needs.

DEVELOPMENT CONNECTIONS OVERLOOKED

Some organisations even want to go one step further. According to Oxfam's philosophy, a disaster may open a society to development possibilities, and may even be taken advantage of as an opportunity to aid development. Fredrick Cuny expands on this in the Oxfam-sponsored Disasters and Development.

He points to the fact that many disasters, particularly sudden or "cataclysmic" events such as earthquakes and cyclones, inevitably produce physical and social changes. Such disasters may therefore create a climate wherein developmental changes in society are more acceptable.

Disasters may even raise a demand for development, highlight political weaknesses and force a change in government. This happened in Bangladesh after the cyclone in 1970 and the floods in 1974, in Nicaragua after the 1972 earthquake disaster, and in Ethiopia after the 1972-74 drought.

The connection between disasters and development has not been recognized until recently. Those agencies who have concentrated on disaster relief

and preparedness have usually dealt with disasters as isolated events. Relief agencies have thought, and some still believe, that the best response is fast, massive, standardized and short-lived, with as little "entanglement" as possible, regardless of the type or context of the disaster. This approach is defined as "Quick and Dirty Programs" in the glossary of Cuny's Disasters and Development.

Those who have worked with development in the Third World have usually not linked disasters to development either. When a disaster has occurred, development agencies have regarded it as a nuisance and tried to avoid becoming involved; or even worse, the risk of existing or new potential disaster hazards have been overlooked in some planning and implementation of development activities. It is now being observed that insensitive development may be the cause of many new disasters in poor countries. We will address this further in a later section, but some examples can be given here.

There is evidence that the clearing of steep slopes for cultivation, grazing, or exploitation of industrial timber is the cause of water runoff and increased flooding in South and Central America. Uncontrolled urbanisation in the flood plains is aggravating this problem.

Overly optimistic development of agriculture with the incorrect use of irrigation in areas unfit for intensive farming is found in the semi-arid regions, south of the Sahara in Africa. When this fails to give the expected yield, droughts might be blamed for disastrous crop failures and food shortages, although it is known that a mean deviation in annual rainfall of at least 40 per cent is normal.

It is also being observed that industrial development constitutes a growing hazard to human health. Industrial outlets in air and water seriously affect large cities in India, Brazil and other developing countries; the rate of heart and respiratory disease, stillborn births and cancer is increasing alarmingly in these countries.

ECOLOGICAL LINKS DISREGARDED

Definitions and perceptions of disasters are very obviously geared to people. They all deal with disasters as immediately destructive or harmful to human lives, property and livelihood.

From an ecological point of view, this may not be the most satisfactory way of seeing the problem. Disasters can occur in any ecological system - with or without an immediate impact on people. Any destruction or disruption which causes a serious imbalance in an ecological system could be regarded as a disaster.

Many ecological systems are evidently subjected to, or threatened by disasters, although people are not always immediately affected. This connection has been disregarded so far, and is not included in any definition of disasters.

Mismanagement of natural resources often results in irreparable consequences such as desertification, soil erosion, etc. Sensitive

eco-systems, such as tropical rain forests with their thousands of species of plants, insects and animals, are being destroyed by this exploitation.

Insensitive development of large settlements, industries, agriculture, and infrastructures may cause disruption, pollution and gradual destruction of land, air and water. The entire planet could be threatened by gradual changes in the atmosphere. In addition, wars and conflicts have harmful effects on the environment, not to mention the potentially devastating consequences of a nuclear war.

The ecological links to disasters will be highlighted in the following sections of this report. It will be shown that human interaction with natural environment can be the most destructive cause of disasters as well as being the most constructive means of their prevention.

PREVENTION AND PREPAREDNESS LIMITATIONS

Some organisations have tried to make a distinction between disaster prevention and disaster preparedness, partly in order to limit their own activities to one of the two.

The definitions given here were formulated by the Office of United Nations Disaster Relief Co-ordinator (UNDRO) and have appeared in publications of the Economic and Social Commission for Asia and the Pacific (ESCAP), the League of Red Cross Societies and the World Meteorological Organization (WMO).

> "Disaster Prevention may be described as measures designed to prevent natural phenomena from causing or resulting in disaster or other related emergency situations. Prevention concerns the formulation and implementation of long-range policies and programmes to prevent or eliminate the occurrence of disasters. On the basis of vulnerability analyses of all risks, prevention includes legislation and regulatory measures, principally in the fields of physical and urban planning, public works and buildings."

> "Disaster Preparedness may be described as action designed to minimize loss of life and damage, and to organize and facilitate timely and effective rescue, relief and rehabilitation in cases of disaster. Preparedness is supported by the necessary legislation and means a readiness to cope with disaster situations or similar emergencies which cannot be avoided. Preparedness is concerned with forecasting and warning, the education and training of the population, organization for and management of disaster situations, including preparation of operational plans, training of relief groups, the stockpiling of supplies and the earmarking of necessary funds."

It is considered that disaster prevention, as defined here, demands such a strong power base and so many resources of an economic and legislative nature that it is out of bounds for non-governmental organisations. Disaster preparedness, in contrast, is found to give organisations like the Red Cross obvious roles in first aid and relief training, stockpiling of supplies and liaison with donors abroad when disaster strikes.

It is not so clear, however, why disaster prevention should require a much stronger power base than disaster preparedness. Both by definition obviously need long-range government policies and support by legislation and regulations.

What is remarkably missing in both definitions is any trace of acknowledgement of people's own initiative and ability to fend for themselves.

Both definitions consider mostly the effects of violent impacts ("principally in the field of physical and urban planning, public works and buildings" in the first definition, and "which cannot be avoided" in the second), with no mention of discovering their causes. This is all the more disquietening since the dubious term "natural phenomena" appears in the first definition, and UNDRO, the Red Cross and most other organisations that deal with disaster traditionally attach the same quality of "naturalness" to the preventable processes of floods, landslides, crop failures, and diseases as to the more inevitable impacts of earthquakes, tropical cyclones and volcanic eruptions.

The definition of disaster prevention in particular has been formulated as an abstraction which lacks ecological consideration. It hardly inspires practical action at a grassroot level.

Disaster preparedness in this context can hardly mean anything besides preparations for emergency assistance, i.e. the readiness to tackle the consequences of disasters after they have appeared rather than attacking the causes beforehand, or to cure rather than prevent. It has often been stressed that Red Cross intervention should be confined to the emergency phase of a disaster. An Agenda for Red Cross (Tansley 1975), even warned against pressure from within the movement itself to act in the rehabilitation or reconstruction phases. Such pressure, according to the report, should be resisted firmly.

The Office of United Nations Disaster Relief Co-ordinator (UNDRO), which took the initiative to formulate the definitions of prevention and preparedness, is itself divided into two sections: a Relief Co-ordination and Preparedness Branch and another called the Prevention and Support Services Branch. In line with the definitions, the respective branches of UNDRO provide expert advice and background publications to promote disaster preparedness and disaster prevention. In both cases the implementation is the responsibility of governments and other organisations which may want to make use of the advice. UNDRO itself has no mandate to work on practical field implementation.

Contacts with UNDRO have confirmed that its efforts in disaster

preparedness are geared towards mitigation of the effects of disasters, to first and foremost improve the readiness at national and international levels to provide emergency relief to disaster victims.

It is difficult for UNDRO to distinguish disaster prevention from disaster preparedness, however, since its prevention programmes also deal with mitigation of the effects of disaster impacts.

CONCLUSIONS

The following conclusions can be made from this review:

There exist almost as many definitions and perceptions of disasters as there are organisations and institutions working in this field.

The definitions reflect the particular interests and objectives of those organisations.

Most definitions limit themselves to sudden, dramatic events or unusual situations where human lives and properties are lost or at risk.

Definitions are focused on man and human environment but ignore the ecological interactions and often overlook the links to development.

Definitions of disaster prevention and disaster preparedness deal mostly with the effects of disaster impacts. They do not inspire actions to tackle the root causes of disasters.

Perceptions and definitions change over time in line with new knowledge and experience.

We have seen that what is meant by "disaster" is more or less up to anyone who takes interest in those matters. There is a tendency to concentrate on certain dramatic and sudden events, but attempts have also been made to widen the scope and identify the underlying factors, the environment of disasters, the disaster context or the disaster process.

By and large, this abundance of conflicting definitions seems to reflect a rather confused perception of disasters, Third World disasters in particular. We shall see in the following chapter what implications this has for the disaster response.

3. Erratic response

Many would claim that compassion is behind most disaster interventions in the Third World, and that disaster aid always helps the victims. But unfortunately, disaster assistance has not always been appropriate.
Since it is a common opinion that the need for disaster relief is increasing it is essential that these actions are improved to the best advantage of the disaster-stricken people.

Example: Horn of Africa

Event:
A considerable influx of people into Somalia in the late 1970s was associated with the war between Ethiopia and Somalia over the Ogaden in 1977.

Response:
Refugee camps were established in Somalia. These were run by about 30 foreign relief agencies, which brought in large quantities of aid, mainly food. It was decided that certain definitions of "man-made disaster" and "refugees" were applicable and should be adhered to. Only those who qualified as refugees would be entitled to relief.

Environment:
The entire area, on both sides of the Ethio/Somali boarder, was semi-arid with a sensitive, deteriorating ecology and a generally poor population.

Context:
A large portion of the refugees as well as other people in the environment of the camps were nomads who were used to being on the move. For them, the national boundaries seemed artificial, as they wanted to follow their herds of cattle wherever there was grass for grazing. The armed conflict went on above their heads - literally as well as in a figurative sense. At that time, drought affected the area, resulting in deteriorated grazing and diminished herds. People became poorer than usual, and they were hungry.

Consequences:
To the astonishment of the relief agencies, the "refugee camps" continued to grow in size and number. The disaster aid, avaliable mainly on the Somali side, created a "pull effect" on people on the Ethiopian side of the border so that they decided to cross and register as refugees in order to benefit from the relief, which they felt they needed. People who had been in the Somali territories the whole time also felt a need of relief and joined the more genuine refugees in the camps. There were speculations that some victims of war-drought-poverty even went, in their nomadic manner, either back and forth over the border or from one camp to another to report as "multi-refugees" in order to get a better harvest of aid. At one point in 1981, as many as 1.5 million "refugees" were registered in the camps - three times the estimated population of the entire Ogaden. Since then, attempts have been made to create a new "pull-back effect" with international relief on the Ethiopian side.

The abnormal concentration of people in the relief camps in Somalia has caused an ecological disaster: Fuel is needed in substantial quantities for cooking, with the consequence of deforestation and desertification in expanding circles around the camps. Cooking fuel was not among the relief items provided by the agencies.

SABOTAGED BY REALITY

This example from the Horn of Africa shows that relief agencies may run into problems if they isolate certain events and design their programmes strictly on the basis of a particular definition.

In this case, United Nations High Commissioner for Refugees (UNHCR) was the co-ordinating agency. According to the mandate given by the UN General Assembly, UNHCR had to follow strictly the criteria that designated a person a refugee. In Somalia, these intentions were "sabotaged" by the environment and the context in which the problems occurred, and the relief input that was probably exaggerated by political motives on one side of the border and underappraised on the other side.

This was only one of a multitude of difficult disaster situations in the poor countries. Entirely different situations develop each time there is a disaster. This chapter points out some of the difficulties in dealing with international disaster assistance and suggests some improvements.

POPULAR AND UNPOPULAR DISASTERS

Earthquakes in particular have a sudden impact on the news media and donors as well as the vicitims, and this may be the reason why the donors' response tends to be equally sudden and erratic. Earthquakes also seem to

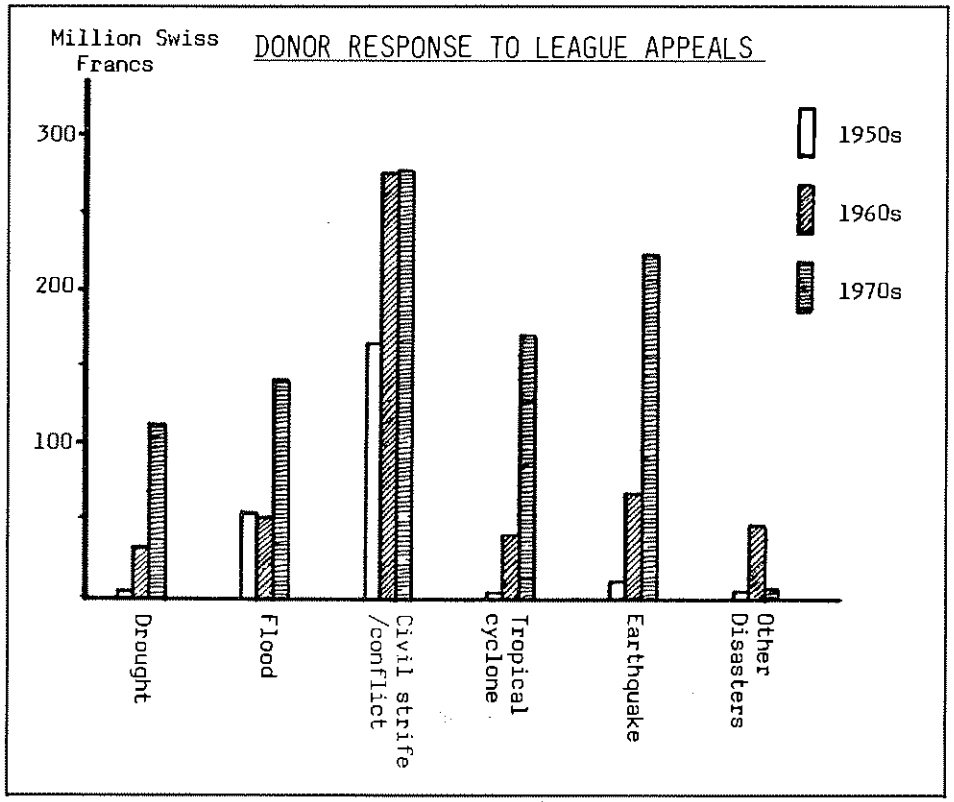


Figure 10.

be the most favoured phenomena for response. The donor response to Red Cross appeals in Figure 10, apart from the specific issue of civil strife/conflict, corresponds quite well to the death statistics in Figure 6, (Chapter 1), at least in the 1970s. Compared with the proportions of the surviving affected victims, in Figure 7 (those who could be helped), it is just the opposite. It looks almost as if donors have responded more to dead people than to those living.

In 1983, the highest Red Cross response per assisted was still geared to earthquake victims. An international appeal for Turkey's earthquake-stricken people in November almost immediately brought in about 233 US dollars per person assisted. Drought victims received the lowest response. At the end of 1983, the drought appeal for Brazil, also launched in November, had gathered no more than 56 US cents for each person for whom assistance had been intended.

The League of Red Cross and Red Crescent Societies launched 48 international appeals to aid over five million victims of "natural" disasters in 1983. The largest appeals were for drought victims in India and Mauritania, but donors contributed the most to two European countries: Poland ("food needs") and Turkey (earthquake). The response to these two countries' disasters accounted for 26.7 per cent of the total gift value for relief of 57 million US dollars in that year. Poland got four times more than what was appealed for, India got one-third of the appealed amount, and Mauritania got about half. The response to the drought victims in northeastern Brazil met only 2.4 per cent of the expressed needs at the end of 1983, although it rose slowly to above 50 per cent in March 1984.

THE ROLE OF THE PRESS

The donors' response is probably highly influenced by media coverage of disasters. Generally, news agencies give a lot of attention to sudden, dramatic events and political issues. In recent years, technology has also allowed quicker worldwide dissemination of information, which may have led to an increased fascination with events which occur suddenly. Slow processes in remote areas, such as drought conditions, are more difficult to make news of, although a much higher number of people may be affected by such situations than by dramatic earthquakes. In these situations, the news media could play an important role in improving public awareness of the essential problems behind disasters.

INSENSITIVE RESPONSE

Prince Sadruddin Aga Khan, who was for twelve years the UN High Commissioner for Refugees, highlighted the drawbacks of the current international approach to relief programmes at an UNDRO meeting in Geneva in 1983. He stressed that a large percentage of aid is highly inappropriate - indeed at times insensitive and insulting to the beliefs and traditions of the people the Northern donors are trying to help.

According to Prince Sadruddin, the current international relief system is increasingly becoming a non-system owing to the proliferation of ad hoc bodies, well-intentioned and keen to help, but inexperienced and

over-zealous to respond to real or supposed needs. More often than not they send personnel, equipment and supplies which do not meet the needs of the victims but contribute to general confusion and ill-feeling on both sides.

"Foodstuffs, clothing, blankets and medical supplies, if not avaliable within the stricken country itself, can usually be purchased in a neighbouring country, with the double effect of reducing the astronomically high cost of transportation for the donor and providing foreign exchange to a developing nation," he said.

PERSONNEL PROBLEMS

The need for foreign personnel has often been exaggerated. As High Commissioner for Refugees, Prince Sadruddin witnessed the efficient way in which the countries on the Indian Sub-continent rose to the challenge of having to deal with large-scale disasters. There was not always a need to send doctors, nurses, agriculturalists, hydrologists or sanitation engineers to the Sub-continent - they could often be recruited locally and put to work from within each of those countries affected. Central and South America could provide the same human resources, and increasingly the Middle East and Africa would be able to offer similar personnel.

Most relief agencies, however, are probably of the opinion that at least their larger relief operations should be accompanied by some of their own field personnel. Often both administrative and technical expertise is useful for supervision, a sense of control, and feedback to home offices and donors. The major problems seem to be the lack of well-trained field personnel and the high turnover in professional staff.

As field personnel are often engaged for only short periods of time, the organisations that hired them lack a collective memory of the lessons that could have been learnt from one operation and been incorporated into future programmes.

Some organisations, such as the Red Cross Societies in a few European countries, are building up rosters of persons who have been given short training courses, but few organisations choose or can afford to have professional field personnel permanently employed. Here, a rethinking is probably required, as no one will become a real professional until he or she has obtained a considerable amount of experience in the field.

DISASTER MYTHS

Disaster relief has been impaired by a number of myths. According to one such myth, the needs are always the same in any disaster, regardless of the type of disaster and where it happens.

Another myth, linked to the first one, is the belief that anything given for free will be gratefully received, particularly by the poor in the Third World.

A third myth says that the quickest possible disaster response is always

the best. Thus, without always assessing the needs and preferences of the victims, unnecessary or inappropriate items may be flown by expensive charter flights to any place in the world, which suffers from any type of disaster.

The results can be both amusing and tragic. Gaudy party hats from distant sympathizers have appeared on sturdy men in rural Africa, high-heeled shoes have been seen stored near a group of people who had lost their feet in Ethiopia, slimming pills were sent to the victims of the Hungarian disturbances in 1956. Tins of chicken cooked in pork fat were sent to a Moslem country where people do not eat pork. Blankets were donated to India, donated by India to Nepal and re-donated from Nepal to India, without being used or wanted anywhere.

Some of these stories are old, but many relief practices still need to be improved. When Turkey had an earthquake in 1983, donors were asked to send no medicines or second-hand clothes, as these are generally not needed after earthquakes. A swift response came a few days later: a Northern donor flew in a planeload of precisely these items - and a TV crew to cover the distribution.

FOOD GIFTS AND TABOOS

In the early 1970s, when protein was a common catchword among food donors, field nutritionists in Bangladesh were amazed at the announcement of a Swedish donation of a milk-protein concentrate fortified with egg protein. Even under cold storage conditions it spoiled within three months, but as it took three months before it arrived on an ill-equipped cargo vessel, the smell of rotten eggs ensured that no one would go anywhere near it.

Food aid is a particularly delicate subject. Although disasters may force the victims to change their habits for some time, food habits would probably be the last they would change. A Moslem society would not welcome pork, a Hindu community would not accept beef, and a child, unaccustomed to milk powder might not be able to digest it without getting ill.

In spite of these elementary rules, new mistakes are common among donors. In addition, commercial enterprises continue to develop food and many other products to attract the "humanitarian market". A Danish food company recently offered canned meat offal, to be seasoned according to regional tastes. This firm itself acknowledged that the Danes would not eat such food. Apparently it assumed that hungry people who had no choice would accept anything to fill their stomaches.

In real life, disaster victims, however hungry, would rather starve than violate taboos that may have been in practice for centuries. Meat, in particular, is surrounded by such a variety of taboos in traditional societies that it probably ought to be considered a taboo altogether by Northern aid industries and donors.

There are even some myths in the Northern countries about traditional food taboos. One such myth, for example, is that only Moslem societies refuse

to eat pork. In Ethiopia, where Islam and the Ethiopian Orthodox Church have almost equal numbers of followers, neither group eats pork. Moreover, a Moslem eats beef or mutton only if the animals have been killed by a Moslem according to a prescribed ritual. Almost identical restrictions are enforced among the followers of the Ethiopian Orthodox Church. Only some of the most westernised city dwellers, who usually do not need disaster aid themselves, have stopped following these strict rules in Ethiopia.

A number of authors have recently written about various myths and misconceptions that exist among the public as well as relief agencies concerning disaster victims, and they all underline the fact that relief items should be culturally appropriate. Cuny, for example, stresses that short-term feeding does not mean the sending of "junk foods" from Northern donors to a disaster in Africa, and emergency shelter does not mean providing a Western architect's idea of an instant house to a society that is perfectly capable of building an adequate structure from indigenous materials.

NEEDS IN GENERAL

According to Cuny and many others who have a wide field experience of disaster assistance, a few things may be needed in most types of disasters in the Third World. Cash, loans and credit are perhaps the only types of assistance that are appropriate regardless of the type of disaster. Feeding, with food which is normally used by the community, is often needed for a short time immediately after a sudden disaster impact. Depending on climate, blankets are useful quite often, but it is important that these are made of the right type of material, particularly in a humid climate (a woolen blanket is a big problem when it has been soaked with rainwater). With the exception of earthquakes, there may be reason to consider agricultural assistance in most types of disasters.

Medical supplies, supplementary feeding and intensive feeding are usually needed only by two types of disaster victims: war victims/refugees and people severely affected by drought/famine. Generally, these are also the only disaster victims who may require long-term food aid. The much debated topic of food aid will be discussed briefly here.

FOOD AID A SOLUTION?

The food situation is more serious than ever in many Third World countries. Over half a billion people are constantly suffering from severe under-nutrition, and more than one billion may not get enough to eat to meet their food energy requirements. Situations of acute food shortage, such as the current food crisis in Africa, seem to be problems that grow year by year, causing increasing deaths and vulnerability to diseases.

And yet, enough food to meet everyone's need is available in this world. In some industrialised countries people eat more than 40 per cent above their requirement, often contracting serious health problems due to over-consumption. For the governments in America and the EEC member

countries, surplus stocks of food grain and dairy products have long been a tremendous headache.

Many are moved and revolted by this flagrant injustice, and believe that the obvious, simple solution would be to intensify the dispatch of surplus food from the North to the South. Indeed, it may even seem a stroke of luck, "a coincidence of wants", that there are wealthy countries which produce surplus food and want to get rid of it, while there are so many poor, developing countries which are in need of additional food.

In times like this, it may seem strange that the governments of the United States and the EEC countries are not encouraging their farmers to produce more, but instead offer incentives for farmers to produce less grain and fewer dairy products.

Since the needs are obviously increasing year by year in the Third World, would it not then be appropriate for countries with a food surplus to increase their food aid in the future?

If there are obstacles in the poor countries, such as differences in taste and food habits, lack of warehouses, roads and means of transportation, or lack of the proper organisations to get the food aid distributed to all the needy people - should not the rich countries help the poor to remove such obstacles?

Unfortunately, the solution is not all as simple as that. To argue for intensified food aid as the easy, limited solution is idealistic and, indeed, unrealistic.

MOTIVATION FOR FOOD AID

In 1981, in the document Food for Thought, prepared for the World Council of Churches, Jonathon Fryer urged the churches to severely limit their involvement in longer-term food aid programmes, including food-for-work. He did, however, recommend that the churches continue their participation in emergency food aid actions.

Travel and research had convinced him that there were severe problems with most forms of food aid. It was almost never the most effective and cost-effective way of tackling the real problem, which, according to Fryer, was not hunger (which is a symptom and not a disease), but a mixture of the world and national systems of food production and distribution, and the social structures of many developing countries.

Commenting on Fryer's report, Jean Fischer of the World Council of Churches wrote: "The present world food system is a complex one resulting from the interactions of powers, forces and varied interests. Hunger is not a fatality. Neither is it a technical problem which can be easily solved. Rather, it is a major social, economic and political problem of our present-day civilization. It has become an extremely deadly political weapon."

Many people would claim that compassion is behind most food aid

programmes, but, according to Fryer,"... investigation shows that motivation is highly complex, and not always entirely benevolent".

He used as an example the practices of the USA, Canada, Australia, New Zealand and the EEC member states regarding food surplus. Under pressure from farmers, the governments of those countries have bought up stocks of surplus agricultural produce, and have then used it as food aid. This has been a more palatable, and sometimes less expensive, way of disposing of it than destroying it or storing it for long periods of time. The farm lobby in those countries has not allowed the surplusses to be put on the domestic markets or to be dumped on the world market, as the prices would then have dropped drastically. Such disposals have fluctuated with the availability of surplus stocks, and the peaks have not always coincided with the periods of most urgent needs in the developing countries.

Food aid has also played a role in sales promotion, as it has been an effective means of developing tastes, and therefore markets, for imported food stuff. Wheat, in particular, has made great impacts in countries where other types of cereals have been the traditional staple food. The new habit of eating bread in the cities of the Sahelian countries, for example, has created a demand for wheat imports, but it has become a disincentive to those countries' own agriculture, as wheat is often not a suitable crop in this region.

The food aid issue that Fryer thought most deserved close scrutiny, however, was the political one. The United States, in particular, has been known for its politically-flavoured food aid. In recent years, for example, the USA has sent huge quantities of food to Egypt as a reward for its support for the Camp David agreements. Other African countries, with more urgent food needs but less interesting politics, have not been favoured with the same amount of US food aid.

Other Western countries have also used food as the means of winning friends and influencing people. Several Western countries, using NGOs as the channels, have responded generously to Poland's largely politically motivated plea for food. Vietnam, on the other hand, has become almost an international pariah since it began its involvement in Kampuchea, and pleas for food aid when recurrent typhoons have caused extensive crop damages have been met with a less sympathetic response in this case.

Fryer's report is an example of the many cautious warnings that have been raised against food aid programmes in recent years. The debate has not only focused on the motivation of donor countries, but it has also contained a lot of criticism of the effects of food aid on recipient countries.

In 1980, about 9 million tons of cereals and 580 thousand tons of non-cereal food products were allocated for poor countries under the term "food aid". The value of this aid from the major donors amounted to (in millions of US dollars):

USA	*1,307*	*50%*
EEC (as an entity)	*437*	*17%*
Japan	*261*	*10%*
Canada	*165*	*6%*
Others (individual EEC members included)	*449*	*17%*
	2,619	

Major donors among the EEC member countries were France, Germany, United Kingdom and the Netherlands.
(Sources: "Food Outlook Statistical Supplement", March, 1983, FAO Rome. "1981 Review: Development Co-operation", OECD, Paris.)

EMERGENCY FOOD

A serious attack on food aid was delivered in 1982 by Oxfam's Tony Jackson in his book Against the Grain. Jackson, like most critics, underlined that "food aid is often needed for emergency relief and this will often entail imports, especially for refugees", and he asserted that "a well-organised and equitable relief programme is possible."

Whilst disaster relief and the feeding of refugees account for only 10 per cent of all food aid, Jackson stressed that this part is absolutely essential to the best interests of disaster-stricken people. Having recognised the importance and value of emergency food aid, he went on to suggest how this could be improved to the best advantage of the stricken community:

> "In many respects, procedures for emergency food aid can be improved by the donors. Food requirements need to be assessed carefully and consignments of food made only if the commodities avaliable answer these needs. At present, there are too few routine checks on donations to ensure that inappropriate foods are not sent. Also, potential donors should investigate within the stricken region or a neighbouring country to ensure that food needs could not be satisfied more swiftly and cheaply from local sources."
>
> "Food aid, if it is needed at all, must arrive at the right time. Donors need to find speedier ways of releasing food commodities once the need for them has been established. Conversely, they must recognise that prolonged donations may upset local recovery efforts and should, therefore, make firm plans to suspend supplies as soon as possible."

> "For the same reason, belated donations are in most cases unnecessary. Handling agencies need to be more flexible in their approach to distributing relief supplies, including food. Even then, there is no need to give the food away and to do so may undermine the efforts of local farmers to market their own food, or of the local community to return to normality. Wherever possible, local people should select and participate in the distribution of food aid."

Approximately 70 per cent of all food aid is given or sold on concessional terms to Third World governments. They usually sell it and use the proceeds from the sales to supplement their budgets. The remaining 30 per cent of the food is designated to be distributed free of charge to the poor, either through long-term development projects or in relief operations after disasters and for refugee feeding. This is called project food aid. Most project food aid is channelled through the World Food Programme (WFP) and the two major US voluntary agencies, CARE (Co-operation for American Relief Everywhere) and Catholic Relief Services (CRS).
(From Tony Jackson's Against the Grain.)

LONGER-TERM FOOD AID

On the basis of Jackson's book, Brian Walker, then Director General of Oxfam, raised the question at an UNDRO Lecture in November, 1982, as to whether the remaining 90 per cent of all food aid was actually counterproductive to the best interests of the people it was aimed to help. OXFAM had been particularly critical of food-for-work, food aid in mother/child health programmes, institutional feeding in schools and orphanages, and project food aid which competed with local food production. These views had also been expressed in OXFAM News, the organisation's periodical newsletter.

"Food-for-work programmes," according to Against the Grain, "generally have a notoriously low productivity rate and are widely associated with shoddy workmanship, so that although they create short-term employment, their claim to provide long-term benefits to the community is often proved wrong. On occasions, the benefits which are created accrue to the relatively well-off, some of whom get free labour provided under the food-for-work scheme."

On mother and child health programmes distributing food, Jackson's conclusion was that they "have usually failed to improve nutritional levels and have also failed to reach those who are most in need of supervised supplementary feeding. In most cases attempts to provide nutrition education are no more than token. There is even some evidence that children who do not receive food aid do better nutritionally than those who do." He made a similar comment on school feeding programmes, and concluded in general that "the evidence is that although the food may be feeding people, the beneficiaries are usually not those who are most in need".

The recent food aid debate has also included such criticism as: food aid is bulky and costly to transport; it places undue strains on the scarce logistic, storage and administrative resources of developing countries; it undermines community initiatives; it depresses domestic price structures, causing decreased production; food-for-work projects are less efficient and more costly than projects with cash-employed labour; because communities are not generally identified with planning food-for-work projects they do not regard maintenance as their responsibility; food aid is particularly susceptible to local corruption.

Although many have made their contributions to the debate, Against the Grain probably listed most of the criticism ever levelled against programme food aid, and it concluded that "it is time to call for substantial reduction in non-emergency project food aid."

THE WFP REPLY

The World Food Programme (WFP), with project food aid as its principal activity, felt compelled to defend its activities. It also defended food aid as such. In a letter to Brian Walker, WFP Executive Director James C. Ingram said that while a debate on project food aid could obviously be beneficial, the dangers of drawing "sweeping and dogmatic conclusions" from a small number of examples and from incomplete data were enormous. (Jackson's book was thronged with examples, many of which touched upon WFP projects.)

WFP made its stand clear in its October/November 1982 issue of "World Food Programme News":

"Food is a surplus resource available for development in the poorer countries of Africa, Asia and Latin America, 80 per cent of which are net food importers. Critics of food aid should put the uses of this resource in perspective, and present viable alternatives. What some opponents of food aid seem to be suggesting is that all countries should buy the food they need commercially, at market rates which many cannot afford, while food-rich nations should simply destroy unsold stocks, as was done before World War II. If food aid were to be discontinued, would it be replaced by larger cash contributions? It seems highly unlikely, particularly in the current economic climate."

The WFP News went on to argue against the OXFAM publication point by point. On emergency assistance, relief and rehabilitation, it said that, wherever possible, such as in Burma, Thailand and Zimbabwe - countries from which it makes large-scale purchases - WFP buys food regionally. Very often supplies are not available locally. In order to bring food to disaster areas in time and in sufficient quantities to prevent starvation, the Programme is in a position to divert food from development projects within an affected country or from shipments at sea.

It asserted that a substantial part of WFP's resources is used to feed starving people who are often too weak to work after disaster has struck. But it advocated the phasing-out of free relief distribution as soon as local governments could organise constructive rehabilitation. This,

according to WFP, could be done by food-for-work, which in the Programme's opinion "restores dignity and progressively reduces dependency on outside assistance" at the same time as it provided people with the nutrition and energy they needed to embark upon long-term restoration, particularly in areas which were ecologically prone to "natural disasters".

It also said that food aid was too marginal to have any disincentive impact on self-sufficiency in food production; in many projects food aid served as the basis for increased food production. Because it was visible, because shipments, deliveries and distributions could be monitored by field staff, recipient governments could be held to their obligation to use it for the agreed purpose. WFP's food-for-work projects did not help the large landowners more than the really poor, as most assisted projects were carried out on communal land or on holdings of less than one hectare. "There are many recorded cases in which food aid has helped the poor more effectively than cash," assured the WFP article.

It admitted, however, that the benefits of school meals were hard to measure, but maintained that food aid was a key factor in providing millions of children throughout the developing world with the opportunity of education. It also agreed that some of the criticism of the distribution of milk powder to vulnerable groups was quite valid - encouraging mothers to discontinue breast feeding, causing gastro-intestinal diseases by the use of contaminated water or unsterilised bottles, being inappropriate due to lactose intolerance and having a questionable nutritional impact - and stressed the need for evaluation and other approaches to reach the needy.

CONCLUSIONS

A large portion of all international assistance to the Third World consists of food aid. Although it has decreased over the last decade, FAO figures indicate that it is still 10 per cent of all international aid. In disaster interventions, food plays a major part.

The food aid debate has been going on for decades, and it will continue. Some of the current arguments for and against have been described here in order to illustrate the complexity of the subject. Those who consider involvement in food aid - and that may be many - need to be aware of all the pros and cons. Some of the most vulnerable Third World situations of today appear to have become almost permanent emergencies. In spite of the many arguments surrounding it, food aid may be the only alternative to starvation for some time to come.

Regardless of the severity of the situation, all food aid programmes should be primarily working for their own extinction, as should indeed all aid programmes; their goal should be to eliminate the need for their services.

Frequently, one disaster is followed and aggravated by another. The victims may suffer simultaneously from drought and armed conflict, for example. This is particularly common in Africa, but it also occurs in Central America and Asia.

The effects on the victims are often traumatic. Their chances to cope with a drought situation or some other type of "natural" disaster may be severely hampered by warfare. In addition, it is difficult to organise relief interventions for them, national or international, due to the security problems.

Although humanitarian assistance which places the basic needs of the victims in focus ought to be respected and supported by all parties involved in conflicts, this is not always the case. Increasingly, relief interventions are hampered or even prevented by civil strife or armed conflict. Notable examples where this happened recently are Angola, the Horn of Africa, Mozambique and Uganda (drought), Afghanistan (earthquake) and Kampuchea (floods).

The discussion in this chapter has pointed at some of the most common difficulties as well as shortcomings in connection with relief interventions. The reason for addressing them was to show that considerable improvements are both possible and necessary. In the following chapters we will sometimes revert to this subject and suggest some areas where relief could be improved.

Foreign relief assistance has an important role to play, but it should not be over-rated. Past experience shows that it is always the disaster victims themselves who have to bear the brunt of the problems. According to Cuny, foreign disaster aid has, at most, covered 40 per cent of the costs of a Third World disaster. In many cases its importance has been far less than that (see Chapter 9, "Floods in China", for example).

One important conclusion of this report is that relief alone is not an adequate response to the rapidly increasing number of disasters in the Third World. Relief must be supported by vigorous actions to prevent disasters, that is by longer-term improvements.

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III. FORCES OF NATURE, ACTS OF MAN

4. Impacts versus disasters

The terms "natural disaster" and "man-made disaster" tend to be misleading. Most disasters are the consequences of interactions in which man is involved, even if they are triggered by forces of nature. The current tendency of disasters to increase can be attributed more to people than to nature. This is the key to the understanding of disasters and their prevention.

"NATURAL" AND "MAN-MADE" DISASTERS

Relief agencies, scientists, and other groups often classify disasters either as "natural" or "man-made". The term "man-made" is used to describe situations which man clearly causes, such as wars, armed conflicts or civil strife. Surprisingly, all other disasters, possibly with the exception of "technological" disasters, are labelled "natural". All avalanches, floods, landslides, droughts, crop failures, etc. are thus given the same quality of "naturalness" as earthquakes, tropical cyclones and volcanic eruptions.

What is the logic behind these separate labels? The term "man-made" is obviously related to a cause - disasters made by man, or caused by acts of man. In the same way, "natural" disasters would be interpreted as "nature-made", or caused by forces of nature. However, it may be logical to assume that all disasters are caused by forces of nature and/or acts of man. But the jargon places the blame on nature for most disasters, which is totally misleading.

The Argentine environmentalist Rolando Garcia in his report, "Nature Pleads Not Guilty", emphasises that the interactions between man and nature must be understood, so that nature is not seen as the sole agent in disaster.

FORCES OF NATURE

By first observing how forces of nature build up without interference from people, we may be able at a later stage to understand how disasters are caused, why they increase and how they could be prevented.

The most important natural impacts and examples of their environmental effects are listed in Table 5.

Forces of nature would sometimes cause extreme events even in the absence of people. Storms would blow, earthquakes would occur, volcanoes would erupt, rain and snow would fall sometimes abundantly, and sometimes not at all. Such impacts would cause floods, droughts, landslides, avalanches, rock falls, fires and other secondary phenomena. These would have occasional effects on vegetation, animals, soil, air and water. In some areas these events would be more frequent than in others, but localised destruction would be counterbalanced by other natural forces to allow for a gradual recovery and a new state of ecological balance.

In recorded history, major changes have rarely occurred over only a few decades. Scientists generally agree that significant global changes take place only over tens of thousands of years. A slight imbalance has been and still is responsible for very slow processes which cause gradual climatic variations, shifting of tropical zones, glacial phases, formation of mountains, valleys and river deltas as well as the evolution of all living things.

All this would be part of the global environmental reality, if there was no significant human interference. Scientists have often assumed that

FORCES OF NATURE

IMPACTS	EXAMPLES OF ENVIRONMENTAL EFFECTS
Earthquake	Landslide, rock fall, avalanche.
Tropical cyclone (strong wind + heavy rain + storm surge)	Flood, landslide - destruction of plants and animals. Soil erosion.
Tsunami	Flood - plant, animal and soil destruction.
Volcanic eruption	Plant, animal and soil destruction. Air and water pollution.
Inland storms (tornado, etc.)	Plant destruction, soil erosion, water disturbance.
Thunderstorm, Lightning	Fire, flood - plant, animal and soil destruction.
Heavy rainfall	Flood, landslide, soil erosion - deterioration of plants and destruction of animals.
Heavy snowfall	Avalanche - soil erosion. Heavy snow melt flood.
Absence of rain*	Drought, depletion of water resources, plant and soil deterioration, and destruction of animals.
Heat wave	Deterioration of plants, soil and water resources, destruction of animals. Heavy snow melt - flood.
Cold wave	Deterioration of plants and destruction of animals. River ice jam - flood.

Table 5.
* Absence of rain has been included even though it is not an impact; it has no sudden effect.

this was the case. Seismologists, for example, have studied earthquakes (Figure 11), not people with their seismographs. Meteorologists have in a similar manner studied tropical cyclones (Figure 12) and other weather phenomena. But the interaction between these events and man is a relatively unstudied field.

SCIENTIFIC OBSERVATIONS

Seismic records are particularly reliable, as all earthquakes anywhere on earth can be observed from a single observation point with a seismograph. This is being done continuously in many places. The Seismological Section at Uppsala University in Sweden, for example, has a continuous series of

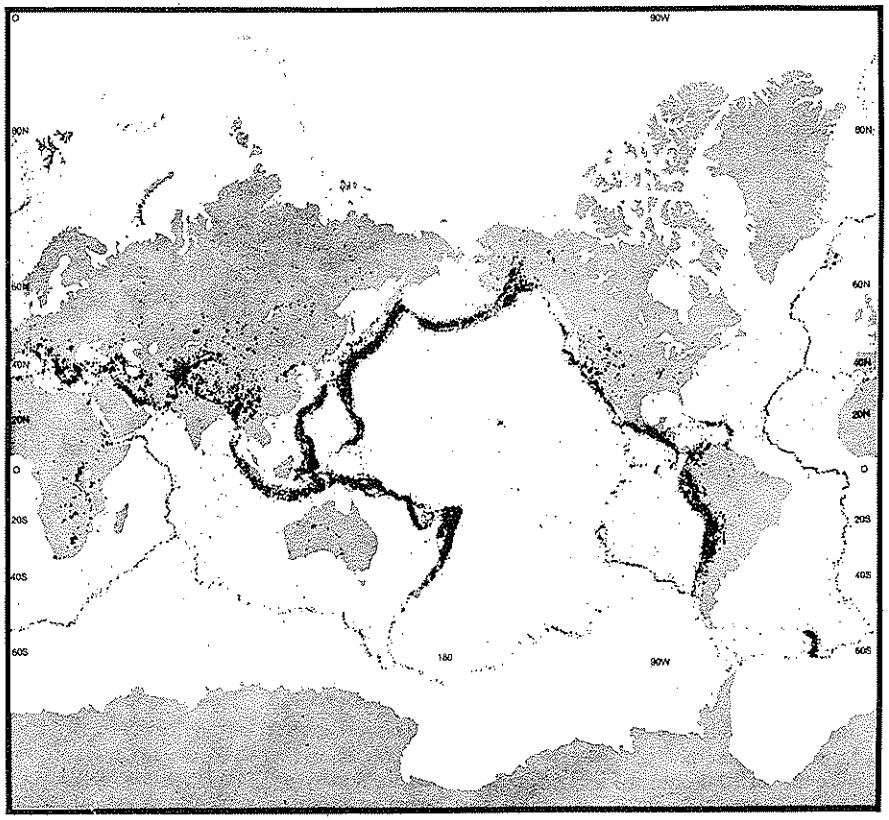

Figure 11. Earthquake epicentres for magnitude 4.5 and above in the 15 years 1963-77.
(National Geophysical and Solar-Terrestrial Data Center, USA)

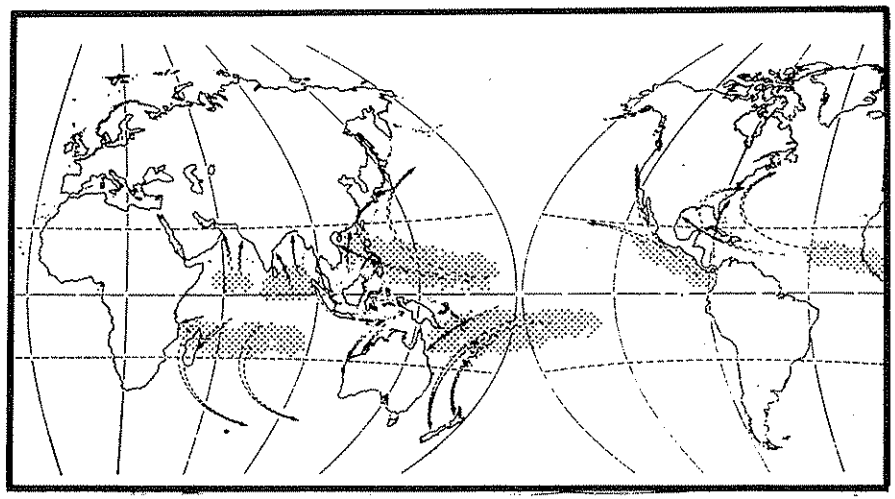

Figure 12. Main areas of origin and main paths of tropical cyclones.
(Impact of Science on Society, UNESCO, 1/1982)

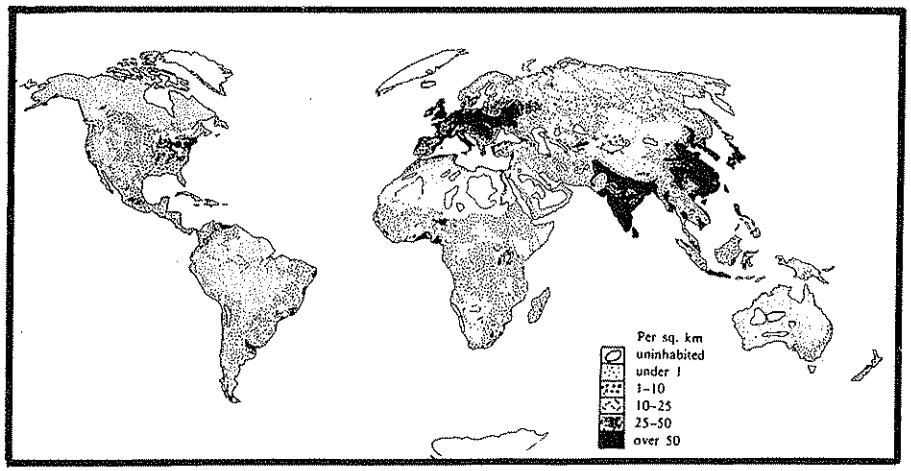

Figure 13. World population density. Source: The World Environment 1972-1982, UNEP. (After Rand McNally Atlas, with modification)

earthquake records dating from 1904. This 80 year old seismogram shows that an average of 200 earthquakes of or above a Richter magnitude 6 occur per year. About 20 of those events usually have a magnitude above 7, and an average of two of those are of a Richter magnitude 8 or slightly more.

This pattern has been roughly the same throughout this century. The magnitudes and the durations of the earthquakes have not increased, the number of earthquakes per year remains about the same, and the areas where they occur, as seen in Figure 11, are also the same as they were at the beginning of this century.

Similarly, metorological data show that the occurrence of tropical cyclones also follows a traditional pattern. Between 80 and 100 tropical cyclones form annually over the warm seas in certain areas between latitudes 5 to 30 degrees on both sides of the equator (see Figure 12). The technique of studying tropical cyclones with the help of radar and satellites has developed rapidly in recent decades, but the patterns of cyclones have not changed, according to scientists.

IMPORTANT DISTINCTION

There is no reason to question the reliability of these scientific data, unless the word "disaster" obscures the information. It leads to confusion when scientists report all the earthquakes and tropical cyclones they have observed under the title "disaster", as in the case of the UNESCO annual summaries of "natural disasters" (see Chapter 2). If terminology is used in that manner, and we compare scientific records with the disaster statistics illustrated in Chapter 1, the confusion is complete. Who is wrong, and who is right? Are disasters constant features, or do they increase?

It is in fact easy to see that both scientific observations and disaster statistics may be correct - if a certain distinction is made.

A seismograph does not register anything but earthquakes. Disaster statistics, on the other hand, deal with earthquake disasters. Only a few earthquakes result in disasters, as the majority of the quakes occur in areas where there are no people. Similarly, tropical cyclones cause disasters only on some of the occasions when their paths cross ships, islands and populated coastal areas.

To understand where such disasters are most likely to occur and most likely to increase, the information from seismologists and meteorologists must be combined with information about populations, human activities and human conditions. The maps in Figure 11 and 12, for example, will be useful for disaster studies only if they are combined with other maps which show population density (Figure 13), population growth, locations and development of city slums, and indicators of poverty.

PROBABILITY OF INCREASE

Large cities are expanding rapidly, with fragile structures in many places where earthquakes are sure to strike sooner or later. This can be seen in three major belts. One follows the Pacific islands from Japan via the Philippines and Indonesia, south to New Zealand. Another earthquake-prone belt stretches across Asia from China over the Himalayas, the Middle East, Turkey, the Mediterranian countries in Europe and Africa, to the Azores islands. A third major earthquake-prone belt can be found on the western side of the Americas, from California, over Mexico and Central America, to the countries along the Andes. (See Chapter 7.)

Cyclone-prone coastal areas are heavily populated in the South Pacific Islands, the Philippines, Southeast Asia, around the Bay of Bengal in India, Bangladesh and Burma, on Madagascar, on the Caribbean islands, in Central America and even in Florida in the United States. In all those areas, human exposure to tropical cyclones seem to be increasing, with a probability of more serious future disasters. (See Chapter 8.)

Earthquakes and tropical cyclones are two major natural hazards that usually develop without being influenced by human activities. Of comparatively less importance are tsunami, volcanic eruptions and inland storms such as tornadoes, but these belong to the same group. Disasters related to all these hazards occur because people are exposed to them, that is, make themselves more prone to these hazards. Increased population in areas prone to earthquakes and tropical cyclones thus leads to a greater risk of disasters.

MOST SIGNIFICANT INCREASE

Floods, drought, landslides, avalanches and rock falls are secondary impacts that differ in fundamental ways from earthquakes and tropical cyclones. These have been listed under "environmental effects" in Table 5. All these effects have one thing in common: they can be caused by forces of nature as well as acts of man.

There is a much greater risk of disasters related to this type of phenomena than to earthquakes and tropical cyclones. The reason is that acts of man can have two major consequences: creation of new hazards, and increased exposure to an increasing number of these hazards.

This explains why disasters related to drought and floods are those which have the highest number of affected and show the most significant increase in the disaster statistics in Chapter 1. The picture given by the statistics appears to be reliable on these points.

It also highlights an aspect of disaster prevention which has not yet been fully considered - prevention of causes rather than only effects. Earthquakes and tropical cyclones are natural phenomena which cannot easily be prevented from occurring. But floods and droughts, which are largely man-made phenomena that effect much larger numbers of people and increase at an alarming rate, have causes that may be preventable by human actions.

This chapter has delt mainly with the physical side of the causes of disasters. The human side, which includes not only humam exposure but the way in which people are becoming exposed, will be discussed in the following chapter. More on the hazards that are related to climate, natural environment and human interactions with these will follow in Chapter 6.

5. Human vulnerability

The relationship between disasters and the natural phenomena to which they are attributed are usually less important than human factors. Exposure to hazards make people prone to impacts, but hunger, malnutrition and poverty are some of the most prominent factors that make people vulnerable to disasters. To be vulnerable is to be weak and at the same time threatened.

THE HUMAN SIDE OF DISASTER

The previous chapter described the physical side of some major causes of disasters; what can be called disaster agents, trigger mechanisms, natural hazards or, in our case, forces of nature. But it is not enough to consider only the characteristics of these physical impacts as the causes of disasters. The human side of disaster causes seems to be more important.

The Prologue to this report gives an account of the drought situation in Ethiopia in 1983. It is mentioned that part of the United States also experienced a severe drought that year. Both countries, apparently, were prone to drought, but the way in which those two countries were affected differed considerably. It was only in Ethiopia that drought caused a disaster.

There are many examples of how the same type of impact has different effects on different countries. It often seems that the relationship between disasters and the natural phenomena to which they are attributed is less important than other factors.

As will be shown in Chapter 8, the Philippines is much more exposed to tropical cyclones than Bangladesh. Nevertheless, Bangladesh has had about the same number of cyclone disasters as the Philippines since 1960, and 70 times the death rate in those disasters. Bangladesh, however, has almost four times the concentration of people per square kilometre as the Philippines, and also a type of coast that is more vulnerable to cyclones.

Population density in disaster-prone areas naturally plays an important role. As illustrated in Chapter 1 (Figure 9), there is a clear link between the severity of disasters and the concentration of people in the areas in which they occur. But this is not the only crucial factor.

Cities, which are equally populous and equally prone to earthquakes may be affected differently by earthquakes of similar strength depending on local housing standards and the training of the population to respond correctly to the first signs of the danger.

There are also variations from one country to another in people's ability to absorb losses and recover after disasters. The way in which local communities within a country or individuals within a community recover from disasters also differs considerably.

In addition there are many differences in the perceptions of disasters. What is considered to be a disaster in a rich country may be an extreme event in otherwise relatively comfortable and safe surroundings. A sudden occurrence of people killed, wounded, hungry and homeless, even on a limited scale, is sensational. However, these events occur against a background of medical care, social services and insurance coverage. Help can often be given up to the point of recovery. The biggest concern is often financial losses - the cost of the disaster.

In the poor countries of the Third World, the context is entirely

different. Disasters do not happen against the same background as they do in richer countries. The environment is different, and as a result the events are viewed differently. A disaster may be yet another harmful event in surroundings which are not usually comfortable and safe. Disaster aid may also be looked upon in a different way. Help may be needed and occasionally given in response, but a complete recovery to relative comfort and safety is seldom reached.

DISASTER-PRONE AND VULNERABLE

It will be useful to agree on the use of two words when we discuss disasters, and to understand the distinction between them: disaster-prone and vulnerable.

The term disaster-prone is mostly related to the disaster agent, the hazard or the immediate cause of disaster. Disaster proneness is usually determined by the history of past events and the risks of new events in the future. A certain person, community, population or place, area or country is thus regarded as prone to one or several types of disasters which have occurred in the past under conditions which continue to exist, or to new hazards that may have been added when conditions have changed.

A person who travels in chaotic traffic is prone to accidents. A community near a nuclear power plant may be prone to radiation in case of a breakdown. One place is prone to drought, another to tropical cyclones. Political instability may make a vast population conflict-prone. Economic recession implies proneness to economic and political collapse. Deforestation makes certain areas more flood-prone, etc. To be prone is to be threatened.

Vulnerability, on the other hand, is more related to the effects of disaster impacts and to the prevailing socio-economic conditions of the people who might be affected. It is linked to the ability to absorb the effects of an extreme event or situation, and to the ability to recover from it. Hunger, malnutrition and poverty are some of the most prominent factors that make people vulnerable to disasters. To be vulnerable is to be weak and at the same time threatened.

Vulnerability varies from one society to another or from one place to the other, which means that the same type of disaster impact strikes differently in different places. This can be illustrated by two examples:

1. People living in Tokyo may be condsidered highly prone to earthquakes but they are generally not markedly vulnerable. They live in houses or work in buildings which can often withstand even quite intensive earthquakes, they have been trained to protect themselves when a tremor is felt, and the society to which they belong has the economic capacity to absorb the effects of a destructive seismic event.

2. For many people in Caracas, Lima and Managua, the situation is different. They are also prone to earthquakes, but at the same time more vulnerable. Houses and buildings are not as safe as in Tokyo, people have not received the same training in responding to quakes, and the societies do not have the same economic capacity to absorb the destructive effects of earthquakes.

Chapters 7 and 8 will describe disasters related to the two major forces of nature over which people have little or no influence: earthquakes and tropical cyclones. It should be noted, however, that the technical details of those relatively rare impacts are not the most important factors in explaining the causes of the disasters. The severity of an earthquake disaster is not determined by the magnitude of the earthquake, and the effects of a tropical cyclone disaster are not directly proportional to the wind speed of the cyclone. The crucial factor in both cases is the condition of the people affected and their environment - the degree of their vulnerability.

Extreme vulnerability exists in societies where large numbers of people have no capacity to absorb the effects of disasters, such as developing countries with their increasing millions of rural and urban poor. When a disaster event occurs, the statistics will show that this population loses little, because they have little to lose. But that little might be all they have, with no hope of recovering it in the future.

VARIED VULNERABILITY

Similar events may cause different consequences in poor and rich countries, but those events may even differ in their impact on various groups within a population. The entire population of a certain area may be equally prone to hazards such as earthquakes, tropical cyclones, floods, drought or disease, but certain groups within this population may differ considerably in vulnerability. It has often been observed that widows, single mothers, children, disabled persons and the elderly are more vulnerable than anyone else in practically any disaster situation.

In rural areas, the landless farmers, day labourers and various types of craftsmen are more vulnerable to crop failures than poor farmers who own a small plot of land. While the latter may be able to feed themselves, it often happens that no one can afford to provide the landless with jobs and wages when disaster strikes.

On the other hand, in the drought in Ethiopia in the early 1970s, it was found that poor farmers who owned individual plots of land were worse off than the equally poor farmers who lived in areas with communal land tenure systems. The former group often yielded to the temptation to sell their land to wealthier farmers and to move to the towns, thus making themselves completely dispossessed in the future. The latter group, who also left their homes to seek aid elsewhere, were not allowed to sell any land and could return home to cultivate the communal land after the drought.

One disaster can also make people more vulnerable to the next, and those people cannot then recover from phenomena which may not be extreme by themselves. To a poor, malnourished child, a common cold can be as much a disaster as an earthquake. Thus, impacts that would be relatively harmless among people with a good standard of living can reach disaster proportions among a poorer group.

This is part of what may be called a disaster process. Attempts to bring the victims "back to normal" with temporary disaster relief does indeed not make much sense in such a context. As the poor and vulnerable populations increase, and the environment on which they depend is being worn out and becomes more dangerous, large areas become almost permanent disasters in the Third World. Disaster interventions, even if they are improved upon, cannot cope with these problems.

6. Climate and environment

Through studies, climate has been shown to be almost always abnormal. In recent years, the fluctuations seem to have increased. Due to man's often destructive interactions with his environment, the earth is increasingly unable to absorb this abnormal weather. The result is disaster.

NATURE ON A RAMPAGE

1983 has been described as a year of unsurpassed climatic events. "El Niño, a dislocation of the world's largest weather system, flung high winds, rampaging floods and the misery of drought around the globe," wrote Thomas Y. Canby in National Geographic magazine in February, 1984.

El Niño was blamed for any misery that had the slightest connection with weather conditions that year. Its global impact reportedly ranged from drought and bush fires in Australia to flooding, snow melt, mudslides, heat, drought, crop failures and West Coast storms in the United States. It seemed to cause drought and crop failures in Indonesia, the Philippines, India and Sri Lanka, a series of tropical cyclones in the South Pacific, and the hottest summer in 200 years in Europe.

Drought, disease and malnutrition - even starvation - in Southern Africa, Ethiopia and the Sahelian countries were blamed on El Niño, as well as record rains, floods, and landslides in Argentina, Brazil, Bolivia, Ecuador, Peru and Central America. But in Bolivia it also caused drought, as it did in Brazil and Central America. High ocean temperatures were said to ruin South America's anchoveta industry, mackerel survived only by eating their own eggs, 17 million nesting birds were evicted from Christmas Island, coral reefs died across the Pacific - to mention only a few of the abnormal events that were said to have been caused by El Niño.

By June, 1983, weather experts agreed that El Niño was over. Total damage: 8.65 billion US dollars, according to National Geographic's estimate. There was some solace: massive El Niños do not usually develop in close succession.

WHAT IS EL NIÑO?

El Niño de la Natividad is the name given to the phenomenon by South American fishermen. It means the Christ Child. It usually occurs around Christmas time each year.

The National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce made a detailed analysis of El Nino in "UNDRO News", September/October 1983:

Near the end of each year, a weak southward-flowing warm ocean current develops along the coast of Ecuador and Peru, where it causes the sea surface temperature to rise for a few weeks. Every few years, a much greater than normal rise in temperature is observed, and the name El Niño is now used primarily for these major warm episodes. These are not confined to South America's coast, but extend westward along the equator, more than a quarter of the distance around the earth.

Each time such a major warming of the sea surface temperature occurs, it is an important element in a vast system of ocean atmosphere climate fluctuation. It affects ocean currents, trade winds, atmospheric pressure and precipitation, perhaps worldwide, as may have been the case in

1982-83. It has been observed that a seasaw of surface pressure occurs over the Pacific Ocean, which may last over a period of a few seasons to a few years. When pressures are high over Australia, Indonesia and the Indian Ocean, they tend to be low over the southeast Pacific and vice versa. Just how and where this starts is not well understood.

Exactly ten years before this El Niño, at the end of 1972, there was one that was also widely felt in the Pacific regions. The anchoveta fisheries of Peru collapsed during that time, due to the combined effect of a major El Niño and overfishing, and they have never fully recovered since. The 1982/83 El Niño developed surprisingly early, in June or July, 1982, and it gained a momentum which was extreme even for this type of weather anomaly - the strongest since World War II, according to some sources, the worst for a century, according to others.

DEFINITE CHANGE?

Was El Niño to blame for all the abnormal weather in 1983, such as the drought in Africa and Brazil, or the intense summer heat in Europe and the US Midwest?

"We see no obvious connection", observed NOAA's Dr. Eugene M. Ramusson. "For awhile El Niño was blamed for everything weather-wise. For all the havoc it wreaked, it also was a victim of bad press."

When El Niño was over after the spring of 1983, the drought still existed in Africa and Brazil, as it had for years before El Niño occurred. Sri Lanka had floods instead of drought, and Senegal also had floods, although it continued to be affected by drought at the same time. Panama and Bolivia also had drought-affected areas long after the traces of El Niño had vanished.

It appeared as if the climate had become exceedingly unreliable. One relief agency started to issue weather alerts in the second half of 1983, listing the countries affected by abnormal weather, and requesting emergency assistance due to a "worldwide climate change".

Was it true? Was climate changing definitely, and had global weather conditions really begun to be permanently abnormal?

The best answer to these questions was probably given by Dr. Jerome Namias, forecast specialist with the Scripps Institution of Oceanography in La Jolla, California, when he explained the complexity of climate: "Weather is always abnormal. Perhaps the only thing more complex is human behaviour itself."

"STANDARDISATION" OF CLIMATE

At the 1935 conference of the International Meteorological Organisation (now WMO), it was agreed that 30 years would be sufficient for a "climatic normal period"; more precisely, the period 1901-1930. Later, there were doubts as to whether this had been a wisely chosen period, so the following 30 years, 1931-1960, were in due course substituted as the "new

normal period". Today, scientists seem to be of the opinion that these two were probably the warmest, and in many regions the moistest and most favourable periods of such length for centuries past - apparently, these were highly abnormal periods.

In Chapter 2, we took up the many varying perceptions of disasters. Perhaps the biggest confusion concerns climatic perceptions. Making a global review of flood and drought problems in a recent publication, one scientist wanted to make a point of periodic onslaughts of droughts. He used the Soviet Union as an extreme example: "During the 150 year period 1830-1980 the European and Asian parts of the USSR suffered severe drought damage - 81 of those years were dry. Crop failures of 19 per cent and 25 per cent respectively were reported during the 1972 and 1975 droughts."

At most 69 out of these 150 years could have been called "normal", while as many as 81 were drought years. It is strange that the "normal" years seemed to have been more rare than the extreme years.

Professor H.H. Lamb of the School of Environmental Sciences, University of East Anglia, is of the opinion that climate has been too much taken for granted in recent time: "Since sometime in the late nineteenth century it has been useful to suppose that for all practical decisions climate can be taken as a constant, however obvious the year-to-year fluctuation may be." It is completely wrong to try and standardise climate by making average calculations on a 30 year "normal period", according to Professor Lamb.

In his book, Climate History and the Modern World, he points out that climate is always changing to a greater or lesser degree: "There have been significant shifts of climate during the twentieth century; at first a more or less global warming to about 1950, then some cooling. More recently, a notable increase in the incidence of extremes of various kinds in almost all parts of the world has hit agriculture and created difficulties for planning in many fields."

Perhaps climate has returned to normal in the real sense of the word, that is, to greater fluctuations, such as used to define the climate in the centuries before the twentieth.

COOLING OR WARMING?

Climatology is a relatively young and a very complex science, full of theories and contradictions. According to one school, we are approaching a global warming, the so-called "greenhouse effect", as a consequence of the increasing carbon dioxide content of the atmosphere. It is feared that this may produce a climate warm enough to melt the Greenland and Antarctic ice caps, raising the sea level and drowning most of the world's great cities. Others argue that the next ice age may be due to begin, and could come upon us very quickly. This, then, would be the "albedo effect", also due to the increasing concentration of carbon dioxide in the atmosphere.

There is no conclusive evidence in either direction yet, except that the amount of atmospheric carbon dioxide is increasing by nearly four per cent

each year, due to the burning of fossil fuels, clearing and burning of forests, loss of humus in the top soil and decomposition of biomass by termites. Whatever differences there are in opinion among the scientists, they all seem to agree that this global process of displacing carbon from the circulation in the earth's organic material to the atmosphere where it cannot be reached can have no good consequences.

Whether the global climate is going to be cooler or warmer is subject to argument and speculation, but the local effects, where much of the carbon losses appear, can be observed more easily.

THE NATURAL STATE

Normally, nature controls its moisture content by a cover of soil and vegetation, which soaks up rainwater, stores it and recycles it. Soil and vegetation create water reserves to be used in periods of no rain, and if there is abundant, torrential rainfall, the impact is softened by vegetation, and excess water is released slowly to streams and rivers.

This has been described as the natural "sponge effect". It is most prominent in dense forests with abundant ground vegetation, principally in tropical rain forests, but it even works satisfactorily if there is a good ground cover of grass. The sponge effect is noticeable even in areas where there is very little rainfall, and its beneficial results can be seen in flatland as well as on steep slopes. Vegetation keeps the soil in place, soil gives life support to vegetation, and both depend on water with which they interact in an exceptionally well designed manner.

The self-perpetuating interactions between vegetation, soil and water have some influence on local climate through what is called "evapotranspiration", which affects humidity, temperature and cloud formation. If such local climate modification is allowed to work over large areas, there may be some significant effects even on large climatic systems. On this last issue, however, scientists are not ready to draw any definite conclusions. They are more inclined to agree, though, that if large areas are stripped of existing soil and vegetation cover, large-scale climatic and other changes may be the consequences.

The natural "sponge effect", created by the three agents, soil, water and vegetation, is probably superior to any other method of preventing floods as well as droughts, and it also plays a great role in preventing landslides and avalanches. Even the impacts of storm surges, tsunami and forceful winds are modified by it, as well as some effects of earthquakes.

MAN'S INVOLVEMENT

By adding to the three physical components just mentioned, a fourth, the human element, the interactions can turn into a reversed cycle:

If people destroy vegetation in order to get land, food, fodder, fuel or timber, the soil is no longer protected. Rain creates surface runoff, and the soil erodes. When the soil is gone, no water is retained and the land cannot produce any food, fodder, fuel or timber, so people will again need

land. In order to meet their needs, they turn to new land and start the process all over again. This can serve as a rough description of an ecological disaster process that is very common in many Third World countries. There are certain circumstances under which the risks are particularly high:

* in areas where the population density and/or the population growth is highest and the resource needs are most intense. Examples: China, India, Bangladesh, Middle East, Sub-Saharan Africa, Central America.

* in areas of exceptional demand for fodder, owing to high livestock density. Examples: Iraq, Ethiopia, Central America, Uruguay.

* in areas where the vegetation is particularly sensitive and at the same time attractive for exploitation. Examples: Tropoical rain forests in Brazil, Zaire, Indonesia.

* in areas where there is acute shortage of fuel wood. Examples: Nepal, India, Ethiopia, the Sahelian countries, Bolivia.

* in arid and semi-arid areas where rainfall is limited and erratic. Examples: Parts of India, Middle East, the Sudano-Sahelian region, parts of Chile and Brazil.

* in mountain slopes and river basins where the soil easily runs off. Examples: India, Nepal, Ethiopia, Central America, Colombia, Peru, Bolivia.

Other factors of importance are: land distribution and the land tenure system, farming practices, agricultural policies, pricing policies, development preferences, and resource exploitation by industrial countries.

DISASTER PROCESS

This process can be a gigantic disaster in itself. It often starts with deforestation and ends up in desertification, almost irreversibly destroying the environment, and leaving people on the margin of existence. The effects of this process on vulnerability are cumulative, both with regard to people and environment.

The symptoms can best be seen in times of major variations in rainfall, such as in 1983. Two things may happen: abundant rain, and a long period without rain. The major corresponding symptoms in the environment are extensive floods and intensive droughts, both of which can bring further degradation of the environment. The effects on people are often loss of dwellings, livestock and food resources, which may culminate in famine and death.

When this disaster process has reached a certain stage, the role of climate is no longer very clear. The same area may in fact be affected by flood and drought in the same year. These two apparently opposite disasters have been observed in Bangladesh and India; large areas may be flooded in the monsoon season, but since the water runs off quickly, there may be drought a few months after the floods.

Exceptional cases of "daily" drought conditions, even in the middle of a better than average rainy season, have been studied in the Caribbean, where bananas are the most important export crop. Dominica, Grenada, St. Lucia and St. Vincent have bananas cultivated on the steep hillsides above the beaches, where the unprotected topsoil beneath the plants is washed away by rain erosion and blown away by the wind. There is little topsoil left to retain the water, so when the rain falls, it immediately moves down the slopes and away from the crops. The plants show every sign of drought-affliction as soon as the moisture dries up. The same effect has been observed in Haiti, where deforestation has led to catastrophic erosion.

Professor Anders Rapp of Lund's University has described how destruction of the natural "sponge effect" can result in considerable loss of soil and water even in gently sloping land. Monitoring of surface runoff and erosion in Tanzania showed that vegetation played a very important role in soil and water conservation. No erosion occurred, and almost all rainwater was retained under a natural cover of grass or bush with widely scattered trees where no grazing took place. On land with millet cultivation, 25 per cent of the water ran off, bringing with it 78 tons of topsoil per year for each hectare. Completely uncovered land - after harvest and grazing or burning of straw - lost 50 per cent of the rainwater and 146 tons of topsoil per hectare in a year due to surface runoff.

It is possible, even in difficult terrain, to make use of land without losing the "sponge effect". It can even be restored in highly degraded land areas, and this must be an important part of future disaster prevention. Before going into this, we shall take a closer look at the major types of disasters that are caused by human interactions with natural environment; first earthquake and tropical cyclone disasters, and then floods and droughts.

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IV. MAJOR TYPES OF DISASTERS

7. Earthquake disasters

Asia has experienced the worst earthquake disasters, owing to dense population and urbanization throughout history. With the increasing population and worldwide tendency of poor people moving into cities, the risk of severe future disasters is increasing in many areas prone to earthquakes.

HISTORICAL EARTHQUAKES

It is estimated that five million people have died in earthquakes in the last 1,000 years. Some of those historical disasters are known to have caused a very high number of casualties as well as enormous material losses.

All known earthquake disasters with a death toll of 100,000 or above have occurred in Asia, predominantly in China. As with other types of disasters, this can partly be attributed to China's high concentration of people throughout history. The following are the most notable earthquake disasters which have been recorded (the figures of victims are estimates):

893	*Daipul*	*India*	*180,000*	*dead*
1290	*Chihli, Shangtu, Luanking*	*China*	*100,000*	*dead*
1556	*Shensi*	*China*	*830,000*	*dead*
1662		*China*	*300,000*	*dead*
1730	*Chihli*	*China*	*100,000*	*dead*
1730	*Hokkaido*	*Japan*	*137,000*	*dead*
1779	*Tabriz*	*Iran*	*100,000*	*dead*
1850	*Ning-yang-fou, Se-tchouan*	*China*	*300,000*	*dead*
1920	*Kansa*	*China*	*200,000*	*dead*
1923	*Tokyo, Yokohama*	*Japan*	*143,000*	*dead*
1927	*Nanshan, Kansa*	*China*	*200,000*	*dead*
1976	*Tangshan*	*China*	*242,000*	*dead*

(Sources: Latter, Münchener Rück, NOAA, UNDRO)

COUNTRY	Earthquakes 1960-1981	People Killed	Low-Income Economy	Middle-Income Economy	High-Income Economy
Iran	22	45,800		X	
Turkey	15	10,450		X	
Indonesia	14	4,300	X		
Peru	11	67,200		X	
Greece	10	150		X	
China, Peoples Rep.	9	245,100	X		
Mexico	9	650		X	
Yugoslavia	8	1,250		X	
Japan	7	300			X
Philippines	7	8,550		X	
Chile	6	7,350		X	
Italy	6	4,250			X
Colombia	5	400		X	
India	5	300	X		

Table 6. Earthquake disasters in individual countries 1960-1981.
Sources: League, OFDA and World Bank.

RECENT DISASTERS

In the 22 year period between 1960 and 1981 a total of 175 earthquake disasters were recorded by the League and OFDA (Table 6). Apart from the exceptional and "atypical" Tangshan disaster of 1976, about 1,780 people were killed per recorded event in the 1970s. The average death toll per event was only 760 in the previous decade. The number of recorded earthquake disasters also rose, from 69 in the 1960s to 83 in the 1970s. Countries with five or more recorded earthquake disasters in the period 1960-1981 are listed in Table 6.

THE TANGSHAN EARTHQUAKE

In the 1970s one single impact in Tangshan, China, took more lives than all other earthquake disasters in that decade combined. The official death toll of 242,000 given by the Chinese authorities was reconfirmed by them as late as 1983, although outside estimates went as high as 665,000.

In Tangshan, an industrial city of about a million inhabitants located 150 kilometres east of Beijing, the earthquake, with a Richter magnitude of 7.8, struck early in the morning when people were still in bed. Besides the heavy death toll, it was reported that 98 per cent of the residential buildings and 90 per cent of the industrial structures in the city were completely destroyed, adding up to one of the most devastating earthquakes in history.

ECONOMIC LOSSES

An earthquake is generally considered to be the most destructive and frightening of all forces of nature. A long-term worldwide comparison done by the insurance industry shows, however, that economic losses due to floods and storms far exceed those due to earthquakes. At times, however, earthquake disasters become very significant, as in the case of Tangshan. The Chinese have not disclosed the amount of financial losses that were incurred by that event, but they are assumed to have been extremely high.

However, earthquake losses, like those of other disasters, tend to involve more money in high technology industrialized countries than in the Third World.

Although it is difficult to compare the actual losses related to people and the economies in different parts of the world, it is clear that some significant earthquake disasters have had far-reaching effects on the countries stricken. The Guatemala earthquake of February, 1976, for example, caused an estimated 1.4 billion dollars worth of damage. This earthquake was a single, intensive shock, with a Richter magnitude of 7.5 and an estimated death toll of 23,000. Slight but numerous shocks can also have a significant impact. The Ancona region in Italy, for example, had 2,500 small earthquakes in the first six months of 1972, causing a total damage estimated at 300 million US dollars.

CLASSQUAKES, URBAN NIGHTMARES

Disaster records seem to suggest that earthquakes are mostly urban problems. Many cities, like Tangshan in the 1976 earthquake, have been reduced to rubble by them, and some cities have been affected more than once.

In 1954, El Asnam in Algeria suffered an earthquake in which 1,600 people died. The city was rebuilt with "earthquake proof" buildings by the French. In 1980 a new earthquake struck El Asnam, killing 3,600 people, leaving 300,000 homeless, completely destroying 25 per cent of the buildings and damaging another 55 per cent.

Just before Christmas in 1972, Nicaragua's capital city, Managua, was badly damaged by an earthquake in which 5,000 people were killed. Much of Managua had been rebuilt after 1931, when it was ravaged by both earthquake and fire. Historical records show that the same city had been hit at least twice before by earthquakes.

Among other cities that have been struck are Agadir, Antigua, Lisbon, Los Angeles, Tabriz, Tokyo, Yokohama and Guatemala City.

It seems that major earthquakes also follow a cruel timetable. The 1976 Tangshan earthquake happened in the early morning hours. In February of the same year, Guatemala's earthquake happened at night, killing about 23,000 people. The 1972 Managua shock also came at night, and in October, 1983, Turkey suffered an early morning earthquake in which at least 1,500 people died while in bed. Earthquakes appear to wait until night, to strike at people while they sleep.

One would assume that earthquakes would at least affect rich and poor equally. But their most remarkable aspect is that they appear to respect the social hierarchy. Lloyd Timberlake, in an Earthscan press briefing document on disasters in 1984, introduced the term classquake when he found that earthquakes almost seemed to seek out the poor in the slum areas of the Third World cities.

Why do earthquakes prefer to strike at cities, why do they wait until night to hit people, and why do they seek out the poor?

Earthquakes do not make these distinctions, of course. They follow their natural tracks regardless of cities, they can occur at any hour, and they jolt rich and poor equally.

Yet, many Third World cities are hit by earthquake disasters because people have built and rebuilt cities and continue to build larger and larger cities in places that are prone to earthquakes. The concentration of people in those cities explains the concentration of disaster effects.

The poor in those cities have houses of the poorest quality, often on the most dangerous ground, and people are particularly vulnerable at night while sleeping in these houses. The houses often collapse on the inhabitants. This is not specifically an urban problem, but it is most

noticeable in cities due to the concentration of poor-quality houses in slum areas.

The Guatemala quake was an example of this. Over one million of the nation's six million people were left without shelter in the 1976 shock. Some 9,100 square kilometres of the most densely populated part of the country north and west of Guatemala City were affected. Fourteen towns were almost totally destroyed. In another 17 towns, less than one-third of the buildings were left standing. The earthquake killed almost 23,000 and injured 75,000 people. It was the poor who died in the rural highlands because it is the poor who inhabit the rural highlands. But in the capital city, the disaster appeared to be more selective. The journal "Latin America" stated on 9 April 1976:

> "Some 1,200 people died and 90,000 were made homeless in Guatemala City, almost exclusively in the slum areas of the city. In this well-known fault zone the houses of the rich have been built to costly anti-earthquake specifications. Most of the poorest housing, on the other hand, is in the ravines or gorges which are highly susceptible to landslides whenever earth movements occur."

Today, places where earthquakes are likely to occur are fairly well-mapped. With the increasing population and the worldwide tendency of people migrating from the countryside into cities, there is an increasing risk of higher death tolls and greater property losses in many areas prone to earthquakes. Major Third World cities in which large numbers of the poor are forced to live on dangerous ground in dangerous structures include Lima, Santiago, Quito, Quayaquil and Caracas.

PLATE TECTONICS

A revolution in thinking emerged in the beginning of the 1970s which has led to a growing understanding of why and where earthquakes occur. Observations over a long period had already shown that earthquakes have usually appeared in narrow zones on land, and more often in the oceans, where volcanoes and mountain ranges were also found. Scientists started to combine this knowledge with theories of continental drift, sea floor spreading, the heat flow of the earth's subsurface, etc., to create the concept of plate tectonics. This concept is endorsed by many seismologists, but not by all.

According to this theory, the earth's outer shell (the litosphere) is broken into a mosaic of seven major and some smaller oceanic and continental plates which are in constant motion (see Figure 14). The tectonic plates move apart, collide or slide past one another. The interaction between these plates causes earthquakes and other geological phenomena. Here are the most important examples, as described by Henry Spall of the United States Geological Survey ("Impact of Science on Society," UNESCO 1/1982):

a) Oceanic plates are pulled apart from one another, resulting in sea floor spreading and the formation of mid-ocean cracks. Over those deep cracks the mid-ocean ridges develop from hot volcanic material which rises to fill the gaps between the plates. Seismic activity is associated with the activities of the volcanoes. The long mid-Atlantic ridge illustrates this phenomenon.

b) Oceanic plates collide with, and are forced under continental plates. One edge forces up and crumples the other, forming a mountain ridge. This is accompanied by volcanic eruptions and frequent earthquakes. The formation of the Andes in South America is one such on-going process. This is also an important component in a more complex process in the island regions to the east of Asia.

c) Continental plates are forced against one another resulting in intense compression over wide areas, periodically releasing energy as earthquakes. Typical of this is the broad seismic belt from Gilbraltar over the Mediterranean countries, Iran, and the Himalayas to Burma.

d) Two plates scrape against one another, build up great stresses from the friction and relieve the tension in earthquakes from time to time. As this is a relatively shallow process, it is not associated with volcanoes. The San Andreas fault threatening San Francisco in California is one example. Another is the Anatolian fault in northern Turkey.

Some seismic zones have not yet been fully explained by the plate tectonic theory. One such area is the East African Rift Valley, a volcanic rift with a series of lakes and hot springs, stretching from Ethiopia to Mozambique.

The earthquake zones of the world were shown in Figure 11 (Chapter 4). In that map the earthquake epicentres for magnitude above 4.5 between 1963 and 1977 had been plotted in. It can be seen that the zones coincide with the plate tectonic theory illustrated in Figure 14.

MAGNITUDE AND INTENSITY

The Richter magnitude, often used as an indication of the force of an earthquake, is a measurement of the energy released by the quake. It can be calculated on the basis of observations from a single observation point for events anywhere on earth, but it does not address the possible damaging effects of the earthquakes. Magnitudes up to 8.9 have been recorded (Colombia and Japan), but there is no theoretical limit. A "Richter scale" with a gradation from 1 to 10 does not exist, although news reports often refer to this fictional scale.

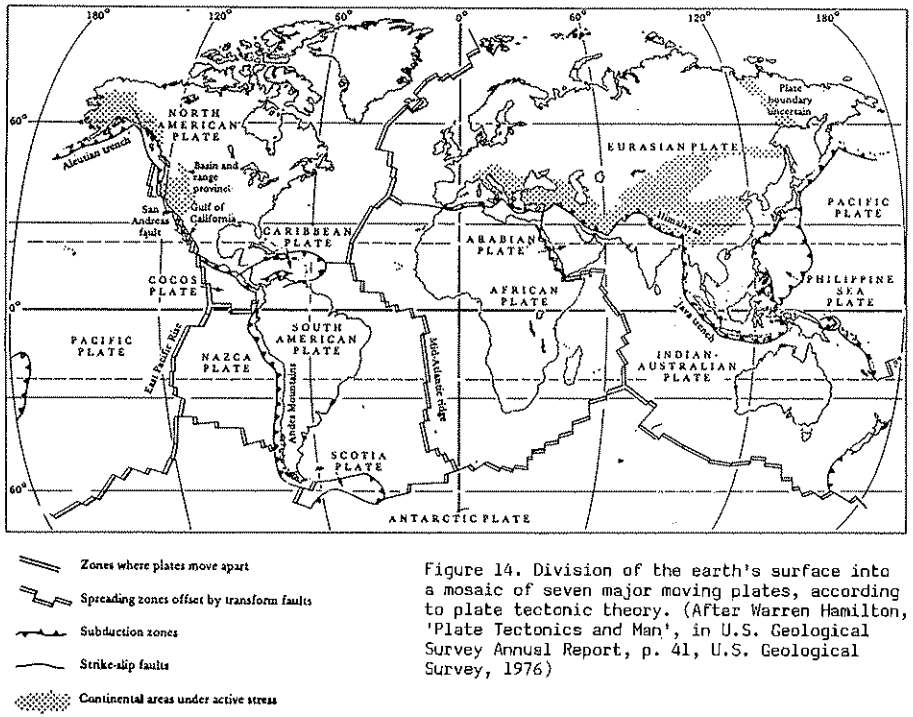

Figure 14. Division of the earth's surface into a mosaic of seven major moving plates, according to plate tectonic theory. (After Warren Hamilton, 'Plate Tectonics and Man', in U.S. Geological Survey Annual Report, p. 41, U.S. Geological Survey, 1976)

According to global observations, an average of two earthquakes of a Richter magnitude 8 or slightly more occur every year. One digit decrease in magnitude means a ten times higher frequency, so that earthquakes of magnitude 7 or more generally occur 20 times in a year, magnitude 6 or more 200 times, and so forth. The majority of those events have no effect on people as they appear in uninhabited oceanic or land areas.

As a general rule, earthquakes of magnitudes 6 or above may have damaging consequences when they appear in populated areas. Even much lower magnitudes can sometimes be associated with damage, particularly if the quakes are frequently repeated.

In order to classify earthquake effects, a number of intensity scales have been developed, such as the 12-graded Modified Mercalli Scale. Different intensity scales are being used in Europe, Japan, the Soviet Union and the United States. For insurance companies the intensity scales may serve as useful tools, but they are less helpful for the news media, relief agencies, and the public, owing to the confusing variety of scales that are in use.

The consequences, or the intensity of the damage caused by an earthquake

largely depend on factors like soil or rock conditions, density of population and type of building structures. Secondary effects, like rock falls, landslides, dam collapses, fires and tsunami (great sea waves) often follow as a result of seismic events. In the case of landslides and rock falls, the risk is often enhanced by deforestation and the building of roads.

MAN-MADE EARTHQUAKES

The above suggests that only natural processes set earthquakes in action. There are, however, some examples of artificial seismic actions caused by human activities. Underground explosions in connection with nuclear tests, for example, resemble earthquakes and are usually identified by seismological instruments.

Seismic activities, sometimes with considerable damaging consequences, have been observed during the filling of artificial lake reservoirs. Such seismic activity caused significant damage to the town of Koyna, India, in 1967 and has also been observed in China, Greece and Zimbabwe.

Other human activities, such as the exploitation of oil and gas deposits or the injection of waste fluid into deep wells have also been followed by earthquake events.

TSUNAMI

Tsunami is the Japanese term, adopted universally by oceanographers, for the immense ocean waves caused by impulsive disturbance of the sea bed. The term tsunami is often incorrectly translated as "tidal wave". ("Impact of Science on Society," UNESCO, 1/1982).

Catastrophic tsunami are usually caused by large earthquakes under or near the oceans, close to the edges of the tectonic plates. A series of waves of very great length and period can be generated by such earthquakes. Those waves may travel long distances, increase in height abruptly when they reach shallow water and cause great devastation far away from the source.

Submarine landslides and volcanic eruptions beneath the sea or on small islands can also be responsible for some tsunami, but their effects are usually limited to smaller areas. Volcanic tsunami are usually of greater magnitude than seismic ones. Waves of more than 40 metres in height have been witnessed as a result of those.

Fortunately, tsunami are not very frequent, but a number of events with great loss of life and property have occurred. The maximum number of people reported killed in a single event is 215,000, by a tsunami striking the Bay of Bengal in 1876.

Most of the destructive tsunami have occurred in the Pacific Ocean, but devastating events have also occurred in the Atlantic and Indian Oceans, as well as the Mediterranean Sea,

The Philippines experienced a local tsunami in 1976 which killed 8,000 people, leaving 10,000 injured and 90,000 homeless. Colombia was struck by a tsunami in 1979 which took the lives of hundreds of people and destroyed several fishing villages. The Hawaiian Islands, Indonesia and Japan have been struck repeatedly.

The most destructive Pacific-wide tsunami in recent times occurred in May, 1960, killing over 1,000 people and causing tremendous destruction to property in Chile, Hawaii, the Philippines, Okinawa and Japan.

A Pacific-wide future tsunami could make an enormous disaster impact, since rapid habitation and development of the coastal areas have been seen in many of the countries bordering the Pacific. J. H. Latter of the Institute of Geological Science, Edinburg, has estimated a possible death toll of 250,000 if a future tsunami of seismic origin should strike vulnerable areas at full force.

PREVENTION OF DISASTERS

It is very important to see the distinction between earthquake events and earthquake disasters, i.e. between the natural forces and the human consequences of a disaster. Although the earthquake itself may not be preventable, it may still be possible to prevent earthquake disasters.

The plate tectonic theory, and the maps of past events give a rough idea of the earthquake-prone zones. Local investigations of past events and ground conditions provide more refined means to determine the risk of future earthquakes.

Experiments have demonstrated a limited possibility of controlling some seismic activity, for instance by injecting and pumping water to decrease friction and prevent energy buildup in faults like the one in California. Such methods appear to be too sophisticated and costly for most developing countries.

Knowledge about risks, however, can be used for risk mapping. This has been done in the richer countries, for example in Japan and the United States, but has not been well developed in the Third World. There, neither the governments, development planners, nor the public know exactly where it is dangerous and where it is safer to settle.

Avoiding disasters does not always involve a choice between getting exposed to or stearing away from hazards, but instead often depends on how people get exposed. The types of houses people live in is a particularly important issue. Safe houses are not necessarily more expensive and do not look very different from the traditional ones; safety is more a matter of choosing correct materials and using skill in building.

Strictly enforced building codes and zoning laws are, however, not realistic in many Third World cities, where a growing number of people are

building their own homes on illegally occupied land because they have no other option.

Methods of predicting earthquakes are being developed. China, for example, has been successful at least twice, whereby great numbers of people were warned, city areas were evacuated, and people could escape earthquakes that destroyed 90 per cent of the houses. The same methods failed to predict the devastating Tangshan disaster of 1976. The Chinese predictions are based on forerunners, or "precursors", such as observation of the water level in deep wells, the presence of radon gas in the water and unusual behavior in animals. Another method of earthquake prediction is being developed in Greece, the so-called VAN method, based on observations of electric field variations in the ground before earthquakes. Japan, the Soviet Union and the United States have a number of advanced research projects aimed at predictions.

Seismologists are at present fearful that earthquake warnings, based on predictions that they may be able to make in the future might cause panicking with worse consequences (e.g. traffic accidents in cities) than the earthquake itself. However, according to social studies and as demonstrated by the inhabitants of Tokyo, if people have been trained to respond to warnings, they do not panic.

Uncontrolled urbanisation is perhaps the most serious threat when it comes to earthquake disasters of the Third World. The most important means to stop the increasing trend in those disasters would be to halt the migration to the cities of rural poor, and this implies rural development, which has not generally been a priority so far.

8. Cyclone disasters

The incidence of tropical cyclones is ten times higher in the Philippines than in Bangladesh. Bangladesh, though, with only a fraction of the Philippine's coastal area, has had as many cyclone disasters and 70 times more people killed in those disasters since 1960. The major differences in the causes of the disasters were in the coastal conditions and in the exposed and vulnerable populations of the countries.

TROPICAL CYCLONE DISASTERS

The most frequent reports of tropical cyclones have come from the Philippines, but the most disastrous events since 1960 have occurred around the Bay of Bengal. Bangladesh was hit by a cyclone in November, 1970, which caused the deaths of 200,000 to 300,000 people in the low lying delta area. Between 1963 and 1965 cyclones killed about 40,000 in the same country. More recently, in November, 1977, about 14,000 lives were lost due to a cyclone in Andhra Pradesh and Tamil Nadu in southern India.

The list of countries where five or more cyclone disasters occurred between 1960 and 1981 is seen in Table 7.

COUNTRY	Storm events 1960-1981	People killed	Low-income economy	Middle-income economy	High-income economy
Philippines	39	5,650		X	
Bangladesh	37	386,200	X		
India	26	24,930	X		
Mexico	14	1,560		X	
Korea, Rep. of	10	700		X	
Madagascar	9	970	X		
China	7	170			
Hong Kong	7	510			
Mauritius	7	15			
Burma	7	1,350	X		
Haiti	6	5,800	X		
Vietnam	6	7,480	X		
Fr. Caribbean	5	100			

Table 7. Tropical cyclone disasters by countries, 1960-1981.
Note: USA not included. Source: League and OFDA statistics, World Bank.

As seen in Table 7, the most serious tropical cyclone disasters occur in low-income countries in Asia. Between 1947 and 1973 as many as 96 per cent of the known deaths caused by tropical cyclones occurred in Asia.

NATURE OF TROPICAL CYCLONES

Owing to its violent nature, its potential duration, and the extensive area that it might affect, the tropical cyclone is potentially the most devastating of all storms. The dangers are created by violent winds, excessive rainfall and an increase in the sea level. Scientists have over a long period of observations developed a relatively good understanding of the nature of tropical cyclones. The use of radar, weather satellites and computers has further improved this knowledge.

Tropical cyclones have a variety of regional names. For example, what is called a severe cyclone in the Bay of Bengal is known as a hurricane in the North Atlantic. Names also depend on the storm's wind force (the Beaufort scale), its wind speed, and the way the storm is created. For convenience, the name tropical cyclone is used for all the intense storms in Table 8.

REGION	Range of maximum wind speeds met/sec. 17-32	32-85
Western North Pacific Ocean	Tropical cyclone	Typhoon
Bay of Bengal and Arabian Sea	Cyclone	Severe cyclone
South Indian Ocean	Tropical depression	Tropical cyclone
South Pacific Ocean	Tropical depression	Cyclone
North Atlantic Ocean and eastern North Pacific Ocean	Tropical storm	Hurricane

Table 8. Tropical cyclones with regional descriptions.

It has been estimated that an average of 80-100 tropical cyclones develop annually from depressions over the warm waters of the tropical oceans. The main areas where they originate as well as the main tracks they normally follow were shown in Figure 12 (chapter 4).

Tropical cyclones usually develop between latitudes 5 and 30 on both sides of the equator, although they are more common in the morthern hemisphere. About 50 countries in those two broad latitudinal belts are prone to cyclones. The average frequency of occurrences varies each month and in each area. For example, the 7,000 islands of the Philippines may be affected by about 19 tropical cyclones in an average year; the Bay of Bengal may experience only one tenth of this, but the high density of population and the conditions on the coasts of Bangladesh and India increase the risk of severe disasters.

A tropical cyclone is often erratic in its movement, changing direction from time to time, in some cases describing a loop, speeding up for several hours, suddenly slowing down or pausing without moving at all for days or even weeks.

It travels over the open sea as a vast rotating wind spiral which, as a result of the earth's rotation, turns clockwise in the northern and counter-clockwise in the southern hemisphere. The most severe winds - in isolated cases up to 110 m/sec. (400 km/h) - occur in a circular band surrounding the relatively calm centre, or the "eye" of the cyclone. Wind speeds gradually diminish from the centre to the periphery.

The circular area within which the wind speeds are greater than 17 m/sec. ("gale", Beaufort 8) has an average diameter of 500 to 600 kilometres.

The so-called eye of the cyclone may range in circumference from 20 to about 150 kilometres. Here the storm conditions are calm with light winds and only a few clouds. As the eye passes over an area, the winds suddenly decrease from hurricane strength to very light winds, often causing people to believe that the danger is over. However, as soon as the eye has passed, the winds, now blowing in the opposite direction, very quickly increase to hurricane strength again. The lull in the winds, as the eye passes over an area, may last for up to three hours.

It has been observed that the damage to houses and buildings is not caused only by direct wind pressure. Few houses are actually blown over; instead they explode due to low pressure on the outside, and are then pulled apart by swift winds (Cuny, 1983).

As soon as a cyclone crosses over land it rapidly begins to lose its strength. The damaging effects of the strong winds are therefore usually limited to the coasts, islands and ships at sea.

Tropical cyclones nearly always bring heavy rains as they move inland, in most cases on the windward side of the mountains. The rainfall can be extremely heavy, amounting to more than 250 mm within 12 to 48 hours. As much as 1,000 mm of rain has been recorded at times. This frequently leads to flash flooding, landslides and river flooding.

STORM SURGES, FLOODS

A further characteristic of a tropical cyclone is the increase in sea level, often wrongly referred to as "tidal wave" or more correctly as a "storm surge". Several factors combine to cause this increase, such as the low-pressure central area of the cyclone creating a suction, the cyclone winds piling up water, and the tremendous speed of the storm. In rare cases the storm surge can rise as much as 14 metres above normal sea level. This phenomenon can be described as a large mass of sea water which is pushed along by the storm with great force.

The effects of a storm surge when it reaches land may be aggravated by a high tide, a low-lying coastal area with a gently sloping sea bed, and a semi-enclosed bay facing the ocean. Australia, Bangladesh, China, India, Japan, Mexico and the United States all have areas which are particularly vulnerable to storm surges. It has been found that this forceful sea wave has frequently been a key factor in major tropical cyclone disasters, as was the case in Bangladesh in 1970 and southern India in 1977.

Another important factor, which is often an effect of population pressure, is deforestation. When the trees disappear along the coastlines, as they have in Bangladesh where mangrove forests have been cut, the winds and the storm surges can enter the land with greater force. Deforestation on the slopes of hills and mountains increases the risk of violent flash floods and landslides caused by the heavy rain associated with tropical cyclones. At the same time the beneficial effects of the rainfall - replenishment of

the water resources - may be negated due to the absence of the "sponge effect" of a forest.

SOUTH PACIFIC CYCLONES

Until recent years the South Pacific has not appeared to be very disaster-prone. The media's increasing ability to cover more remote parts of the world has probably influenced the reporting of disasters, but in addition people living in the Pacific islands are themselves inclined to believe that changes have taken place recently.

In the six-month period between November, 1982, and April, 1983, an unprecedented series of at least nine tropical cyclones slammed into the islands of the South Pacific. As it coincided with a worldwide peak in disasters at that time, this series of Pacific cyclone events has generally been attributed to the major global weather dislocation called El Nino. Local observations in French Polynesia reveal, however, that the 1982-83 events may not have been an isolated experience.

Marie-Therese and Bengt Danielsson, living on Tahiti, have reported a gradual increase in the temperature of the ocean waters around the Marquesas Islands over recent years, which has created a perfect breeding ground for cyclones.

"It is quite clear that the whole wind and water circulation system in the eastern Pacific is in a process of change," according to the Danielssons' report. "We personally would not be at all surprised if all these new phenomena are due in the first place to the widespread tampering with nature that has been going on in the world for the past few generations. We refer to such features of today's world as massive deforestation, the effects on the atmosphere of automobile fumes, industrial pollution, and the detonation of more than 1,200 atomic bombs in the atmosphere." ("Pacific Island Monthly", June 1983.)

In November, 1982, hurricane "Iwa" struck Hawaii, leaving 500 people homeless, destroying over 300 houses and damaging another 5,000. Fiji was struck by two cyclones in March, 1983: cyclone "Oscar", which killed 7 people, affected 200,000, and destroyed 9,500 houses, and "Sarah", which caused widespread damage but no casualties. Fiji was also affected by severe drought in 1983.

French Polynesia had the rare experience of being struck by six cyclones in five months, which killed 17 people, left at least 25,000 homeless and damaged or destroyed 10,000 houses. When the sixth cyclone, "Veena", hit Tahiti on April 11-12, the whole village of Tautira disappeared, several bridges on the west coast were destroyed, and uprooted trees blocked coastal roads all around the island. The numbers of houses damaged or flattened ran into the thousands.

APPROPRIATE HOUSING

Representatives of the French Government, who flew to Tahiti with disaster aid, advised the population to build more solid houses in the future.

With the same reaction that the majority of flood, earthquake and cyclone victims elsewhere in the world have, the Tahitians pointed out that this advice only had relevance for those who could afford to build more solid houses. It meant nothing at all to the poor slum dwellers living in shacks of masonite and corrugated iron that they had thrown together themselves. The only advantage they had was that many had been able to reassemble their battered dwellings in a few days, whereas it would take months and years and millions of francs for the owners of plush villas to rebuild their homes.

It seemed to Marie-Therese and Bengt Danielsson that an excellent intermediate solution to the housing problem would be to revert to traditional Tahitian thatched roof houses. They themselves live in the oldest house of this type on the island. For 50 years it has withstood everything that the elements could hurl against it for the simple reason that it has so many openings and interstices that the wind blows straight through it. A European-style plank or brick house, on the other hand, offers solid resistance to wind, and is therefore much more likely to be leveled.

Traditionally cyclone-resistant housing like that in Tahiti had been developed and adopted all over the South Pacific. Even today, most houses in Western Samoa are built without any walls at all.

Based on long experience of cyclones, similar housing standards have developed in the fishing communities along the coasts of Sri Lanka and the Bay of Bengal. After the 1977 cyclone and storm surge in Andhra Pradesh, India, it was found that the traditional designs, based on a 2,000-year-old Hindu building code, were well adapted to resist high winds. There are simple ways of making houses cyclone-resistant with the use of cheap, traditional building materials. Pre-fabricated concrete houses, built by the Andhra Government, the Red Cross and other organisations to replace traditional houses after the 1977 cyclone were not popular among the beneficiaries; they were inflexible, unbearably hot, difficult to maintain, and placed in straight lines which broke down the social patterns of the communities.

EXTENSIVE LOSSES

The period 1960-1981 may be too short to pinpoint certain trends, but the statistics in Chapter 2 indicate that tropical cyclone disasters are becoming relatively less significant compared with other types of disasters worldwide: they constituted 22 per cent of all recorded disasters in the 1960s, but only 17 per cent by the beginning of the 1980s. Tropical cyclones were responsible for only 9.3 per cent of deaths due to disasters during the first two years of the 1980s, according to the same statistics. The consequences in terms of affected population and damages, however, remain serious, both in the Third World and in richer countries.

Several publications mention tropical cyclones, or violent storms, as the most significant type of natural hazard owing to the frequency with which they cause damage and loss of life. This holds true at least in the eyes of the insurance companies in industrialized countries, whose heaviest catastrophe losses are attributed to storms (Munchener Ruckversicherungs-Gesellschaft, 1982). As an illustration, the trend of losses from hurricanes in the United States can be seen in Figure 15. The upward trend in losses involving millions of dollars, is very obvious, but at the same time the decrease in the death toll is notable.

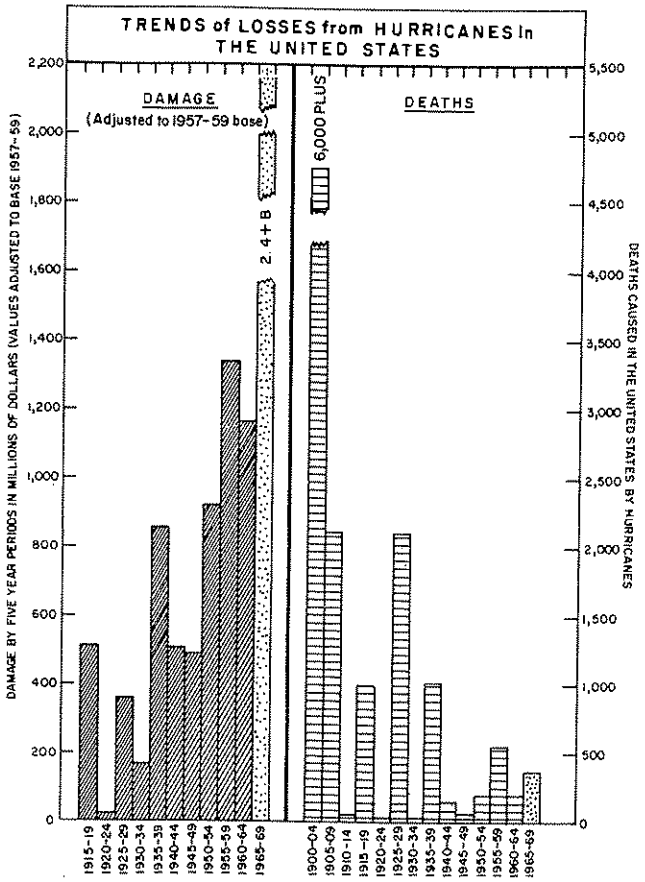

Figure 15. From "Guidelines for Disaster Prevention and Preparedness in Tropical Cyclone Areas", ESCAP, WMO and the League, 1977.

In the U.S., warning services and community preparedness programmes have helped lower the death toll due to hurricanes.

The effects of tropical cyclones appear to be more severe in the developing than in the developed countries. The destruction caused by a single severe storm can completely negate any economic development for several years in a poor area of a Third World country. The rapidly increasing population in many such areas means an ever increasing vulnerability.

PREVENTION OF DISASTERS

As with earthquakes there seem to be very limited possibilities of preventing tropical cyclones from occurring. At least, no method has yet

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been found to prevent their inevitable heavy rainfall.

It may be possible, however, to reduce the wind speed of cyclones. It should be noted that an immense amount of energy is released in a tropical cyclone - in a single day, as much energy as could be released by 400 hydrogen bombs of 20 megatons each (UNDRO, Meteorological Aspects, 1978). An experiment conducted by the USA since 1960 called Project Stormfury, has indicated a possibility of reducing maximum wind speeds by 10 to 15 per cent under certain circumstances. This effect is achieved by heavy seeding of the clouds within the cyclone system with small silver iodide crystals.

These methods do not yet provide viable means of disaster prevention in the Third World. At present, the developing countries have to rely on weather observations, forecasts, warnings and the ability of the exposed population to cope.

With the help of radar, satellites and radio, the tracks of tropical cyclones can be followed, and warnings can usually be issued in time for people to move inland and take shelter. The main problem seems to be that information frequently fails to reach the population in danger due to poor communication. People are also often inadequately trained in ways to respond.

Population expansion in coastal regions also constitutes an increased risk of cyclone disasters. In the Third World, expanding populations along the coasts often belong to the poorest and most vulnerable groups of society. This is particularly true in the Bay of Bengal, but even in the USA an increased vulnerability has been observed in Florida, where elderly people of lower-income groups have started to inhabit the cheaper but storm-prone coastal regions.

Thus, in addition to building appropriate housing, controlling population expansion in coastal areas as well as public information and training are important means of preventing further cyclone disasters along coasts.

Tree plantation and coastal embankments which offer protection from large sea waves are another means of disaster prevention that has been introduced in countries like India and Indonesia. India also introduced cyclone-proof community shelters in remote coastal villages after the devastating cyclone disaster that occurred in 1977. This was done by the Indian Government with substantial funding assistance from the EEC, the Swedish, Norwegian and British Governments and Red Cross Societies, and other organisations. The duration for which protection will be provided, of course, depends very much on the continuing maintenance of these buildings.

Protective tree planting may have some mitigating effect on the storm surges, and inland planting certainly will have a mitigating effect on floods from the rains. The most vulnerable region is a low lying area near a gently sloping bay surrounded by denuded beaches and inland hills. Such a location would run the risk of high winds, heavy rains and exceptional floods from two sides - from the sea wave and from the immediate hill runoff.

TORNADOES

Severe inland storms also occur, but they are usually confined to relatively small geographical areas and are often associated with thunder, lightning and hail. Of those, the most dangerous is the tornado, which is the fastest and most violent of all storms.

A tornado can be described as a funnel-shaped air spiral which can have a wind velocity of up to 140 m/sec. (500 km/h) at its edges - a wind of such force that even massive buildings can be destroyed. The average circumference of a tornado is a few hundred metres, and it is usually exhausted before it has travelled as far as 20 kilometres. Significant losses have been caused by tornadoes in Europe, India, Japan, South Africa and Australia, but the most frequent losses are reported in the United States, where approximately 1,000 tornadoes occur annually.

9. Flood disasters

For many centuries, China's and the Indian Sub-continent's large river basins have been the scenes of the world's worst flood disasters. But the 1982-83 El Niño proved that South and Central America are also becoming extremely prone and vulnerable to floods. The frequency and severity of floods is growing faster than any other type of disaster, with the rapid rate of deforestation as a major cause.

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FLOOD TENDENCIES

Global statistics show that floods are the most frequently recorded destructive events, accounting for about 30 per cent of the world's disasters in a year. There are indications in addition to our statistical sources pointing to a more rapid increase in the frequency of floods than in any other type of disaster.

1983 was an exceptional year, with many of the same countries that experienced droughts being struck by floods, including Senegal, Bolivia, Brazil and India. At least 17 countries in the Third World were flood affected:

AFRICA	AMERICAS	ASIA AND PACIFIC
Central African Rep.	Argentina	Bangladesh
Senegal	Bolivia	China
Sudan	Brazil	India
Tunisia	Cuba	Nepal
	Ecuador	Papua New Guinea
	Paraguay	
	Uruguay	
	Peru	

According to the OFDA statistics, floods killed 80,000 people and affected at least 220 million worldwide in the two decades before 1980. Countries affected by five or more floods between 1960 and 1981 are listed in Table 9. The figures for the number of people killed in floods (from OFDA's Disaster History List) are estimates but may be used for relative comparison.

It appears from Table 9 that the most flood-prone countries have low or middle-income economies. In fact, 80 per cent of all the people killed by floods lived in low-income countries. This can be further narrowed: 70 per cent of all victims lived in India or Bangladesh. The latter country, one of the very poorest and most populous, accounts for about half of all deaths worldwide due to flood. The worst flood disaster in recent years struck Bangladesh in 1975, killing nearly 30,000 people.

Although there are very limited sources of data, it is an obvious fact that the detrimental effects of floods go far beyond the deaths they cause. Particularly in the densely populated low lying areas of Bangladesh, China and India, the effects are widespread, causing masses of homeless, heavy losses of livestock, devastation of crops and grain, disruption of communications, etc. The frequent repetition of flooding means a constant, or even increasing drain on the economy of the rural population. Those who marginally survive may never have time to recover before the next flood strikes - a cumulative effect involving more and more people each time.

COUNTRY	Flood events 1960-1981	People killed	Low-income economy	Middle-income economy	High-income economy
Brazil	28	2,850		X	
India	28	14,700	X		
Indonesia	23	1,200		X	
Bangladesh	17	39,900	X		
Bolivia	13	160		X	
Philippines	13	1,400		X	
Algeria	12	190		X	
Mexico	11	370		X	
Colombia	10	600		X	
Argentina	9	200		X	
Korea, Rep. of	9	1,950		X	
Peru	9	350		X	
Vietnam	9	350	X		
Costa Rica	8	30		X	
Morocco	8	90		X	
Burma	7	140	X		
Ecuador	7	20		X	
Laos	7	400	X		
China, Peoples Rep.	6	1,650	X		
Iran	6	350		X	
Italy	6	350			X
Japan	6	230			X
Mozambique	6	850	X		
Nepal	6	1,500	X		
Pakistan	6	2,100	X		
Panama	6	100		X	
Sri Lanka	6	100	X		
Tunisia	6	700		X	
South Africa	5	280		X	
Tanzania	5	65	X		

Table 9. Flood events by countries 1960-1981.
Sources: League and OFDA statistics, World Bank.

FLOODS IN CHINA

China and the Indian Sub-continent have been known for their floods throughout history. In China, it is reported that the Yellow River has killed more people than any other single feature on the Earth's surface. With the Yellow River in the north and the Yangtze in the south, China is coping with two of the world's most intractable streams of water. In 1980, the Yangtze caused the worst flooding in 26 years in Hubei Province. It was estimated that 18.4 million people lost between 30-80 per cent of their annual income due to the floods. The total damage was estimated at

one billion US dollars, of which about 800 million dollars were attributed to crop losses.

The same year, Hebei Province south-west of Beijing experienced its worst drought in 37 years, with 23 million people affected and damage estimated at 1.4 billion US dollars. Under these circumstances, the Government of the People's Republic of China requested for the first time ever the assistance of the international community.

Contributions in cash and kind, largely composed of food, to a total value of approximately 25 million US dollars were pledged by 21 countries and five inter-governmental organisations - one per cent of the estimated damage.

A UN assessment team, visiting China in January, 1982, acknowledged that the amount of international help was extremely modest in comparison with the quantity of self-generated relief in China. Futhermore, most of the food donations arrived in China after the end of the disaster period, that is, after the bountiful summer harvest of 1981, and some was still due to be delivered in early 1982. While international assistance to both flood and drought victims totalled about 50,700 metric tons, relief amounting to 800,000 tons of grain was distributed from government reserves in Hubei.

It was noted by the UN team in 1982 (Case Report: "Drought and Floods In Hebei/Hubei Provinces 1980/81", UNDRO, 1982) that the situation in Hubei had dramatically improved so that a substantial part of the population in the disaster area enjoyed somewhat improved living conditions compared to the pre-disaster period. This was due to a very good autumn harvest in 1981 and to the reconstruction of public utilities such as dams and individual dwellings, often using better construction materials such as bricks instead of adobe. China has a policy of overcoming any disaster within twelve months by rehabilitation and reconstruction assistance - as opposed to relief aid alone.

LATIN AMERICA'S GROWING FLOODS

China and India have acknowledged their increasing flood problems as being major symptoms of deforestation of watersheds. More recently, South and Central America have shown the same symptoms very drastically.

In 1983, when the major weather anomaly called El Niño reappeared after ten years, it could be seen that vast areas could no longer cope with the heavy rains typical of this recurrent phenomenon. Hundreds of thousands of families in Argentina, Bolivia, Brazil, Peru, Uruguay, and other countries in Latin America suffered from floods of unprecedented magnitude and duration.

The Argentine journal "Boletin de Medio Ambiente y Urbanizacion", October 1983, described how aggressive deforestation had affected the river basin of Rio del la Plata. The "sponge effect" of the earlier forests had weakened so that rainwater immediatly ran off the soil and filled the rivers, far beyond their capacity to release it into the Atlantic Ocean.

It has been estimated that 55 million hectares of forests have been cut since 1930 in the river Parana's catchment area in Brazil. Only 28 million hectares have been subject to revegetation.

In 1983 the State of Parana in Brazil had the worst floods it had ever experienced. As much as 1.8 million tons of grain were lost, and more than 4,500 houses were destroyed. The State of Rio Grande do Soul lost 2.1 million tons of grain in the southern region near the Uruguayan border. In Itaqui city, the river Uruguay rose a record 14 metres, inundated 40 per cent of the urban area and destroyed 2,000 houses.

Deforestation, and simultaneous urbanisation near the rivers, mostly by the poor who migrate from the countryside, have grown into enormous problems in Brazil, Argentina and a number of other countries in Latin America.

Apparently, the awareness of the ecological links to disasters is growing too. The authors from several countries who contributed to the Argentine publication cited above also gave voice to a growing frustration with international developmental funds. In their opinion, the funds incur debts for "development" they don't need, (for example, the worlds largest hydroelectric dams in Brazil), and the debts have to be paid back in the deforestation and subsequent disasters they don't want (logging for timber export and clearing for beef-exporting ranches by national as well as multinational enterprises).

It is now a well established fact that deforestation is to a great extent responsible for the increasing floods of the world. China, more than India, is also convinced that reforestation can help prevent floods.

China is one of the poorest countries of the world, but in spite of this, seems to cope quite well with its enormous flood problems. India, another poor country with an enormous population and similar, if not worse, flood problems is also used to coping with the large effects of flood disasters. We shall take a closer look at India here.

FLOODS IN INDIA

Floods happen so often in India that they have little sensational value. Events that would have caused enormous concern in other countries may pass more or less unnoticed when they occur in India. Unless the floods are exceptional even according to Indian standards, they tend to be dismissed with a shrug of the shoulder by international as well as national relief agencies and news media.

As a member of one of India's many charitable organisations said in September, 1980: "Why bother? This happens every year. They are used to it." Or, to quote the Malthusian explanation suggested by an unconcerned Indian businessman during an inflight conversation from Europe to Bombay at that time: "We need not be too concerned. It may be nature's way of keeping a check upon population growth".

This was at a point when, according to official figures, 1,184 persons had

died and 20 million people were affected by floods in 46 of the 56 districts in Uttar Pradesh, India's most populous state. It was estimated on 22 September 1980 that the total flood losses in the state had reached 1.2 billion rupees (150 million US dollars at that time). The water started to recede at last. For more than two months 1.8 million hectares of crop area and whole towns and cities had stood constantly submerged in deep water in the plains along the Ganga, Ghagra, Gomti and Rapti rivers. At least 1,430,000 houses, mostly made of mud, had dissolved and collapsed - when heavy rains again started to play havoc in the state.

When that year could finally be summed up, it was found that 1,800 people had been killed and 32 million affected by heavy floods in the northeastern states of Uttar Pradesh, Bihar, West Bengal, Assam and Orissa. India's flood losses in 1980, as recorded by the American OFDA, totalled at least 320 million US dollars. Some areas in Uttar Pradesh had over 1,300 mm of rainfall (53 inches) in a few months.

Following a policy that is gaining ground in quite a few Third World countries, neither the Indian Government, nor the Indian Red Cross chose to appeal to the international community for assistance. Was it national pride that prevented asking for help from outsiders? According to Indian authorities: no. When international emergency assistance is offered it is usually welcomed, but India maintanis that, unless circumstances are exceptional, it has adequate food stocks and the emergency capacity to absorb flood losses. Apparently, 1980 was not an exceptional year. The yearly monsoons make northeastern India one of the rainiest areas of the world, and two years before, in 1978, the floods had been much worse.

THE JAUNPUR EXPERIENCE

In the 1980 floods, Jaunpur, a congested district town of a few hundred thousand inhabitants near Varanasi in Uttar Pradesh, was among the worst-affected places. The whole town, like most parts of the district, was inundated by the swollen river Gomti, and water stood more than two metres deep for more than two months.

Not even the highest spot in town, which, not suprisingly, was the premises of the district administration, escaped the floods. In the mornings the newly appointed district magistrate (DM), a forceful young woman, rowed her little boat and moored it to a pole on the office verandah. Throughout the day she could see the effects of the floods right in front of her. The seat of the district powers looked like a veritable refugee camp, as 2,000 or so of Jaunpur's poorest squatter families took shelter in the corridors and on the verandahs of the offices. Out in the district, some 700,000 flood victims had fled with their few belongings to elevated areas along the roads.

The Indian Red Cross distributed blankets and clothing to some 5,000 of the poorest families in the district, having been advised on suitable distribution points by the DM. She even deployed some of her own staff as Red Cross volunteers, with lists of the most needy families. (The district magistrates, or "collectors", all over India also have the duty

of being president of the district Red Cross.)

But the major relief operation was purely a government undertaking. The DM in Jaunpur was asked whether she wanted any further Red Cross assistance, such as feeding centres, medical teams or water purification campaigns. "No," she said firmly, as if she feared that some relatively insignificant NGO involvement would disturb the relief organisation she had worked out so laboriously since she took charge of the district.

"Feeding will have to continue on a massive scale for at least three months after the flood, until the farm labourers can start earning their living again," she explained. "This is taken care of by the Government. We have the necessary food supplies. We have already covered the need for vaccinations, and we have adequate medical personnel as well as supplies of medicines. The same applies to water disinfection."

During this exceptionally long and difficult flood period, people demonstrated behaviour that is typical of disaster victims. They were for the most part not dazed or waiting passively to be rescued, and there was no sudden outbreak of looting or any other anti-social behaviour. Instead, they relied on imagination and creativity, helped each other and behaved in an organised manner.

The townspeople travelled in boats and rafts in the narrow streets, paying small fees to a new cadre of casual oarsmen, and they climbed ropes and makeshift bridges between the buildings. Families who had occupied the lower levels of the buildings stayed with relatives, friends or neighbors upstairs. Shop owners kept their merchandise in the staircases, and, somehow, life in the town kept going as best it could.

When the water at last receded to the ordinary channel of the river Gomti, the whole town was littered with debris and smeared with a thick, grey residue. But as soon as the water level had dropped enough for people to be able to walk in the streets for the first time in over two months, they were engaged in restoring their town to its ordinary shape. People began cleaning their shops and houses, small restaurants lit their fires and served their first meals in a long time, fresh water began to come out of the taps again, and life started to get back to normal.

FADED OPTIMISM

Just after independence in 1947 the people and the government of India had optimistic aspirations to eliminate floods from their country. This was at a time when, as climatic scientists have later established, global weather conditions had been unusually complaisant for some decades. The optimism has since faded in India, and many now believe that the vagaries of the subcontinent's weather are such that it is nearly impossible to prevent flooding.

The flood situation has in fact worsened at an almost explosive rate. Nearly 40 years after India's national freedom the annual damages to people, crops, animals, property and local economies are higher than ever. In the five-year period 1974-1978 annual flood losses averaged 8.45

billion rupees (845 million US dollars) - about 14 times higher than in the mid-'50s, according to the 1980 report of the National Commission on Floods. As in 1980, the densely populated states of Uttar Pradesh, Bihar, West Bengal, Assam and Orissa usually bear the brunt of the losses, but a number of other states also have growing flood problems. The annual flood losses amount to almost one per cent of India's gross domestic product.

Fierce monsoon rains, heavy snow melt in the Himalayan mountains and storm surges from the sea constitute the major natural causes of the river and coastal floodings in India. Although there might have been greater variations in recent years, there has, however, been no such marked shift in climate that those phenomena alone can be blamed for the dramatic flood increases. There therefore must be causes other than the unpredictability of the weather.

HUMAN CAUSES

We will find an explanation if we look at population figures. Since the year of independence India's population has more than doubled, to about 740 million people in 1984. According to a recent FAO estimate, one third - 250 million - now live in areas that may be affected by floods in any year. This figure may go higher. Continued population growth at the present rate of 1.8 per cent a year would make another 4.5 million people flood-prone in just a year, and about 23.3 million more in five years. Unfortunately, there are other indications that the rate at which the population is being exposed to the risk of floods is increasing even faster than this.

Growing population and exposure in the flood plains does not explain the increase in flooded areas. The State of India's Environment 1982 reported that the land areas prone to floods doubled from 20 to about 40 million hectares in only ten years, between 1971-80. The National Commission on Floods makes a more conservative estimate - from 25 to 34 million hectares - but irrespective of the differences in statistics, the conclusion remains that the areas prone to flooding have increased drastically in recent years.

This conclusion was also acknowledged by a number of participants at an international conference on flood disasters held in India in December, 1981. Experts concluded that the main causes of the increase of flood-prone areas was deforestation and subsequent soil erosion in the hills and mountains where the rivers originate. Formerly the soil was bound by vegetation on the hillsides and soaked up much of the fierce monsoon rains, releasing water gradually to enrich vast fertile regions. Now the rains wash away the mountain soil and leave it in the riverbeds, so that there are shorter but greater peaks in the flow in gradually shallower river channels.

FORESTS WITH NO TREES

India has been subject to deforestation and land degradation for thousands of years. Large tropical forests have slowly been turned into deserts by many generations of farming and cattle grazing. The rate of destruction

has increased dramatically with the growing population pressure.

The Indian Forest Department still controls 23 per cent of the country's total land area - which is the reason why this portion is classified as forest. Apparently, only half of the official forest lands are presently under adequate tree cover. Indeed, aerial surveys have found that some "forests" have no trees at all. Though the Forest Department places the rate of deforestation at 150,000 hectares per year, many observers believe that the actual rate of deforestation is well over one million hectares every year. The official figures only include land that is taken away from the Department through official transactions for agricultural purposes, roads, industries and other development projects. They do not take note of the actual decrease in trees owing to the Forest Department's own timber contracts, shifting cultivation, cutting of fuel wood, illegal logging or other behind-the-scene practices. (The State of India's Environment 1982).

Soil losses due to deforestation and depletion in the protective vegetation cover are reaching gigantic proportions. Every six months more topsoil gets washed away in India than has been used to build all existing brick houses in the entire country. Every minute about 11,400 tons of soil are removed. Much of it disappears into the sea, but large quantities also settle in tanks, reservoirs, streams and riverbeds, reducing their capacity to hold or carry water. Ganga's riverbed has risen half a metre in a few years, according to some estimates. The immediate consequences have been painfully felt: heavy floods over wider areas, affecting more people.

The long-term effects of soil erosion may be even more dangerous, as the ecological capacity to support the population is being undermined. Moreover, the heavy siltation (the settling of sediments) has proved to shorten the life of very expensive dams and reservoirs to one third of what was first expected. Not only is the capacity to hold back flood water diminished, but the reduced capacity to store water for irrigation causes an estimated annual loss in irrigation potential of almost 60,000 hectares. Ironically, the same areas may thus become increasingly prone to floods and droughts at the same time.

The most hazardous degradation of soil and vegetation takes place in the Himalayas, which are the sources of three major river systems: the Indus, the Ganga and the Brahmaputra. Approximately 80 million hectares are drained in India by these rivers. This is 25 per cent of the country's total land area, and neighbouring Bangladesh, Nepal and Pakistan also have their shares of these river basins.

Most of the eroded soil is taken by the rivers from the Indian side of the Himalayas. But some large tributaries also carry soil from Nepal down the Ganga basin, adding to the flood problems in even a third country: Bangladesh. Each year the rains are believed to wash away more than 30 tons of soil from every hectare of the bare hillsides in Nepal. Negotiations between the Indian and the Nepalese governments have so far failed to reach an agreement on measures to put a halt to this catastrophic hill zone erosion.

HOW DOES INDIA COPE?

As was demonstrated in 1980 in Jaunpur, Uttar Pradesh, the Indian Government has much experience in dealing with flood emergencies. Flood relief measures normally fall under the jurisdiction of the state governments The central Finance Commission has dictated that money must be set aside every year in the state budgets, equal to the average amounts spent on emergencies over the five preceding years. If more than the stipulated funds are required, the central government has to fill the gaps. It is then the central Ministry of Agricultural that deals with the matter.

To quote from a report on India's floods by Ashok Dar, "Causes of Famines - Floods" (Swedish University of Agricultural Sciences, 1984), flood assistance from the central government has the following built-in objectives:

a) "The assistance is not meant as a compensation towards the flood damage, but rather as a renovation to the pre-flood levels.

b) The assistance aims at providing employment to the distressed population, rather than charity. In this connection, efforts are made under the National Rural Employment Scheme.

c) An important aspect of central assistance is to provide fresh water for drinking purposes. Here, resort is taken of government schemes like National Minimum Water Schemes or Accelerated Rural Water Supply Scheme to cover the identified villages affected by the floods.

d) The assistance, in principle, is given relatively more to the small and marginal farmers, and sometimes subsidies are provided for seeds, etc."

The policy of central intervention is to include long-term measures in the immediate emergency assistance. To what extent this is successful in actual fact is of course difficult to assess. No doubt, much food and money is spent on keeping people alive in the emergency phases of the floods. But it is not clear how many flood victims become permanent dropouts afterwards and end up as poor squatters in the many fast growing, unhealthy urban slums in India. The urban population more than doubled in twenty years (1961-1981), from 77 million to 156 million. It is believed that half of this increase was attributed to rural to urban migration, for which the frequent floods might have been partly responsible.

In the cities, these migrants are often still flood-prone. Much of the expansion of Delhi has been onto the floodplain of the Yamuna River. Many of the city's squatters, people living in unauthorised subdivisions and people living essentially in campsites are vulnerable to flooding - as are

wealthier people who occupy their land legally. Other Asian cities with flood-prone shantytowns include Manila, Bangkok, Dhaka and in India, Calcutta.

FLOOD PROTECTION

Protective measures and poilicies against flooding have existed in India for a long time. Although the environmental root causes have been well known, the major aim has been to minimize the effects of the floods, or to quote Ashok Dar's report: "...preventing the flood-potential masses of water from becoming a flood". Such measures have included the building of embankments, dams, reservoirs, drainage improvements and flood zoning.

Up to 1980, 10 million hectares of land had been protected out of 32 million "protectable" hectares. In recent years, 627 kilometers of embankments and 1,985 kilometers of drainage channels have been completed annually. The protection of the remaining 22 million hectares of land will cost 50 billion rupees (5 billion US dollars), as per Dar's report. This does not, however, include the cost of maintenance and repair.

In floodplain zoning, progress has not been satisfactory, reports the National Commission on Floods, which is dissatisfied with the apparent lack of enthusiasm at state level. Development activities and settlements are therefore not protected as much as they should be from encroaching areas prone to floods.

THE ENVIROMENTAL DILEMMA

It has been observed by Ashok Dar that, though there is some dissension, government reports in India seem to dismiss the idea that major flood problems could be checked or prevented by environmental improvements. Amazingly, the same reports recognize environmental degredation as the major cause of flood problems. Arguments, strictly academic in nature, are raised for and against the potential effects that environmental improvements would have. What it boils down to, apparently, is the fundamental observation that it is very easy for people to destroy their natural environment, but very difficult to make people repair it.

Impressive schemes for checking deforestation and erosion in mountain regions and providing grass and ecologically sound grazing in forest areas were, in fact, drawn up long ago by the government. But, while at least 150,000, possibly one million hectares of forest disappear every year, only 3.18 million hectares were brought under afforestation between 1951 and 1980.

The Indian Government has launched several schemes since independence to combat soil degradation and erosion. Until 1980-81, only 24.5 million hectares out of a total of more than 150 million hectares threatened with erosion problems were treated under these programs.

Only recently a scheme for the stabilization of 18 flood-prone river basins started, involving 16.7 million hectares. Though 7.5 million hectares need immediate attention, only 0.5-1.0 million hectares are targeted for the next few years.

A scheme to control shifting cultivation was started in 1976-77. Only 2,000 hectares and 1,000 families were covered by this up to 1980-81, while the total area affected is about 3 million hectares, and the number of families to be reached is 492,000.

The situation requires that far greater and more urgent measures be taken. Notable results of reforestation and soil conservation would require implementation on a massive regional scale, at an enormous cost. This is one area where, according to Ashok Dar, in his report "Causes of Famines-Floods", international assistance could be used on a much higher scale for preventive measures.

10. Drought and famine

Drought is perhaps the most complex and least understood of all environmental hazards. It is often seen as an effect of too little rain and, not infrequently it is made synonymous with famine. But it is improbable that fluctuation in rainfall alone causes a famine. As Africa demonstrates today, the same climate may have completely different impacts on different countries. Drought may be the last straw, which plunges a society that was not working well into a disastrous situation.

A SEVERE HAZARD

Droughts affect more people than any other environmental hazard, according to available disaster statistics. OFDA's Disaster History List, which should be taken only as a rough indicator respecting droughts, shows two distinct peaks in the global drought pattern over the last decades.

After a period of relatively favourable conditions in the early 1960s, there were suddenly over 100 million recorded drought-affected people in 1967, most of whom were living in India. The number appeared to drop again, to between 2 and 4 million in the years that followed, but in 1973 it rose sharply to about 220 million. Again the majority of the drought-affected, more than 90 per cent, were found in India. At that time, Ethiopia and the Sahelian countries were believed to have lost well over 200,000 human lives due to drought. However, since those countries together had little more than 8 per cent of India's population, their number of drought-affected remained modest compared to India's, although the effects might have been felt very differently.

After a more recent relatively calm period, the global weather pattern seemed to have gone completely awry: in 1983, reports from United Nations, the Red Cross and news agencies said that about 300 million people were severely affected by drought. India's share of this disaster was said to be 120 million affected, between 20 and 30 million were reported in South and Central America, but for the first time Africa took the lead in the number of drought victims, and Africa's drought problems continued to worsen.

Drought is perhaps the most complex and least understood type of all environmental hazards. It is often seen as an effect of too little rain and, not infrequently it is made synonymous with famine. But it is improbable that fluctuation in rainfall has ever been the sole cause of a famine.

When there are years of less than average rainfall in the surplus food producing countries of Europe, North America, Australia and New Zealand, they may be called drought years, but famine is not allowed to develop. Farmers may suffer economic losses, but there are also mechanisms of sharing the losses and having the risk spread to enable a quick recovery.

Even in the two most populous countries of the world, China and India, which are also among the poorest, great efforts are being made to cope with droughts. These countries have had long experience of large-scale drought situations, and, while the losses may be heavy to the farmers, and the poor and vulnerable populations may suffer considerably, they often manage to avert widespread famine.

China and India have given agriculture and food production high priority, and they have developed policies to keep grain reserves in preparedness for the drought years which they expect will come. China, through its orderly political system, is able to organise food relief and rehabilitation programmes "remarkably well and fast", noted a UN assessment team after the 1980 drought. India, with a less orderly

political scene, has democratic habits which help: before a famine breaks out, opposition parties and newspapers demand prompt action. "Famine code" books have long since been drawn up with instructions for officials to follow.

Africa has now emerged as the most drought prone continent. To many of the young African states this is a relatively new problem. They have had little training in coping with drought and famine, and foreign aid or advice have not always had a positive effect on them.

CRISIS IN AFRICA

In early 1984, the Economic Commission for Africa listed 21 African countries facing famine. FAO reported that more than 150 million people* in 24 western, eastern and southern African nations were "on the brink of starvation" because of drought, and it said that famine had "already caused deaths in some countries".

UN Secretary General, Javier Perez de Cuellar, said in a statement after a visit to eight West African countries in February, 1984: "Africa is faced with a crisis of the gravest proportions. In the countries which I visited, the impact of the continuing drought was clear - and frightening." He established that, "In West Africa, rainfall was at its lowest level since the disastrous 1973-74 drought, and even for the last 30 or 40 years in some areas."

UNDRO published the most staggering figures (UNDRO News, January/February 1984): in 34 of the 45 countries south of the Sahara, an estimated 200 million people, about 39 per cent of the continent's total population, had been "hit by the crisis in one way or another".

But, according to UNDRO, the critical situation was not a "flash phenomenon", since it had been building up over the past two decades through a combination of factors: economic stagnation, high population growth, declining food production, economic devastation caused by civil strife in scattered regions and more recently, unprecedented drought which had "crippled the agricultural economies of most countries south of the Sahara".

Ethiopia was described in some detail in the Prologue to illustrate the African dilemma. Much of the emphasis was on environmental factors, population growth and the widening food gap. These are a common theme in most parts of Africa today, but there are no two countries with identical problems. A few other examples may illustrate this.

MOZAMBIQUE

Mozambique had little or no rain since 1979 in the central or southern regions. At the end of 1983, FAO estimated that 4 million people, one-third of the total population, were affected by drought, 1.8 million of them seriously. A UN report in early 1984 said 10,000 people had already died in three of the worst hit provinces. A Washington Post account of the situation gave a death figure that was ten times higher.

*This figure gives the total population of those 24 countries.

Those worst affected by the drought were mostly rural people. Nearly 350,000 had abandoned their homes in the country's isolated interior to seek food and shelter at government relief camps. Some came on foot for more than 80 kilometres. To reach the nearest food distribution point, another 30,000 crossed the border into neighbouring Zimbabwe, which had already been affected by drought for three years.

The cereal imports required by Mozambique in 1984 were estimated at double those of normal years - 600,000 tons instead of 300,000. FAO proposed 130,000 tons of food aid for emergency needs, plus procurement of seeds and agricultural supplies.

However, drought was not the only cause of the disaster in Mozambique. Security problems hampered food production as well as assessment of needs and government delivery of relief supplies, particularly in Inhambane and Gaza provinces.

The Ministry of Internal Trade reported in February that anti-government guerillas, widely believed to have received the bulk of their support from South Africa, had destroyed or damaged 500 rural centres used for distributing seeds, fertilizer and other essential farming supplies and for warehousing food products. OXFAM reported that homes, state-run shops, health centres and crops were also destroyed by the guerillas.

UNDRO, in consultation with other agencies, including the Red Cross, organised food shipments from Maputo to other ports on the Mozambique coast to enable relief distribution to take place from various points, but the security problems continued to be a serious threat to the drought victims. Many who could not be reached with the aid fled to safer areas.

Civil strife and security problems aggravated the drought in other African countries too, among those Angola, Chad, Ethiopia and Zimbabwe.

ZIMBABWE

While all eight districts of Zimbabwe had poor rainfall in the last three years, the most seriously affected areas were located largely in the south and southwest of the country. These areas usually receive very little rain. Despite efforts to move cattle to less affected regions, it was reported in September, 1983, that some 100,000 head of cattle had perished, with another 350,000 expected to die, representing some 30 per cent of the communal herds in the most severely affected areas.

A total of 2 million people were estimated by the World Food Programme to be in need of emergency assistance. Some 35,000 tons of emergency food had to be distributed each month until the next harvest, and for this, 175 trucks of 7-ton capacity were needed, according to government calculations.

There was no national food shortage in Zimbabwe, a major African country which regularly has a food surplus. Domestic stocks carried over from the 1980-81 bumper crop were sufficient to feed the destitute population, but to get the food out to the needy proved to be a very slow process.

Supplies were being held up for one reason or another: there were no people to load or unload the supplies, transport was not there, or lists of persons in need of rations were misplaced time and again, according to newspaper reports.

The problem inevitably had political overtones, as the area worst affected was Matabeleland. The cattle-herding Ndebele people, out of favour with the Shona-dominated government appeared to suffer the worst from the drought. For perhaps understandable reasons, the army had not been relied upon to assist in the distribution of food. The responsibility was vested in the Ministry of National Supplies, which did not have the necessary capacity to do the job.

The Ndebele people did not feel they had been getting their fair share of the land which had been redistributed after independence in 1980. Their own communal land had been overgrazed by their herds. The whites - 5 per cent of the population - controlled 50 per cent of the land before independence, and economic and security problems had caused slow land distribution since then. African families crowded onto poor quality "tribal lands" had generally been forced to overcultivate and deforest these fragile areas. Poor rainfall had been the final blow.

Population, food and land problems similar to Zimbabwe's, or perhaps more severe, could be noted in South Africa's national states, the "tribal homelands", that were scenes of too many people, too many cattle, too little rain and not enough food.

Communal antagonism, such as Zimbabwe's, which may severely hamper the ability to cope with drought and famine, is another problem still facing many African nations.

MAURITANIA

A Red Cross delegation, returning from Mauritania in mid-May, 1984, was deeply shaken by the severe conditions of the country: "In the capital, Nouakchott, people fought to get empty cardboard boxes and packing materials to feed their goats and cows," they observed. "Furthest to the east, near the Mali border, 79 per cent of the population was malnourished* - 41 per cent severely. Even in the southernmost areas of the country, all vegetation had disappeared in the sand storms and all trees looked dead. At M'Bagne, where the river Senegal used to have 7 metres of water, it was completely dry and covered by sand dunes."

Like many other recent visitors to Mauritania, the Red Cross delegation concluded: "Mauritania is no longer Sahel (an Arab word for coast or border normally used to denote the Sub-Saharan countries of the Gambia, Mali, Mauritania, Niger, Senegal, Upper Volta, Chad and the Cape Verde Islands) - it has been taken over by the Sahara."

Mauritania's president, Mohamed Khouna Ould Haidalla, said in September, 1983, that the drought, which had persisted for more than a decade, "makes it imperative that henceforth the development strategy shall regard drought as a permanent rather than a short-term phenomenon".

*According to the criteria used by the organisation Medicins Sans Frontieres. By WHO/League definition this corresponds to 25 per cent moderately and severely malnourished.

Of all the Sahelian countries, Mauritania was hardest hit by the drought in 1983-84. The 1983 rainy season ended with a 70 per cent lower than average rainfall, and in some regions of the country no rain at all had fallen for several years. Cereal production in 1983-84 was expected to reach one-sixth of the "normal" production, which usually covered only 40 per cent of the country's annual needs. The urgent food grain deficit that year was estimated at 200,000 tons. Mauritania's total population, however, was less than 2 million, having over one million square kilometres of land at its disposal.

It was observed in late 1983 that many of the herdsman, in a desperate move to save their animals, had moved towards Senegal and Mali. In many villages and camps, women, children and elderly people were left to fend for themselves. Often these drought victims had no choice but to sit and hope for relief, which the government trucks sometimes left up to 100 kilometres (60 miles) away.

The Mauritanian Red Crescent (MRC), supported by the League, Sister Societies and Northern governments, took on a major role in the relief operation at the end of 1983. It was the only organisation in the country transporting relief over sandy tracks right out to the isolated camps and villages. There, distribution took place at the MRC's own centres and those run by the Catholic Relief Services or Protection Maternelle et Infantile. The target was to bring to the centres 1,000 tons per month by this exceedingly difficult and expensive means of transportation, in order to give small supplementary rations to 250,000 people for one year.

NIGER

In 1983, the rains were either too late or too little across much of the vast Sahel. All the Sahelian countries except Niger were on the FAO's list of threatened African countries.

Niger's relatively better-off situation is noteworthy, as this country was one of the worst affected in the 1968-73 Sahel drought. By 1974, there were 200,000 people, 5 per cent of the population, completely dependent on food aid.

With a nearly 1.3 million square kilometres land area, Niger is somewhat larger than Mauritania, but its population of almost 6 million people gives it a population density over 2.5 times higher. Compared to Mauritania, Niger's per capita GNP is 28 per cent lower, and the foreign aid received per capita has been 70 per cent lower (1981 figures).

Situated in the midst of the Sahelian belt, far away from the African coast, apparently the least accessible both to rain clouds from the sea and food transports from the coasts, Niger seemed to be more prone and vulnerable to drought and famine problems than most countries.

Niger did suffer from the late 1983 rains, and it had an estimated urgent food deficit of 70,000 tons, but Niger also took quick action in 1983, selling off 5,000 head of cattle from government farms as a warning to pastoralists that grazing lands would not be sufficient for several

months. It advised herders to move to better pastures and began to lay on animal fodder to help get the herds through the 1983-84 dry season.

Niger's government has perhaps done more than any other Sahelian government to promote food self-sufficiency, emphasising food rather than cash crops after the lessons learned in the 1968-73 drought.

"THE PEANUT CONNECTION"

At that time, Niger's economy was depending heavily on groundnuts for export. Alan Grainger has described this as "the peanut connection" in a 1982 Earthscan paperback, Desertification.

Niger had developed this cash crop dependency since the 1950s, when France encouraged its West African colonies with artificially high guaranteed prices to increase groundnut production. In 1968, on the eve of the Sahel drought, Niger's groundnut cultivation had increased to cover 432,000 hectares (one million acres) of its best arable lands. This caused a large reduction in the amount of fallow land in the agricultural zone. Nomadic pastoralists had traditionally used these fallow lands for grazing their animals in the dry season. Instead, they had been forced to intensify use of grazing lands to the north, which caused desertification and increased the nomads' vulnerability to drought.

Like Niger, Sudan, Senegal, Mali, Upper Volta and Chad also entered into a cash crop period with groundnuts. But in all these countries the intensive pressure on land reduced productivity. The yields of groundnuts declined, at the same time as the prices fell relative to staple foods, and the farmers became poorer.

After the disastrous groundnut failure and the 1968-73 drought, Chad, Mali, Senegal and Upper Volta have shifted to cotton as their major cash crop, again using some of their best arable lands. In 1983-84, the urgent food needs of those countries totalled almost one million tons, representing 230 million US dollars worth of food aid - plus an additional 400 million dollars to cover the costs of distribution and the construction of roads necessary to reach the drought victims.

Niger did not shift to cotton on any considerable scale. Instead, some of the land taken out of groundnut cultivation is now planted with traditional drought resistant crops of millet and sorghum. There has also been an expansion in the area under niebe, a valuable subsistence bean which enriches the soil with nitrogen.

DESERTIFICATION

"The desert moves into Sahel, and the savannah becomes Sahelianized," says a 1984 UN report. Satellite observations have shown that, in 1983 alone, the Sahara desert advanced at least 150 kilometres to the south. Many believe that this was the combined result of drought and sandstorms. But in fact, scientists would say that most of the desert had been created already before the advance of a wall of sand.

As to the effect of drought, Alan Grainger wrote in the 1982 Earthscan report, it often triggers a crisis in the arid and semi-arid areas, since rain is sparse and irregular, but drought does not cause desertification. He gave four other causes of desertification, all attributed to human activities, and each made more acute by increasing human populations:

overcultivation
deforestation
overgrazing
unskilled irrigation

The first three causes strip the soil of vegetation and deplete its organic and nutrient content. This leaves the soil exposed to the eroding forces of the sun and the wind. It can be as dry as dust and blow away. The subsoil that is left can become so hard that it no longer absorbs rain, and the water flows over the surface, carrying away the little topsoil that might have remained.

To get fertile land for crops, farmers are clearing 300,000 hectares of land a year in the Sahel, removing its cover and thereby contributing to its further deterioration. Nomadic animal husbandry, with livestock herds having been restored in the late 1970s to the earlier high levels, keeps up the pressure on rangeland and leads to its degradation. Felling of trees, both for fuelwood and for construction, reduces forest lands and their ability to regenerate naturally. Bush fires are also increasing, eliminating valuable biomass and narrowing the number of Sahelian plant species.

Irrigation has lured both farmers and cattle herders into overuse of natural resources. Half of all irrigated farmland in arid or semiarid areas is thought to be affected by salination and/or water logging due to mismanagement of irrigation. For every hectare of newly irrigated land in the Sahel, another hectare of already irrigated land goes out of production. New wells in grazing areas have led to severe over-grazing near the wells, so that the soil has been completely unproductive.

DEVELOPMENT POLICIES

Desertification, and often drought problems, can be seen as symptoms of development having gone wrong. Sometimes, foreign development assistance has been partly responsible.

Over 1975-80, donor countries committed 5.45 billion US dollars in aid to the Sahelian countries. Only 24 per cent of this was actually directed towards agriculture, and less than 40 per cent of all agriculture and forestry projects were rural. The rest went to urban-based support projects. Only 8 per cent went for crops which depend on rain rather than irrigation.

Over one-fourth of all agricultural aid went to cash crops, most of which were exported. Only 5 per cent went to livestock raising, a major activity of the region. Only 1.4 per cent of aid was going to

forestry/ecology in 1980, up from 0.35 per cent in 1975.

Each year the Sahelian region, like most African countries, falls further behind its goal of food self-sufficiency. "The Economist" wrote in September, 1983, that Africa's agony in the 1983-84 drought was partly the result of 20 years of agricultural decline. Africa is the only part of the world which now grows less food for each of its people than it did 20 years ago. In nine countries food production per head is less than 90 per cent of what it was in 1960. The World Bank estimates that nearly 200 million people - more than 60 per cent of Africa's total population - eat fewer calories each day than they would need. Even a slight drop in food supplies, by drought or whatever cause, may result in famine under such circumstances.

REFLECTIONS ON DROUGHT/FAMINE

Famine, according to Amartya Sen, who studied this subject for the International Labour Organisation (ILO), means that some people do not have enough to eat. It does not necessarily mean that food is not available.

A natural calamity, such as a drought, explains Jean Myer of Tufts University in Massachusetts, may be the last straw, which plunges a society that was not working well into a disastrous situation.

Drought, as the Ministry of Agriculture in Niger prefers to define it, simply means "not as much water as the people need".

In a 1982 paper, "Sahel: A Climatic Perspective," prepared for the Club du Sahel, Sharon E. Nicholson of Clark University wrote that, "Several researchers have proposed various mechanisms by which droughts can self-accelerate. The changes of the land surface induced by a drought (removal of vegetation, increased reflectivity, reduced soil moisture) in turn influence the atmosphere in such a way as to strenghten conditions that first produced the drought.... The persistence of conditions of abnormal rainfall over one or two decades may be manifestations of such 'feedback' between the atmosphere and surface." The issue remains unsettled, but it would seem grimly consistent with the recent fortunes of the Sahel if drought proved to be self-perpetuating.

Although climate may be difficult and weather unpredictable, a well functioning society, with a well managed natural environment, may not have to experience any particular disaster as the result of variation in rainfall. This has also been discussed in Chapter 6. More will come in the following chapter. As Africa demonstrates today, the same climate may have completely different impacts on different countries.

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V. DISASTERS IN PROSPECTIVE

11. Environmental dangers

Deforestation, soil erosion and desertification are three major components in Third World disasters. The natural resource base is being weakened so that its capacity to support people is seriously reduced. A recent global assessment shows that desertification - the last stage, in which the environment becomes almost completely unproductive - is growing faster and affecting more people than what was predicted only a few years ago.

ECOLOGICAL DETERIORATION

Many disasters are symptoms of people's incompetent dealings with earth's living resources, on which they are directly dependent. Floods, droughts, desertification, water problems, fuel shortage and environmental pollution are examples of destructive effects of human interactions with the natural environment. In the poor and densely populated Third World countries in particular, the natural resource base is often weakened where these resources are most needed.

The ecological deterioration has caused a growing global concern. An important manifestation of this was the "World Conservation Strategy", prepared in 1980 by the International Union for Conservation of Nature and Natural Resources (IUCN) together with the United Nations Environment Programme (UNEP) and the World Wildlife Fund (WWF). Ecological problems, according to the Strategy, are urgent matters for many reasons:

* The planet's capacity to support people is being irreversibly reduced in both developing and developed countries.

* Hundreds of millions of rural people in developing countries, including 500 million malnourished and 800 million destitute, are compelled to destroy the resources necessary to free them from starvation and poverty.

* The energy, financial and other costs of providing goods and services are growing.

* The resource base of major industries is shrinking.

The Strategy gave many examples of the enormous magnitude of the problems. Seen globally, every year 6 million hecates of land are turned into lifeless desert, for example. This equals an area twice the size of Belgium. Figures of this size tend to become almost incomprehensible. The problems may seem more real, and perhaps grow more obtrusive, if we scale down the global destruction to what is happening during every single minute:

Destruction in progress	Impact per minute
Land that becomes completely unproductive (desertification)	11 hectares (28 acres)
Land where productivity is being reduced to below what is economic	40 hectares (100 acres)
Destruction of tropical moist forest*	21 hectares (52 acres)
Burning of soil generating material (dung and crop residue)	760 tons
Loss of topsoil - Colombia	760 tons
Ethiopia	1,900 tons
India	11,415 tons

* Rainforest, cloudforest and swampforest.

DEFORESTATION

FAO estimates that a total of 11.3 million hectares of forest disappear every year. Among the experts, however, there is much disagreement over the actual rate of deforestation. The US Academy of Science gives a figure twice as high - for the tropical moist forest alone. The FAO figure is said to be far too low as it takes note only of the forests that are cleared for agriculture or other uses. The US estimate concerning the tropical moist forests even includes forest clearing that is not used, or land that may be useless.

The rate of replacement, through tree planting and natural regeneration is very low - for every hectare of cleared forest, at most one-tenth of a hectare is replanted. It would probably be impossible to replace with replanting all trees at the rate they are being felled. If all the children of the world, say 2 billion, were to follow the suggestion of the title of UNEP's booklet, For Every Child a Tree, they might have to plant at least one tree each every day to replace all the trees that are taken away by the adults.

In China even the urban dwellers have to participate in tree plantation - within the cities and in the immediate surroundings. Thirty years after the Revolution, says a UNEP report, Peking's population had planted 800 million trees. Nanking's woods grew by about one million trees per year in the same period, increasing the city's forest area from 1,900 to 6,103 hectares.

But a recent account by Dr. Vaclav Smil (Ambio 5/83), who is a China specialist at the University of Manitoba in Canada, says that an environmental disaster will emerge soon in China if the trend is not reversed. Despite the mass movements in tree plantation, China has lost 24 per cent (16 million hectares) of its forested area in the five major forest provinces since the Revolution. Cutting for household use, black marketeering, fires and conversion to cropland have created a critical shortage of wood for both household and industrial purposes, says Dr. Smil.

While Africa has the fastest growing population in the world, it loses 2.7 million hectares of woodland per year (5 hectares every minute). This means that the forests and the woodland south of the Sahara are declining by 3.3 per cent per capita every year. The wood resources per person would be cut to half in only 15-20 years at that rate.

The main cause of deforestation is clearing for agricultural use, due to the growing population's need for new farmland. About 4 million hectares of woodland are cleared each year in the arid and semiarid areas of the world. More than half of this is in Africa. Land clearance for

agriculture requires the complete removal of the bush with consequent problems of increased surface runoff, erosion and land degradation.

Often the clearing of forests results in fuelwood shortage, but cutting for fuelwood is generally not a major cause of deforestation according to surveys carried out by experts. It usually becomes significant only when deforestation for other purposes has taken away most of the trees, and in areas where the tree cover was always thin.

Other causes of deforestation, which in some regions have serious effects on the environment, are mining, cattle ranching and construction of roads and dams. A major cause, however, besides clearing for agriculture, is logging for commercial purposes. This is most serious, and is happening fastest in the tropical moist forests.

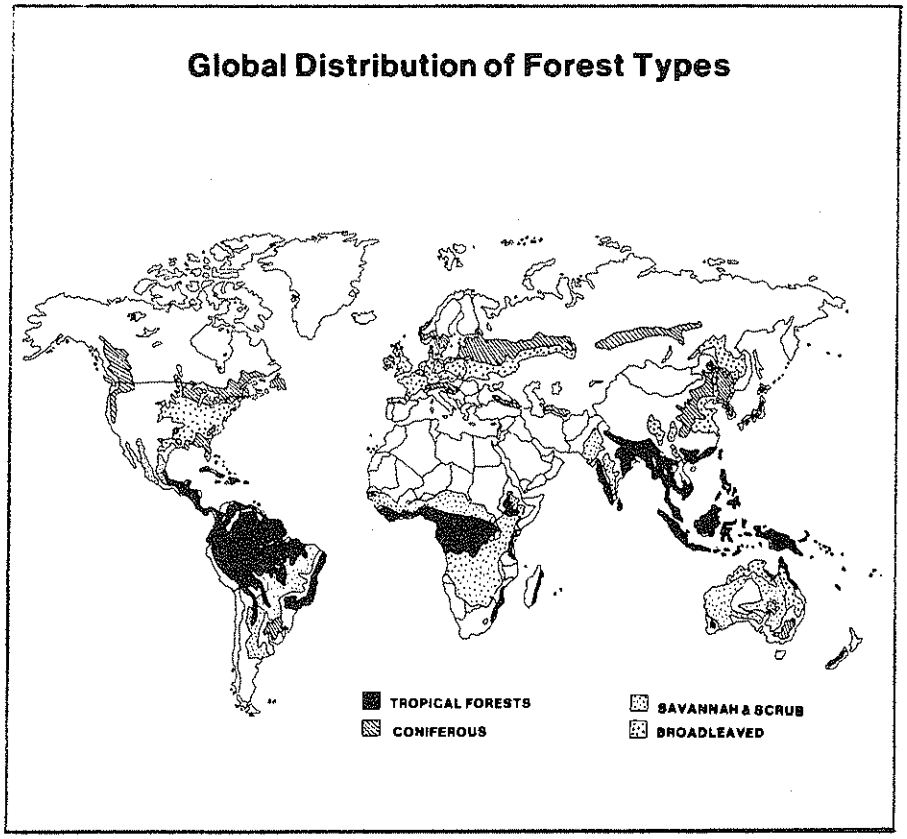

Figure 16.

TROPICAL MOIST FORESTS

Like minerals and fossil deposits underneath the ground, wood is often regarded as just another industrial raw material, more easily available on the earth's surface. In the same fashion as valuable metals are refined from ore, certain attractive wood varieties are extracted from the forests. Sometimes only two trees per hectare have a commercial value, but in the logging process as much as 75 per cent of the surrounding vegetation is destroyed.

While minerals and fossil products are dead materials, mostly found in lifeless underground surroundings, wood is taken out of a sensitive, living environment of which it is a part. Tropical moist forests are particularly sensitive. To cripple this living organism can trigger an avalanche of disasters that may reach even the industrialised countries.

Experiences of disasters from deforestation are not lacking. Soil erosion, landslides, siltation of rivers and dams, floods, crop failures, drought, desertification, famine, extermination of plant and animal species, genocide - the list could be extended considerably.

Destruction of the tropical moist forest may have more far-reaching effects than that. Since it is home to almost half the world's wild species of plants and animals, it is an invaluable gene bank, needed for breeding new varieties of crops and domestic animals.

For example, the average lifetime of wheat and other cereal varieties in Europe and North America is only 5 - 15 years. This is because pests and diseases evolve new strains and overcome resistance, climates alter, soils vary, consumer demands change. Without the insurance of the genetic diversity, most abundantly maintained by the tropical forests, new crop varieties could not be evolved. The risks increase as farmers in most countries rely on fewer high yield varieties than they used to.

The dense tropical moist forests, more than any other type of forest, are important also as absorbers of carbon dioxide. Destruction of these forests could possibly exaggerate the effect of atmospheric carbon dioxide on the world's climate.

The most modest estimate, given by FAO, says that 7.3 million hectares of tropical forests are vanishing per annum. The estimates vary widely, but it seems unlikely that any significant area of this forest type would remain by the next mid-century if the present rate of deforestation continues. The exact effects of this are yet unknown. According to one of the most horrendous forecasts, it would cause the starvation and death of one billion people in the next three decades.

The major part of the lowland forests of Southeast Asia will probably not survive to the end of this century; Thailand has already turned from an exporter to an importer of wood. Almost half of the tropical moist forests of the world have already been lost.

An effort by three UN organisations (FAO, UNEP and UNESCO) to draft a

"Plan of Action For the Wise Management of Tropical Forests" failed in early 1982. Key nations did not turn up at all.

Another meeting a few months later was met with quite a different response. In June, 1982, over 50 countries sent delegates to a meeting in Geneva to discuss tropical forests from an exploitation point of view. This meeting was arranged by the United Nations Conference on Trade and Development (UNCTAD). A new "International Tropical Timber Agreement", drafted by Japan, was discussed. On November 18, 1983, the agreement was concluded.

Japan imports the largest volume of tropical timber (more than 30 million cubic tonnes in 1980) and has apparently been worried over the impending shortage of tropical timber.

INTERNATIONAL TROPICAL TIMBER AGREEMENT, 1983

CHAPTER I - OBJECTIVES

Article 1

Objectives

With a view to achieving the relevant objectives adopted by the United Nations Conference on Trade and Development in its resolutions 93 (IV) and 124 (V) on the Integrated Programme for Commodities, for the benefit of both producing and consuming members and bearing in mind the sovereignty of producing members over their natural resources, the objectives of the International Tropical Timber Agreement, 1983 (hereinafter referred to as "this Agreement") are:

(a) To provide an effective framework for co-operation and consultation between tropical timber producing and consuming members with regard to all relevant aspects of the tropical timber economy;

(b) To promote the expansion and diversification of international trade in tropical timber and the improvement of structural conditions in the tropical timber market, by taking into account, on the one hand, a long-term increase in consumption and continuity of supplies, and, on the other, prices which are remunerative to producers and equitable for consumers, and the improvement of market access;

(c) To promote and support research and development with a view to improving forest management and wood utilization;

(d) To improve market intelligence with a view to ensuring greater transparency in the international tropical timber market;

(e) To encourage increased and further processing of tropical timber in producing member countries with a view to promoting their industrialization and thereby increasing their export earnings;

(f) To encourage members to support and develop industrial tropical timber reforestation and forest management activities;

(g) To improve marketing and distribution of tropical timber exports of producing members;

(h) To encourage the development of national policies aimed at sustainable utilization and conservation of tropical forests and their genetic resources, and at maintaining the ecological balance in the regions concerned.

According to Robert Allen's "How to Save the World", Japanese enterprises have offered to invest up to 500 million dollars in tree logging projects in the tropical moist forests of the Amazon basin - a temptation difficult to resist for governments which suffer from the international debt crisis. Japan is in no way the only industrialised country craving exotic timber, to be used for furniture, TV sets, hardboard, etc.

Tropical timber as a commodity has never been covered by an international agreement before. It is a matter of dispute whether the new agreement is a benefit or a further threat to the forests. Some argue that any agreement is better than none, but looking at the Objectives (see text box) it seems that most emphasis is put on the increase in forest exploitation. It aims at "sustainable utilization and conservation of tropical forests", according to the last paragraph, but forest experts say that no one can do this, except the forest dwelling tribes.

There is, however, no mentioning of the traditional forest people in the UNCTAD Agreement, and nothing of the effects of the deforestation upon them.

IMPACT ON FOREST TRIBES

Forest tribes have unique and invaluable knowledge of species not yet "discovered" by scientists. Many tribal communities have developed a sensitive understanding of the ecological inter-dependences and seasonal variations, and they know how to use the natural environment without destroying it. "The image of limited good" is often a predominant moral code in tribal cultures, which prohibits grabbing more than what is absolutely needed and can be renewed.

Ironically, this ecological sense disappears along with the forests. Forest tribes have been shot, bombed, poisoned, deliberately infected with diseases, pestered by missionaries and have been degraded to slum-dwellers or ill-paid labourers under intruders who force them to help destroy the forests - in the name of progress, development, economic growth and export earnings; and often with governments' blessings. In Brazil alone, the Indian population has fallen in the last 500 years from 6-9 million to barely 200,000. (Caufield, 1982).

The World Bank, in a policy paper, accepts that "only as tribal people are they equipped with the necessary values, knowledge, and organisation to manage sucessfully the resources of marginal ecosystems. The preservation of these groups, therefore, is a significant economic opportunity for the nation, not a luxury". According to the Bank, the tribes should have a free choice to get integrated in modern society, and no one "should compete with the tribal society on its own lands for its resources".

Huge areas of tropical moist forests have also been cleared for agriculture, but farming is often the worst use of the forest soil in the tropics, as most nutrients are held in the vegetation rather than the soil. A few years after slash-and-burn clearing, farming and rain-erosion the soil is virtually sterile. The World Bank illustrates this by the following example:

New non-tribal colonists in one rain forest area of Peru were unable to feed themselves, even with outside assistance. Between food deliveries from outside, they survived by getting "relief" (through bartering or stealing) from the "primitive" Indians who lived in the traditional way in the forest nearby.

SHIFTING CULTIVATION

The traditional method of shifting cultivation is believed to be practiced by more than 200 million people. Originally it may not have been an ecologically unsound practice, but with population pressure and shorter fallow periods, shifting cultivation has become an important contributory cause of deforestation, soil erosion and desertification in many areas.

In this system, a farmer starts with clearing the land, burning the cleared vegetation, and then cultivating for a few years until the yield becomes low. He shifts to another area, leaving this land to regain its fertility for a number of years. In areas with good rain it takes about ten years for this land to regain its fertility, but in dry areas it may take 20 years or more.

This system has broken down with the high density of population, as intensified needs require shorter fallow periods. The population pressure does not necessarily come from within the system. It can also be felt from surrounding settlers who narrow the area available to the shifting cultivators.

It is estimated that in Africa, the degradation from shifting cultivation is responsible for at least 100 million hectares of denuded land. (Ashok Dar, "Causes of Famine-Drought")

SOUND TRADITIONS

In the arid zones, the only living pattern that has proved to be almost entirely ecologically sound is the traditional one. This has evolved over thousands of years to make the best use of whatever rain does fall. The Earthscan publication Desertification, describes how rainfed crops were planted using drought resistant varieties of sorghum and millet in West Africa in areas where the rain was most likely to fall in reasonable quantities. In order to take advantage of pasture grasses, the more arid zones near the deserts were generally reserved for livestock that either had seasonal movements (transhumance) or irregular patterns (nomadism).

A characteristic of the rainfed crops was long, fallow periods, in order to prevent stress on the land. After four or five years of continous planting, the land was left idle or used as pasture for one to five or more years. In some areas, a type of acacia scrub was allowed to invade. After five years, these trees could be tapped for gum arabic for about seven years. During the fallow period, the soil would be protected by a cover of vegetation, vital nutrients could accumulate, and the humus content would build up.

Another characteristic was the symbiotic interdependence and cooperation

between the farmers and the nomads. They bartered cereals and meat, and the pastoralists were able to graze their livestock on fallow land in the dry seasons when the more arid zones had been exhausted. Dung from the cattle contributed to the regeneration of the fallow cropland.

One of the reasons why this pattern is breaking down is the tendency by governments to transform communal land to private ownership, with clear demarcations to provide for taxation. Nomads, like other indigenous people, are not very popular with governments since it is difficult to get them into a money system with taxation. Moreover, nomads cross over frontiers, which for them are artificial. Most governments are therefore encouraging or forcing nomads to settle and give up a living which could have been more ecologically sound.

LOSS OF SOIL

It was mentioned in Chapter 6 that the removal of vegetation may so upset the ecological balance that both soil and water are lost, resulting in a cycle of floods, droughts and falling productivity. Some of the Caribbean islands, it was shown, have already reached the extremely unsatisfactory stage of having "daily droughts", even in the midst of a more than average rainy season.

The risk is greatest in two types of areas: arid and semi-arid flatlands on one hand, and semi-arid slopes on the other. Ethiopia, as described in the Prologue, gives a serious illustration to both of these. The problem of soil erosion is very serious, as it would be almost impossible to replace the soil - it may have taken hundreds, or even thousands of years to build up the present soil cover by the natural processes.

Erosion by the wind, such as in the Sahel, may even be a global hazard, as it causes an increase in atmospheric dust that the wind carries over vast areas of land and sea. It has been proven that dust from the Sahel has blown across the Atlantic Ocean to the United States. This could have as yet unknown consequences on the global climate.

Erosion caused by rainwater runoff in large river basins is already a transnational problem, which requires regional approaches in South and Central America and in the Indian Sub-continent. In the Bay of Bengal, a new island is building up which has been subject to some dispute between India and Bangladesh. Both countries have claimed it. Even Nepal could probably claim some right to this island, as some of the topsoil the island is made of might have been brought by the rivers from the faraway Himalayan slopes in Nepal.

DESERTIFICATION

The destructive process that starts with deforestation and removal of vegetation may ultimately end with a completely unproductive desert. In many ways the term "desertification" is misleading. The popular image of sand dune encroachment is only a minor part of the problem. The situation is better described as a skin disease in which existing wounds get worse and merge with others.

United Nations Conference on Desertification (UNCOD), held in Nairobi in 1977, estimated that 600 million people lived in areas that were directly threatened by desertification. A 1984 assessment by UNEP says that in the seven-year period since then, the figure rose to 850 million. Currently about 35 per cent of the earth's land surface (45 million square kilometres) and 20 per cent of its population are threatened by desertification. Three quarters of this area and 60 per cent of the population are already affected.

Rural population in areas known to be severely affected numbered 135 million in 1984, compared with 57 million in 1977, according to UNEP.

Land irretrievably lost through desertification or degraded to desert-like conditions increases by six million hectares annually. In addition, some 21 million hectares each year are reduced to a state of near complete uselessness.

Rainfed croplands emerged in the UNEP assessment as areas of prime concern. Projections to the year 2000 indicate that the loss of this type of land will accelerate into a critical situation.

Areas affected by at least moderate desertification are: 3,100 million hectares of rangeland, 335 million hectares of rainfed croplands and 40 million hectares of irrigated land.

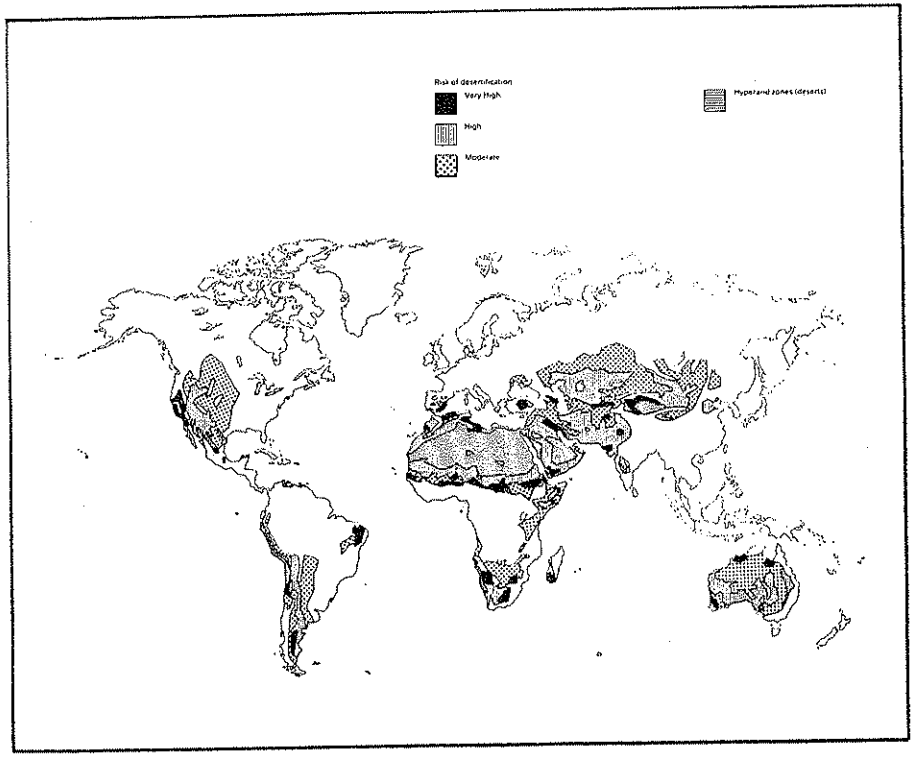

Figure 17. World desertification map, after UN Conference on Desertification, 1977. (Source: UNEP)

100 countries are affected, and in the African countries south of the Sahara, south Asia, South America and Mexico the desertification process is accelerating fastest.

UNEP does not make any predictions, but from its figures it seems possible that by the year 2000 another half a billion people may find themselves living on lands where production is no longer feasible.

The annual costs of desertification, due to the losses in agricultural productivity, is 26 billion US dollars, according to UNEP. It would cost 4.5 billion dollars annually to stop desertification.

At UNCOD in 1977, 94 nations agreed on a "Plan of Action to Combat Desertification", but it has been met by an "absurdly inadequate level of contributions," says UNEP Executive Director, Mostafa K. Tolba. "Far too much technical and financial assistance has gone to showpiece projects and into measures aimed at appeasing the more politically advantaged urban populations."

By the end of 1983, a special account set up by UNEP in 1979 to finance the Plan of Action, had received less than 50,000 dollars - all from developing countries. Funds for the purpose of combating desertification channelled through other agencies and given bilaterally were more sizeable but far from adequate, and observers seem to agree that in most cases a very small portion was actually aimed directly at halting the deserts.

12. Pressing needs

Millions of poor and vulnerable people are increasingly threatened by social and environmental collapse. If those who cannot cope were left to fend for themselves, many would gradually become more vulnerable, starve and die. As disaster relief can only play a marginal role in this context, there is a pressing need for disaster prevention.

POPULATION

With the global resource base being reduced, and the environment becoming more dangerous, is it inevitable that disasters should increase? Does it mean that the limit of the planet's capacity to support life is being reached because there are too many of us?

There are already one billion people struggling to stay alive, many of them forced to destroy the resource base upon which they depend. On the other hand, two-thirds of the world's resources are used up by only a quarter of the world's people.

However, the fact remains that the number of people is increasing and that it is getting more and more difficult for many of them to attain a tolerable existence.

The population growth is exponential, which means that every year's increase is larger than the year before. Population will double about every 40 years at the present growth rate. In 1983 the world population increased by an estimated record 83 million people, bringing the total population to well above 4.5 billion.

Half of the global population lives in the 33 poorest countries, and another 25 per cent inhabit the 63 middle-income countries.

Population growth is an acute problem in many of the poorest countries, which adds to the growing disaster problems. African countries, in particular, need to take urgent action to slow population growth. On an average, the African populations increase by 3 per cent a year, while the economic growth in most cases is much slower or in some cases such as some Sahelian countries even negative.

POVERTY

In 1982 the World Bank estimated that absolute poverty affected close to one billion people. The absolute poor have barely adequate (and often uncertain) diets, and incomes so low that they can spend little for clothing, fuel, shelter, and other necessities.

Absolute poverty is increasingly concentrated among the low-income countries. Roughly 40 per cent of the poor are in India, Bangladesh, and other South Asian countries. Another 20 per cent are Chinese. Low- and middle-income sub-Saharan Africa accounts for about 15 per cent of the poor, as does East Asia (principally Indonesia and Indochina). Latin America, North Africa, and the Middle East account for only about 3 to 4 per cent each, according to the World Bank report.

The great majority of the absolute poor - over 90 per cent - are rural people who work on farms, or do non-farm work that depends in part on agriculture. More than half are small farmers who own or lease their land; another 20 per cent are members of farming collectives, mainly in China. The remaining one-fifth to one-quarter are landless. While often no poorer than the poorest farmers, landless labourers are more likely to

see their jobs disappear in a crisis and are less able to fall back on reserves. Over 80 per cent of the landless labourers live in Bangladesh, India and Pakistan, with the rest in areas such as Java in Indonesia.

POVERTY AND ECONOMIC GROWTH

Much of bilateral and international development assistance has had as its goal to encourage growth in national economic resources or, in a measurable term, growth of GNP. It has been assumed that helping a government or a poor country as such would also help all members of society, including the poorest; even that such aid would bring about a more equal distribution of resources.

Critics maintain that the poorest have not been helped by such aid, even though GNP may have increased in the developing country. Aid to develop irrigation and cash crops has mostly helped the big farms, they say, and support for imports has gone to raw material and spare parts in private industries. Large sums have been used to extend roads, railways and telephone networks, none of which have had any positive impact on the poorest. Bangladesh, for example, which has been a major aid recipient since its creation in 1972, has shown a rather fast economic growth reflected in a doubling of its GNP. However, hardly any improvement has been noticed among the poor who make up the majority of the population.

In World Development Report 1982, the World Bank partly agrees:

"Over the long run, economic growth reduces the total number of those living in absolute poverty and makes it easier to deal with those who remain. The impact of growth is uneven, however, and the prospect of eventual benefits is of little comfort to those who suffer in the interim. Moreover, growth itself may increase hardship for those who do not share in it."

The fact remains that the poor are there and seem to increase in number rather than decrease. As those poor more than any other people are the potential disaster victims, their conditions need to be improved in order to decrease their vulnerability. Since most of them live in rural areas, aid aimed at helping them must be rural-oriented. This need has generally not been well covered so far. A majority of Third World countries have not given enough priority to rural development, and the average share of agriculture in their budgets has not been more than 10 per cent. International aid shows a similar pattern.

FOOD OUTLOOK

Only Africa has had a fall in the production of food per capita during the last decade. Central American countries showed a slight improvement, while Asian and South American countries had somewhat better improvements An FAO outlook for the year 2000 envisaged the following cereal deficits (in million tons);

	Minimum (normative)	Maximum (trend)
Africa	*28*	*44*
Far East	*14*	*50*
Latin America	*6*	*28*
Near East	*30*	*40*

Table 10. Projected cereal deficit for the year 2000.
(Source: Ashok Dar, "Causes of Famine-Droughts")

Africa's towns are fed mostly by imported food, while the rural areas remain stuck in subsistence agriculture. Cereal imports into Africa nearly quadrupled in volume between 1960 and 1982. Government price policies have often discouraged farmers from producing more food. Low food prices, it was thought, would keep urban wages low and help the embryo industrial sector to grow. Some governments also favoured towns because bureaucrats, police, army and intellectuals - who were more politically important than peasants - were in the towns.

The FAO has emphasised that Africa needs to double food production this decade to have enough to feed itself, and this would not be impossible. More than half of the unused farmland in the world is in Africa. Some optimistic calculations even say that Africa could grow at least 100 times more food than it grows now, if appropriate techniques and the right kind of crops were used. Famine, under such circumstances, appears to be completely unnecessary in Africa, even though there are large areas with poor soil and little rain.

The Sahel region is a particularly difficult area due to its climate, environment and inaccessibility. Population increases at a rate of 2.5 per cent a year while cereal production rises at a rate of one per cent. Figure 18 illustrates how the available food energy has failed to meet the needs of the Sahelian populations since 1970. It also shows the development of cereal production and food imports (including food aid) since 1970.

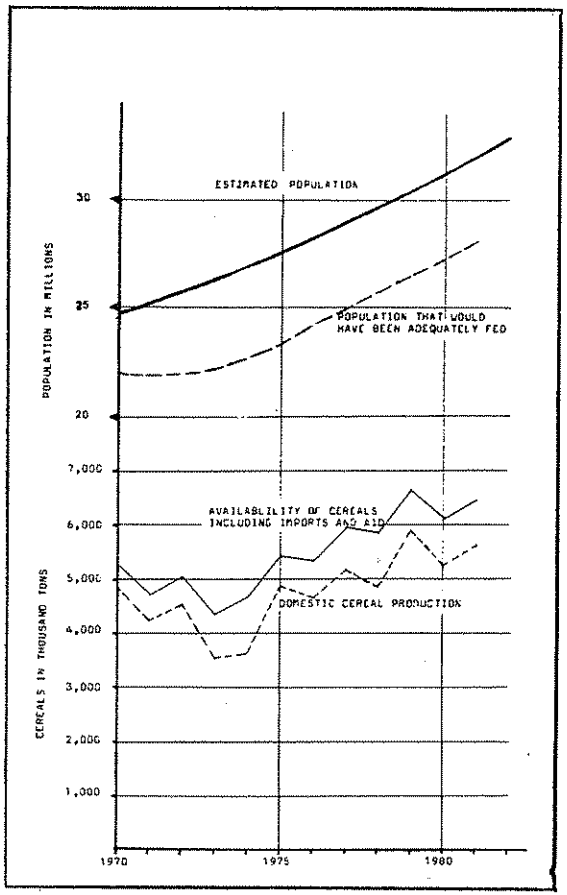

Figure 18. The food gap in the Sahel.

A study has shown that the nutritional status of the Sahelian populations usually varies with the seasons. The intake of protein and food energy among agricultural populations often falls to 30 per cent below the requirement for 2-3 months before the harvest (June - September).

Nomadic populations, which move with their livestock, do not usually have any marked protein deficiency, but their food energy intake is often insufficient, which affects their body weight. During drought years the energy deficiencies among the affected populations may fall as much as 50 per cent below the required minimum.

Figure 19 compares surplus consumption of food energy with the deficiencies among a few selected countries. Note that both excess food intake and deficiencies increased in all these countries. It is also worth noting that Bangladesh, while doubling its GNP, also doubled its food energy deficiency, according to these statistics.

According to an estimate made by the FAO, about 500 million people are

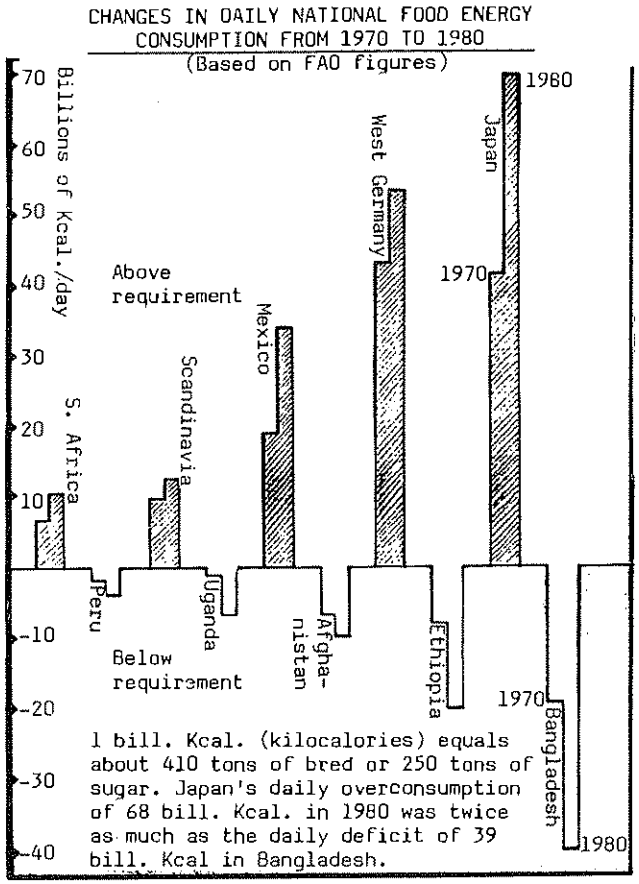

Figure 19. The gap between surplus consumption and food energy deficiency in selected countries.

constantly undernourished. This number is expected to increase to about 750 million by the year 2000.

FUELWOOD PROBLEMS

Most people in the Third World depend on wood for energy. In Latin America, wood accounts for 20 per cent of total energy consumption. In Asia it accounts for 10 per cent of the total, and in Africa for about 60 per cent. Some individual countries are far more dependent on wood than these average figures suggest. In Tanzania, for example, wood accounts for some 95 per cent of total energy.

Acute fuelwood scarcity is already a severe problem in the arid zones

south of the Sahara and in East and Southwest Africa. The mountainous areas of Central and South Asia, of Southeast Africa and the Andean plateau of South America have similar problems. These are areas where the remaining forest cover is inadequate to meet the current needs for fuelwood, according to FAO's "The State of Food and Agriculture 1981". The problems are expected to worsen in all these areas.

Half of all energy consumed in India is spent on cooking food. In 1975-76, the country burned 133 million tons of fuelwood, another 73 million tons of dung and 41 million tons of agricultural wastes. Even in the cities 50 per cent of the cooking energy is from fuelwood. In the last six years fuelwood prices have nearly doubled in many Indian cities.

30 out of 45 districts in the State of Madhya Pradesh are already suffering from "firewood famine", to use the words of The State of India's Environment 1982. At the present rate of consumption the forests in all but 16 districts of the State will have disappeared in 20 years.

The outlook for Africa is particularly grim. An FAO report indicates that in the year 2000 about half of Africa's expected one billion inhabitants will have to eat raw food, due to fuelwood shortage. Already in 1980, a total of 55 million people in Africa suffered from the acute fuelwood shortage, with another 146 million facing the choice between not enough wood or overcutting.

Phil O'Keefe has observed that urban demand for energy is more responsible for deforestation than selective cutting for rural household energy. Whole trees are usually taken to meet only the urban demand for charcoal, while the rural households cut twigs and branches without felling the trees.

It is estimated that 75,000 hectares of Tanzania's savannah woodlands are cleared every year only to meet the needs of fuelwood of the capital city Dar es Salaam.

OTHER GROWING PROBLEMS

A few of the many problems facing the Third World have been mentioned here to illustrate the pressing needs among the poor. Many other needs could have been listed: clean water, housing, health services, education, and many more.

Urbanisation is one of the worst problems facing the Third World today. It is expected that half the world's people will live in urban areas by the year 2000. There will be 58 cities of over five million inhabitants compared with 29 today. Around one billion people now live in Third World cities - a number that will double by the turn of the century.

Those moving into the cities from the countryside are often forced to do so because of environmental degradation and pressure from populations larger than the rural area can support. A disaster, such as a drought or a flood, may be the final blow that displaces them into the city.

One of the most tragic problems is the effect of poverty on children. UNICEF has estimated that 40,000 children die unnecessarily every day due to malnutrition, diarrhoea and simple diseases. The same number become permanently disabled due to similar causes. This has been called a "silent disaster", as it is a continuing process without any dramatic, sudden impact. It is an example of the cruelest disasters - those that strike continuously without getting much attention.

MOST PRESSING NEEDS

In marginal areas and among the most vulnerable sections of society of the poorest Third World countries, millions of people are threatened by social and environmental collapse. These areas are growing and the affected populations are growing too. These vulnerable people cannot wait for the possible benefits of a general growth of their countries' economies:

- If they were left to fend for themselves, many would gradually become more vulnerable until starvation would develop and they would die. This would conflict with humanitarian principles.

- Without immediate attention, the stress on marginal areas might turn them into deserts before any considerable economic progress would be achieved. Hence the ecological capacity to support people in the future would be undermined.

- As the environment would become exhausted, an increasing number of people would have to be resettled in safer and more fertile areas. However, most people would not be willing to leave their traditional habitat, and new areas might not be sufficiently available.

- A growing number of destitute people - eventually hundreds of millions - might become more or less permanently dependent on disaster relief and rescue interventions, which, not only as a matter of principle, but for practical reasons would not be feasible.

The points made here cannot be dismissed as an imaginary prophecy. These are disaster problems already facing the Third World today, on such an enormous scale that disaster relief can only play a marginal role. To take some of the most telling figures that have been brought up earlier in this report:

- Rural people already severely affected by desertification number 135 million in 1984, with an addition of at least 700 million directly threatened by desertification and the interrelated miseries of drought, food shortage, decline in water resources, lack of fuelwood, etc.

- In India alone, 250 million people live in areas where there is a risk of recurrent flooding. An equal number may be exposed to the risk of floods in China, and many millions of people in other Asian countries and in Latin America are prone to floods.

- In Africa, as many as 200 million people may already be severely affected by the crisis that has built up over the past few decades of unfortunate development.

- Many millions of people in the poorest countries are already dying from starvation and disease - among which are 15 million children who die each year. Approximately 500 million do not have enough food to eat, and nearly one billion are so deprived of the necessities of life that they fall within the category "absolute poor".

These are disasters that are not being curbed by current development efforts. Instead these problems continue to increase. This calls attention to one of the most pressing needs in the Third World today: disaster prevention that tackles the root causes of the most significant disasters.

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VI. PREVENTION BETTER THAN CURE

13. Need for new approach

Disaster prevention is possible to a much greater extent than has been believed so far. It is also necessary and urgent. Disaster prevention is primarily an aspect of development, and for some countries disaster prevention may have to be the main objective of development for some time. Whenever possible, emergency assistance also ought to be linked to the prevention of future disasters.

SOME IMPORTANT OBSERVATIONS

The following are some of the major observations which have been made in the previous Chapters:

* There is a general increase in disasters, particularly in the Third World. Disaster situations occur more frequently, the victims become more numerous and larger areas are gradually being affected. Droughts and floods are those recorded disasters that affect most people and show the sharpest increase.

* Low-income countries are worst affected, and poor people tend to be hardest hit. Most victims live in rural areas and belong to the poorest sections of the populations.

* The causes of the dominating so-called "natural disasters", and particularly the increasing tendencies, are essentially man-induced. Three major interlinked factors influence the increases:

  - environmental degradation
  - growing vulnerability
  - population growth

* The relationship between disasters and the natural phenomena to which they are attributed are usually less important than human factors. Exposure to hazards makes people prone to impacts, but hunger, malnutrition and poverty are some of the most prominent factors that make people vulnerable to disasters.

* Vulnerability varies from one society to another or from one place to the other, which means that the same type of disaster impact strikes differently in different places. Those events may even differ in the way they hit at various groups within a population.

* Deforestation, soil erosion and desertification are three major components in Third World disasters. The natural resource base is being weakened so that its capacity to support people is seriously reduced.

Some other important observations, which may explain why disaster interventions in the Third World often fail to meet the essential needs of the victims, are:

* External disaster response has mostly been aimed at sudden, dramatic and unusual events. Less attention has been paid to slow, predictable disaster processes that affect much larger numbers of people.

* Interventions have been misguided because of a number of myths about the disaster victims and their needs, such as the belief that disaster victims are helpless and always have the same relief needs.

* By approaching disasters as isolated events, the interveners have often overlooked the links between disasters and poverty, environment and development.

* Disaster preparedness as well as disaster prevention have been geared more to the effects of certain natural impacts than to such major causes as the vulnerability of poor and exposed populations or environmental degradation.

It has also been noted that many millions of poor people in Third World countries are more or less permanently affected by disaster processes, and that hundreds of millions are vulnerable to floods, droughts, food shortages, decline in water resources and lack of fuelwood.

These overwhelming problems are not curbed by current development efforts but rather continue to increase. Rural development is usually not the priority it ought to be.

Third World disasters, finally, have begun to reach such proportions that disaster relief can only play a marginal role in mitigating them. Without massive actions to prevent major disasters, relief efforts would seem to be almost meaningless in the long run.

THE SCOPE OF PREVENTION

From what has been discussed in earlier Sections of this report, it seems obvious that disaster prevention is possible, necessary and urgent in the Third World.

It ought to be possible, since many fundamental causes and effects of disasters depend to such a high degree on people. Many disasters appear to be unnecessary altogether, and in many instances the effects need not be as serious as they usually are.

Since it is possible, disaster prevention is also necessary, because the unnecessary harm to people and the environment has reached such enormous proportions, and because emergency response cannot adequately meet the needs of the victims.

Prevention is urgent, as the increasing severity, frequency and consequences of disasters are nearing the point of being unmanageable. Large parts of Asia, Africa and Latin America are already threatened by environmental collapse, as the ecological base for people's existence is

being so damaged that it can no longer support the growing populations of those regions.

A few natural phenomena, such as earthquakes, tropical cyclones and climatic variations must be considered as more or less permanent fixtures in the environment. Until now, disaster prevention has been designed to deal primarily with the risks of those relatively rare hazards, notably earthquakes and tropical cyclones, from technical and regulatory angles (see "Prevention and Preparedness Limitations", Chapter 2). This is certainly an important field of prevention in countries that are particularly prone to such hazards. However, these types of disasters have been well covered by other studies. We shall concentrate here on the types of Third World disasters which we feel are more significant.

In the majority of Third World countries, environmental hazards that are created by people have begun to dominate the disaster scene. This is made most obvious by the marked increase in drought and flood events, although general depletion in natural resources is the major, permanent problem in the poorest and most populous countries. So far, disaster prevention efforts have not generally observed the environmental links to drought. Floods have been treated more or less in the same manner as earthquakes, without attention to their preventable causes. More attention has been given to protection, such as construction of dams, dykes and embankments in the floodplains, than to environmental rehabilitation of the watersheds upstream.

Whether a disaster will occur or not does not only depend on the force with which a physical impact is delivered. The way in which an impact is received and felt is equally important. The effects of an impact depend to a large extent on human and environmental conditions, and these effects vary with the degree of vulnerability. This is a major potential field of study, yet to be explored by those who deal with disaster prevention.

A new approach to disaster prevention is needed, and it ought to involve improvement of both human and environmental conditions, and the interactions between people and environment. All this may have to be done at the same time, and obviously, the human side of the problem has to be tackled first. Technical measures alone such as housing regulations or irrigation, or plans designed to rehabilitate the environment like tree plantation campaigns, can easily fail and even become harmful if no attention is paid to the primary needs of the most vulnerable people.

DEVELOPMENT ISSUE

All major disaster problems in the Third World are essentially unsolved development problems. Disaster prevention is thus primarily an aspect of development. In some countries, particularly in Sub-Saharan Africa, disaster prevention may have to be the primary goal for all development, or at least for all development assistance coming from the Northern countries.

Disaster prevention should perhaps even be the goal for all disaster

interventions by Northern organisations. It should, to the extent possible, be linked with development for long-term improvements. A policy in this direction has, for example, already been adopted by the World Food Programme, British and American Oxfam and the US-based organisation CARE. At least for NGOs, a disaster can sometimes be used as a "vehicle for change" and their emergency assistance may become their entrance ticket to assisting a new group of people.

More specifically, development aimed at disaster prevention needs to emphasise the following (examples are given in Chapter 14);

* The vulnerability of the poor must be tackled. Improved self-reliance regarding food and fuel, access to land, employment, improved health and nutrition, family planning and education are very important components of disaster prevention.

* Much more attention must be given to rural development. This contains the most important solution, since most of the world's absolute poor, those who are the most vulnerable in any disaster process, live in rural areas. Rural development is important also to curb the present uncontrolled urbanisation in the Third World. It should be noted that rural development among the very poorest people may not involve agriculture alone, as many of these people are either landless or don't have secure access to enough farmland to support themselves.

* Rural development is likely to succeed only if it is carried out by the people themselves and starts with their own needs. Development among the poor is primarily a matter of opportunity, and it is a dynamic process that does not benefit from too many new and unfamiliar outside elements. Outsiders, be they foreigners or representatives of the countries' own government authorities, need to see themselves as participants in people's development - in contrast to the currently more common top-to-bottom attitude. Local initiative should always be encouraged.

* Environmental problems will have to be fully acknowledged. Large areas are becoming completely worn out, forests disappear at a high rate, enormous amounts of soil are displaced and lost, and millions of hectares of arable land are turned into desert. Enormous efforts are needed to save what can still be saved of environmental resources and to repair and replace what has already been destroyed. All development must take place within the sustainable limits.

* It needs to be acknowledged that tribal cultures (nearly 200 million people altogether), many of which have long

traditions of handling some of the world's ecologically most sensitive and difficult areas, are not necessarily outdated remains of the past. Attempts to "modernise" or "civilise" nomads of the Saharan fringes or the rain forest-dwellers of the Amazonas, for example, and grab their environment for exploitation, have already led to human as well as environmental tragedies. These tribes are often the only groups that have sufficient ecological understanding of how to make a living from such sensitive environments.

OVERALL MEASURES

There is an urgent need for some overall supporting measures and large-scale actions:

* Regional approaches are important, for instance to such large transnational problems as the deterioration of the Himalayan river basins, South America's growing problems of a similar nature, and the desertification dilemma in the Sahel.

* National development policies need to focus on rural development, vulnerability among the poor, land tenure, etc.

* National food security reserves, crop forecasts and early warning systems need to be introduced and strengthened.

* Marketing and price policies concerning agricultural products need to be improved in order to encourage domestic food production.

* There is an urgent need for dissemination of improved agricultural techniques and training in community-based development implementation.

* Transportation, roads and infrastructures have to be developed.

* In many countries disaster relief practices need to be improved, and it may even be necessary to design special disaster prevention strategies in some of the most disaster-prone countries, on which to base disaster response and development in general.

Many countries have already adopted policies concerning the above measures, but practical implementation often needs to be stepped up considerably.

The Plan of Action to Combat Desertification, for example, was endorsed by 94 countries in 1977, but the UNEP assessment in 1984 showed that the implementation of the Plan had not been encouraging over the first seven years.

National food security reserves are already being maintained by some Third World countries, notably China and India, but African countries are generally not well equipped in this respect. In some cases they have not been given the support they need.

In Ethiopia, for example, a National Food Security Reserve scheme was introduced in March, 1982, in agreement with FAO/WFP. A donated grain reserve of 180,000 tons over a four year period was envisaged. This institution failed to attract any response, in spite of repeated appeals to the international community. Apart from the initial 12,000 tons of wheat donated by WFP and 1.3 million dollars worth of technical assistance from WFP and the Netherlands, no contribution had been pledged 15 months after the introduction of the programme.

"The result is so discouraging that even our Government is hesitating to set aside more funds for the administration of the programme," according to the disappointed General Manager of the Ethiopian Food Security Unit. He said in May, 1983, that even 180,000 tons would have been a marginal reserve. As much as 500,000 tons would be needed for a genuine national reserve, according to him.

Crop forecasting and early warning systems are another important field which needs to be developed much further. FAO's global information and early warning system started in 1975, involving 100 developing and donor countries. Forecasts are often based on meteorological data and the fluctuations in grain prices on the domestic markets in Third World countries, but it is difficult to estimate how much food grain is actually available, since considerable quantities are always kept outside the formal market system, for instance by subsistence farmers.

Marketing and price policies have been much debated lately, primarily with Africa in focus. Domestic food market systems have not been satisfactorily developed. In some countries it is machinery which channels food only in one direction - from the rural areas to the cities. When there is a local crop failure, there is no ready mechanism to secure transfer of food from one rural area to another. Artificially low prices have also contributed to the vulnerability of farmers as well as entire countries, as farmers have often been discouraged from developing farm practices and increasing their production. However, drastic changes have proved hazardous, as numerous examples of food riots in Third World cities illustrated in early 1984, when some governments decided to increase the prices of agricultural products.

After a visit to China in April, 1984, the Executive Director of the World Food Council, Maurice J. Williams, proposed a new international aid programme inspired by China's crop subsidies. It would go beyond current aid efforts by subsidising higher prices for farmers' crops, thus

encouraging the farmers to grow more, without raising costs to consumers or governments with excessive debts. In China, where the government introduced such a system in 1979, sizeable increases in agricultural prices brought record harvests in three of the four years that followed.

The importance of rural improvements and ecologically sound techniques will be highlighted further in the following Chapter.

RELIEF PRACTICES

Disasters related to drought situations and food shortages are likely to require much international attention in the future. It is important that they are not treated only as logistics problems by governments, aid donors and relief agencies. Whenever possible, short-term assistance should be linked to longer-term improvements. It is equally important that actions to prevent emergencies begin early, since the conditions can usually be monitored well in advance.

However, disaster relief also needs to be improved, both logistically and in other ways. This has been discussed in some detail in Chapter 3. A few more points will be added here.

Relief interventions during severe drought periods usually emphasise food for the affected populations. This is undoubtedly one of the most pressing needs in many drought situations, but there are a few other needs which often escape the attention of the relief agencies:

water
household fuel
animal feed

Water is of course the primary need in many drought situations. It was observed in the 1983 drought in Ethiopia (see the Prologue) that many people left their homes not primarily due to lack of food but because they were running short of water. Some efforts were being made by the Ethiopian Government, UNICEF and OXFAM to improve water supplies, but it was not a major component in the drought operation. To supply water may present technical problems, but so do food supplies. Improved wells or even distribution of water seem to require higher priority in future drought assistance.

Fuel is another item which needs more attention, particularly when displaced disaster victims gather in large numbers at relief distribution points (due to drought or for other reasons). A relief camp means an enormous stress to the environment, and it has often been observed that those camps cause deforestation and even desertification. Again, some innovative thinking may be required to solve the fuel problem, but there may be some possibilities within the respective countries to solve it.

The third item, animal feed, was brought up by WFP Executive Director James C. Ingram at the Sixteenth Session of the Committee on Food Aid

Policies and Programmes (CFA) in May, 1984:

"One particular aspect of disaster prevention is the supply of animal feed to prevent loss of livestock when pastoralists, as in the Sahel, are critically dependent on their livestock for subsistence or to generate income essential to purchase their basic food requirements," reported Mr. Ingram. WFP provided livestock feed until 1973 when it was decided that priority should be given to human feeding.

It may in fact be equally important to supply emergency feed to draught animals in agricultural areas at the time of severe droughts. After a long period of drought, the farmers are themselves exhausted, and if they have lost their oxen, donkeys, camels or whichever type of draught animal they might have had, they will be able to cultivate only a marginal crop even if the rains are favourable.

IMPROVED AWARENESS

There is an obvious need for improved awareness about the many different aspects of Third World disasters. An abundance of recent international disaster appeals and media reports of disasters give the impression that almost all disasters were inevitable. There was little or no analysis of the actual causes behind those disasters.

It would be difficult to come to grips with the dangerous trends in disasters if governments, various organisations, the media and the public continued to regard "natural disasters" only as effects of climate or "Acts of God", for example. The understanding that there are significant man-made elements in all types of disasters is a necessary prerequisite for attacking the root causes and preventing them.

Once this basic understanding has been acknowledged, further awareness is needed concerning the various options to prevent disasters. Ecological awareness is one important side, but to understand people and human behaviour is equally important.

Information drives appear to be as important in the North as they are in the Third World. Training in ecological awareness may be required among development planners and various types of field workers, for instance, and special training in integrated community approaches may be highly relevant even to the staff of international organisations, also at high level, as many of their programmes have so far had a lack of human touch at grassroots level.

"MASS PARTICIPATION"

The serious disaster problems of the Third World call for massive actions to combat environmental degradation in order to prevent the disasters from growing even worse. It has often been stressed that the success of

environmental programmes requires "mass participation" by people, and in some countries "voluntary labour" has even been specifically mentioned as an important form of people's contribution to reduce the cost of several schemes, such as reforestation and soil conservation programmes.

The public's response has, however, not been as massive as may have been desired in many of the worst affected areas. This may to some extent be symptomatic of the current top-to-bottom approaches to many of the problems in the Third World.

"Why," the masses may ask, "should we give our voluntary labour to improve land that does not belong to us? How could we afford this, we, who live from hand to mouth? Participation in whose programme?"

Those "masses" may be one billion people today. For them, environmental concern may be a luxury which they cannot afford.

A common mistake in the attempts to identify the root causes of disasters such as floods and droughts has been to linger at climatic and, later, stop at environmental observations. When the link to the decline in natural environment has been identified as the root cause, it has often been assumed that the concern raised by this discovery would be widely shared, to the extent that it would create an impetus among the poor to join hands with the affluent in massive voluntary actions to cure nature of its ailments.

Therefore, the supposedly ignorant "masses" have had an abundance of purely technical schemes and methods thrust upon them in the belief that these would provide the ultimate solutions. Foreign aid has often been aimed at this type of intervention.

The mistake lies in a reluctance to take even one step further back in the chain of disaster causes and discover the root of the root cause. This inevitably would lead to the human element, and the human, or inhuman conditions.

In many ways the poor are more deeply affected by environmental deterioration than the affluent. Most of the rural poor live directly off the marginal soil which they are forced by circumstances to destroy. But the problem of absolute poverty points inescapably to the problem of inequity in resource and power sharing. Besides the many extremely poor, there are also many rich and powerful people in Third World countries, and a great number in between have power and control over considerable amounts of land, resources - and poor people. One may sometimes wonder: who would benefit most from "mass participation" and "voluntary labour", and who would benefit the least?

Questions related to land tenure systems and land reforms have often come in the forefront in the literature about poverty, and these are relevant also in the discussion about disaster prevention and environmental improvements in the Third World.

Development aimed at preventing disasters has to focus on poor people and

start from the needs felt by the poor themselves. Only when the poor are given the opportunity to develop and improve their lives will the talk about "mass participation" become relevant. This approach to development has to start at community level, and it requires the support of governments and certain types of overall policies. This is why it is called a "bottom-up" approach.

To initiate development at community level requires special training and certain types of people who find satisfaction in acting as catalysts to other peoples progress and initiatives. Often, these types of people are found within the many non-governmental organisations (NGOs) - national as well as international.

It is now being widely acknowledged that the success of community-based development depends to a very large extent on NGOs.

NGOs AND COMMUNITY PROJECTS

At the community level, NGOs main role is to help improve the conditions of the most vulnerable groups, preferably through longer-term development projects. This work often has to start with individual families and requires detailed knowledge about the community involved. Some foreign NGOs are well equipped to take on this work particularly if they have been involved over a long time in a certain area. If they enter a new area with implementation of community development in mind, however, they must be careful to learn from that community about its structure and needs before they map out any specific projects.

It is common experience among expatriate field workers that it takes about two years before a community and an outsider come to terms with one another to the point where a sensible project can gain momentum. Some voluntary agencies have tried to find shortcuts and pushed pre-designed, insensitive projects onto a new group of people, with the result of frustration and waste of money on the part of the agency and harmful disruption of life on the part of the community.

Community development projects are often more useful than temporary short-term relief projects, but they are in no way easier to carry out. In many Third World countries, however, there is ample opportunity to channel foreign NGOs' assistance through national and local NGOs to ensure proper consideration of local needs and situations.

In India, for example, NGOs play a very important role in development. Next to the USA, India has probably the largest number of voluntary organisations in the world. There were already 10,000 voluntary, including foreign, agencies in India in the early 1960s, according to Encyclopaedia Britannica. They represent all spheres of interest. There are humanitarian, political, environmental, social and religious of all sects and denominations. Women's, men's and youth clubs flourish, and there are agencies which specialise in health, nutrition, sanitation, housing, gardening, agriculture, disasters, etc. Over 240 non-governmental organisations, from all over India, were listed as environmental NGOs in a World Wildlife Fund's directory of 1983.

Third World countries often have more NGOs than is known internationally. A recent survey made by UNEP reveals that in addition to a few Northern NGOs, there are a number of national voluntary organisations active at community level even in the Sahelian countries.

Most of these organisations are local, but some are also nationwide, like the Scouts, church organisations and the Red Cross. Each time a disaster strikes, many of these agencies mobilize their resources for local action - mostly not reported outside the country and not well known even in the country's capital.

Many are involved in community-based development projects which appear to be a key to disaster prevention. This is where local NGOs can make their most valuable contributions, as it contains a "bottom-up" approach, starting from the local people's needs. To support this, without trying to control it, may be the best way of participation in disaster prevention and development - the outsiders' participation in people's development, not the other way around.

NEW RED CROSS ROLE

The traditional approach by the Red Cross has been to give emergency assistance to isolated disaster events. A shift in the approach can now be noticed. The Swedish Red Cross wants to act as a forerunner, and is developing a policy to set aside 20-30 per cent of all emergency funds for longer-term preventive actions. The Society is already engaging in community-based rural programmes together with Sister Societies in a few Third World countries. Similar policies are emerging within the other Nordic Red Cross societies.

The Swedish Red Cross has recognised three major fields in which its activities are being intensified:

* information, in order to create a better understanding and a change in public opinion with regard to the increasing disaster problems and the necessity of disaster prevention in the Third World,

* training and education, of staff and field workers, particularly within the Red Cross, in order to improve their performances in extending services to disaster victims, and

* projects at field level aimed at disaster prevention, which the Swedish Red Cross wants to identify, support and participate in together with Sister Societies and other organisations in Third World countries.

The tendency to link emergency assistance to longer-term actions can even be noticed within the League of Red Cross and Red Crescent Societies

(which is the international federation of national societies). The League has recently teamed up with UNICEF and WHO in a prevention and treatment campaign against child-killing diseases. Diarrhoea treatment for children has been included in the curriculum for voluntary first aid training by the Societies in eastern and southern Africa, for example.

A further step was taken by the Red Cross Movement at its General Assembly meeting in Geneva in October, 1983. It was agreed that in addition to its emergency role, the Red Cross must recognize its responsibility to work "towards the reduction of the impact of famine and towards ultimate prevention". In line with this decision, member societies in Western Africa, for example, are now designing programmes to help combat desertification.

In the near future the Red Cross is likely to take up new types of community-based disaster prevention training programmes for its field workers in Third World societies as well as participating Nothern societies.

If the Red Cross starts to speak out loudly against the alarming disaster trends, and changes its way of approaching disaster problems, it may have a very important impact on public opinion. The movement is established worldwide by its 131 national societies with over 210 million members. With the Red Cross or Red Crescent Societies still under formation, they will eventually cover practically all countries in the world.

14. Ecodevelopment

By giving some technical examples, this Chapter will illustrate measures which can be taken to prevent disasters by protecting or improving the environment. The applicability of these ecological techniques depends on cultural, social, economic and political circumstances, which vary from one place to another. This will also be illustrated by a few examples.

The 1983 experience at Ebenat in the Gondar Region of Ethiopia was described under "A Disastrous Shelter" in the Prologue (pg. 11). The situation that developed at Ebenat was most unfortunate, from a food aid point of view as well as in almost every other respect. People had left their homes to seek help, but the concentration of people, the stress on the environment, inadequate food supplies, lack of water, miserable sanitary conditions, rain and outbreaks of diseases threw them into a new disaster situation.

At that time, a more promising situation developed at Qualisa in the same Region. It also involved food aid, but here this aid could be used in a manner completely different from that at Ebenat.

THE QUALISA EXPERIENCE

At the end of 1982, two years had passed without a drop of rain at Qualisa, a group of villages in an isolated area of the mountainous Gondar region of Ethiopia. With their food and water resources running short, Qualisa's 4,000 villagers were on the brink of starvation.

As most people were subsistence farmers, they had no means with which to buy food. They were separated by steep, roadless mountains from the nearest town, Ebenat, some 40 kilometres away. It was not possible to bring in food relief.

The river below the villagers dried up completely in 1982, so there was an acute shortage of water. The only water came from a spring so limited in capacity that the 4,000 inhabitants of the surrounding hamlets agreed to take only their minimum requirement on alternate days.

They managed to get the attention of the Ethiopian Relief and Rehabilitation Commission (RRC), and were encouraged by food-for-work from the WFP to construct a road so that food aid could be brought regularly all the way up to the villages at Qualisa.

The elderly people of Qualisa remembered that 40 years earlier, when the surrounding mountains were covered by forests, they used to have more water, better harvests and better grazing for their livestock - even more rain, they said.

Now, the forests were all gone and the eroded, rocky farmland on the steep slopes usually produced insufficient yields - "an Act of God", they explained humbly.

However, the nearest mountain bore definite evidence of recent acts of man: it had been neatly encircled from bottom to top with stone wall terraces.

The village communities at Qualisa got involved in long-term development as soon as they received relief. When the road was ready and government trucks started to bring in donated food grain and vegetable oil, the food aid continued to be matched by the villagers' own efforts to improve their environment. In May, 1983, they had dug a large pond in the dry river bed

for future water storage. Supervised by a field officer from the RRC, they were protecting the slopes from further erosion and water runoff by making terraces.

As soon as it rained, they were to plant trees and grass on the reclaimed hills. No grazing would be allowed there in the future. Grass would have to be cut and brought to the animals. By modified farm techniques there was even the possibility of better food production in this difficult landscape.

At Qualisa, the villagers had kept the old communal land tenure system. Land could be distributed and redistributed according to the shifting needs among the families.

These villagers would continue to be vulnerable to drought for many years until their environment recovered and its capacity to support life increased to the point of providing complete local food security. They would probably need frequent support. It appeared that the food aid was an appropriate measure in this case, however. The alternative would probably have been a complete breakdown of the communities, leading to migration and, perhaps, resettlement elsewhere.

RESETTLEMENT OR LAND IMPROVEMENT?

In Ethiopia, the RRC has taken up a programme to resettle more than 100,000 families from the most degraded and chronically drought-affected northern highlands. The programme aims at reducing population and animal pressure in the highlands to permit the land to recover. People are being encouraged to move to the more fertile lowlands of the south and west. It is expected that up to 300,000 families (approximately 1.3 million people) may eventually have to be resettled.

The feasibility of resettlement schemes has been subject to discussion. SIDA, which participates in an extensive soil and water conservation programme in Wollo Region, writes in a report: "In the short run resettlement of population is neither feasible nor practical due to economic and sociocultural reasons. The only effective means of rehabilitating the affected population is improvement of their land and water resources through application of soil and water conservation measures along with other agricultural improvement practices."

Resettlement schemes have proved very expensive and, moreover, the target populations are usually not willing to leave their traditional homelands. It is a difficult issue, however, since the pressure on land has resulted in exceptionally widespread problems of erosion, loss of productivity, malnutrition and vulnerability in Ethiopia.

However, soil and water conservation have been given an overriding priority by the Ethiopian Government in its overall programme of agricultural development. Various international bilateral and multilateral donor agencies have come forward with large-scale assistance. The World Food Programme is getting increasingly involved in this operation, which has become one of its largest single projects.

The achievements in the first seven years since the programme started in 1974 were encouraging. According to a WFP report, more than 50,000 hectares of terracing were completed on arable land as well as reforestation of 20,000 hectares of hillsides. A further 60,000 kilometres of terracing were carried out in watershed management schemes and 2,000 feeder roads were built to give access to the work sites.

This type of protection and rehabilitation of the land must, however, accelerate a great deal in order to get ahead of the degradation. On average, the annual terraced and reforested areas in the first seven years corresponded to no more than half of the annually deforested areas.

APPLIED ECOLOGICAL TECHNIQUES

The following are brief descriptions of some of the techniques which may be useful in areas that are sensitive to droughts, floods, erosion and loss of land productivity. First a few purely technical examples:

Terracing is an often used technique of preventing soil erosion and water runoff on steep slopes.

- In dry areas terracing leads to increased infiltration of surface water to ground water.
- In rainy areas terracing slows down the velocity of the water, which leads to increased sedimentation of silt and sand on the slopes themselves and reduced runoff onto the lower plains.

In both cases terracing provides stabilisation of soil and water, which means improved conditions for vegetation. In densely populated areas such as China and Java the demand for land for cultivation forced people to terrace the slopes long ago. It will take time for new terraces in highly eroded areas to become fertile enough for intensive cultivation, but they can be used for forests, fruit trees and forage.

Water storage to balance surplus and shortage is possible in many different ways. A technique relevant in certain places in small rivers is the "sand dam". It requires a simple transverse dam in a river bed, built down to solid and impervious rock. Water is stored, not in an open dam, but together with sand and silt which is collected by the dam. This reduces evaporation and purifies water for human and cattle consumption.

In other situations subsurface storage in rocks or other geological formations can be used. Check-dams for gully control are another possibility, which also prevent gullies from growing wider and deeper. All these technical solutions are substitutes, however. A sound water management programme cannot be developed without a sound environment.

Checkerboard construction isa method to stabilise shifting sand in desert areas near farmlands. Clay deposits from the hollows between the sand dunes are used to bind the sand and improve conditions for vegetation on the sand's surface. This method has been used in China in programmes aimed at "taming" the deserts.

These are three examples of groundworks which have stabilising effects and improve conditions for vegetation, but vegetation itself can also be used:

Establishment and re-establishment of vegetation means both protection against erosion and a base for sustained development. The choice of species is important - trees, brush or grass - as these shall serve the purpose of rehabilitating the land as well as meeting people's needs for food, fuel, forage and timber. The general approach should be to use indigenous species, but sometimes there is reason to introduce exotic species too.

"Closing" of degraded areas, for instance by fencing, may seem to be the simplest way of allowing nature to take care of its own rehabilitation. This can be practiced on slopes as well as flat, sandy drylands to protect them from overgrazing and deforestation.

Reducing the size of livestock herds may have a similar effect. In Mauritania it has been observed that areas which have been degraded to desert-like conditions during long drought periods usually grow grass quickly when there is rain. The pressure from the oversized herds of cows, goats and sheep, however, prevents the grass cover from taking hold. Grazing control must be stricltly followed in areas under environmental rehabilitation.

Sand dune stabilisation is being achieved with grass, plants or trees. In order to make this protection efficient and durable, species which are not fit for animal consumption may be the best. In China, refined methods of planting trees and plants have been developed so that the sand dunes are levelled by the wind.

Stabilisation of terraces is also done with vegetation, for example with grass or leguminous species at the edge of the terraces to prevent soil and water runoff and to provide food and forage. Leguminous species (peas or beans, for example) also enrich the soil with nitrogen.

Reforestation (afforestation) is a major form of environmental rehabilitation which is useful for many purposes. A new forest means that the "sponge effect" has been regained in the environment. Depending on the scale, this may even have an effect on the ocal climate.

One of the main forms of reviving sandy land is through reforestation. The selection of species is very important in this case, as is the technique of planting, the management afterwards, and protection from animal and encroaching sand.

Shelterbelts of trees are planted to protect farmland from wind damage. They are essential for the improvement of sandy land where they control

wind erosion and protect crops. This method has been developed over large areas in China:

"As the drifting sand dune area is generally barren, shelterbelts are grown in narrow rows and the plants are spaced closely to each other. The main forest belt is planted across the direction of the prevailing wind and is spaced at about 150-160 metres apart. Subsidiary belts are placed perpendicular to the main belt at a distance of 500 to 800 metres apart. The forest belts are 10 to 15 metres wide, and each belt has three to seven rows of trees." (From "Conservation Measures in China", UNEP.)

Shelterbelts have played an important role in reducing sand storms, promoting agriculture and animal husbundry, and recovering waste-land. Apart from the economic benefits, shelterbelts have improved the life of the people in general. Eye, ear and lung diseases, which are common among people in sandy areas, have been checked, according to reports from China.

Stabilisation of river basins is a large-scale approach which requires the combination of several of the techniques which have been listed here. The aim is to control the flow of water in a river system and to determine its course in the flood plains, preventing it from moving to other areas. This is mostly done by vegetation, but structural measures such as dams, dykes and embankments may also be needed.

Terracing, reforestation, dams, contouring of farmland on slopes and grazing regulations may be needed upstream. In the flood plain, embankments stabilised by vegetation, and flood zoning that checks encroachment by people may be required. This is to prevent floods, erosion and runoff and to secure a more even flow of water.

These examples have all dealt with measures to improve environmental conditions. A few additional examples will be given to illustrate some human survival techniques when it comes to dealing with the environment.

Catch cropping is a method of "catching up" by using an irregular crop when the planting or sowing season has been delayed for some reason; for example by late rains, flood, drought, war, etc.

Examples:

- planting sorghum instead of maize in Southern Africa when rains have been delayed.
- planting beans instead of rice in delayed monsoons in Asia.
- planting rapeseed instead of wheat after a heavy monsoon season in Asia.

To enable the farmers to benefit from a catch crop, governments or relief agencies need to be prepared in advance with stocks of appropriate seeds or with special nurseries.

Intercropping and multiple cropping are often efficient methods of increasing total yield and at the same time protecting the soil from wind and water erosion, as the ground is kept under maximum vegetation over a long time.

Intercropping means that the space between the plants of one type of crop is used for another type of crop, and in multiple cropping the land is used for an extra harvest in between two major crop seasons. Both systems can serve to improve the soil conditions, for example by planting leguminous species that enrich the soil with nitrogen.

Another method to reduce surface erosion, maintain soil moisture and regenerate the soil is mulching, by which crop residues, vegetable trash or other organic matter is incorporated in the soil surface layer.

Mixed cropping has been practiced traditionally by farmers in large parts of the world, but development of high yield varieties of a few species, modern marketing systems and central supplies of seeds have led many farmers to concentrate on monocultures. This development has proved hazardous for several reasons. It may be ecologically dangerous, as there is a risk of depletion in soil nutrients. And if the one single crop is failing it may be a disaster both for people and livestock.

Traditionally the population of East Africa guarded against disaster by planting a wide variety of crops, spread out over many weeks, so that at least some were likely to survive. For the same reason they kept a great number of cattle.

In the Cunene and Cuanhama regions in Angola, pastoralists still carry on a combination of cattle herding, farming, gathering and fishing activities. Essentially the same pattern is shown by the Karimojong of northeastern Uganda. Here, the cultivation of sorghum, maize and millet by village women near permanent village sites is combined with herding of cattle, sheep and goats by the men and boys. Complete dependence is not placed on crop production, which may fail due to inadequate rainfall, nor is there dependence solely on animal herds.

Many arguments may be made for the reintroduction of mixed cropping, as it makes the farmers less prone to food shortage.

Agro-forestry is an old technique whereby the space between trees is used for cultivation of other types of vegetation - food, fodder, etc. Agro-forestry is another way to combine different crops and avoid dependence on only one. It usually involves the use of the trees for fruit, fodder or fuel. It is a very useful technique since it fully utilises the forest potentials at the same time as the forest cover is kept.

The pressing need for fuelwood makes forestry very important at present. Rural people need fuelwood for household use, and urban areas have

enormous need of wood in many Third World countries. Sometimes this means an advantage for poor people who may be able to earn their living by selling fuelwood. But it may even be a disadvantage for some people. A current debate in India illustrates this.

SOCIAL AND ANTI-SOCIAL FORESTRY

"Social forestry" has become a popular catchword in India. It reflects a new consciousness within the country, and in government agencies, of the necessary links between environmental and social improvements. It also recognizes the intimate relations between forestry and agriculture, as it aims at meeting the fuel, fodder, fruit, timber and other needs of the people.

The Central Government has increased allocations for social forestry considerably since the mid-1970s. Under the Sixth Five Year Plan, 1980-85, the programme aims to involve a total of 1.52 million hectares. In addition, several state governments have started social forestry projects with the financial assistance of international agencies like the World Bank, Swedish SIDA, Canadian CIDA and US A.I.D. Successful implementation of all central and state programmes would cover an area of three million hectares in the five year period 1980-85.

Unfortunately, the term "social forestry" has been misused to suit private profit interests. Some state farm forestry schemes, for example in Gujarat and Karnataka, have turned out to be large-scale plantations of trees mainly for commercial values. Those are usually fast-growing monoculture plantations, notably of eucalyptus. For this reason, eucalyptus has become a very controversial symbol for "anti-social forestry". It has come to symbolise an unholy alliance between the industries, the better-off landowners and some vested interests within the Forest Department.

Private landholders have started to plant eucalyptus, not to be used as fuel, but for the pulp and rayon industry. The industries offer advance payments so tempting that considerable areas of prime farmland, even newly irrigated, have been turned into eucalyptus fields. In one single district in Gujarat, 10,000 farmers have shifted from agriculture to forestry, encouraged to do so by the Forest Department.

If a country decides to speed up the necessary afforestation schemes, it has an obligation also to prevent adverse effects to the poor. In India, critics blame eucalyptus not only for replacing food but for displacing the poor farm labourers, as forestry is less labour-intensive than farming. In addition, plantations on village commons have been said to displace the poor who used the land for grazing. In some areas forest-dwelling tribes have been displaced because natural forests, with their wide variety of species, including bamboo, have been replaced by monocultures of fast-growing eucalyptus.

Though local people often prefer a variety of other tree species, the only seedlings liberally distributed by some forest departments have been eucalyptus. Some states, however, do provide a more varied selection of species.

The bad reputation of eucalyptus, which has cast its shadow on the whole concept of social forestry as well as some forest departments, is very unfortunate. The tree itself has many advantages when used for fuelwood, poles, etc. It must, however, be combined with other types of vegetation if a full-fledged forestry project is to be achieved. And, there is no doubt that forestry, carefully managed, provides some of the best ways to prevent floods.

It was for that very purpose that the most successful and best known social forestry actions were started in the Alkananda Valley in Uttar Pradesh. It was not a government initiative, but a local movement spurred on by village women. "The State of India's Environment 1982", a non-governmental report, gives the following account.

THE CHIPKO MOVEMENT

Chipko Andolan - the movement to hug trees - has both an ecological and economic background. The Alkananda Valley in which the movement originated was the scene of an unprecedented flood in 1970. The tragic aftermath of this flood left a deep impression on the hill folk, and with it, came an appreciation of the vital ecological role that forests play in their lives.

The Chipko Movement was born one morning in 1973 when the villagers in Mandal, near Gopeswar town in the Himalayan foothills, hit upon the idea of hugging ten ash trees that had been earmarked for felling by approaching loggers. The movement spread to other villages, so that the industrial contractors, who were given new allotments by the Forest Department, had to return home empty-handed whereever they tried to cut down trees.

The movement reached its climax one day in 1974, when the contractors arrived with their axes at Reni village to begin felling. They knew that the men were away to protest the forest auction in a neighbouring village. The contractors had not counted on the courage of the women of Reni, however. Led by Gaura Devi, an illiterate woman of 50, they barred the path to the forest which went through their village. The Chipko Movement later became known all over the world as a women's activist movement.

The nonviolent, action-oriented Chipko Andolan has greatly helped to unite the people and focus attention on the mismanagement of forest resources. The villagers resent the manner in which successive governments - beginning with the British - have taken away their forest wealth and turned it into a resource bank for faraway urban markets.

The message of Chipko has spread far and wide among the hill communities in northern India, not always with the wholehearted approval of the Forest Department. It has been recognized that the women of the region are the real strength of the movement. Their protests have, not least of all, been against their own cash-hungry men, who did not care if the forests were destroyed while their women had to walk for many more miles to collect their daily load of fuel and fodder.

Chandi Prasad Bhatt from Gopeswar, who pioneered the movement, has realised that if the local communities gain the right to control their own environment, they also have the responsibility to conserve and develop its natural resources. He has organised the country's largest voluntary afforestation programme through "ecodevelopment" camps. Villagers, students and social workers have planted over a million trees of various species chosen by the people. The survival rate has been an astonishing 85-90 per cent in most cases, owing to the care and protection given by the self-motivated villagers.

Bhatt maintains that ecodevelopment strategies will only inspire the poor when they are based not just on ecology but also on the needs of the people.

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