and typhoid fever Long-term prevention of flooding in Bangladesh is a formidable, but not impossible, challenge involving not only protection of low-lying delta land but also reversal of the deforestation and soil erosion afflicting the upland rain catchment areas of Bhutan and India.

Floods in Khartoum

In August 1988 severe flooding occurred in Khartoum, the capital of The Sudan, which is situated at the confluence of the White Nile and the Blue Nile rivers. Over 200 mm (8 in) of rain fell in 24 hours—more than twice the average annual rainfall—causing severe ground flooding and disrupting communications, food and water supplies, sanitation, transport, and health services. Approximately 127,000 dwellings were destroyed, leaving some 750,000 people homeless. Most of the worst-affected areas of the capital were squatter settlements where more than a million people had sought refuge from the civil war and mass starvation in the southern part of the country The squatter settlements were a disaster waiting to happen; the influx of displaced southerners into the capital had been resisted by government authorities, and virtually no services (water, sanitation, communications, health, or education) had been provided to these people prior to the flooding

The relief program was a mixed success. Many useful donations, such as shelter materials, food, and certain medicines, were flown into Khartoum immediately following the crisis Unfortunately, many of these items—particularly food—failed to reach the people most in need—those in the squatter settlements. The Sudanese Ministry of Health set up a disease surveillance system, which demonstrated an increase in the incidence of both diarrheal diseases and malaria. Health authorities concentrated on treating diarrhea with oral rehydration solution, vaccinating young children against measles, and treating malaria. The surveillance system revealed a high rate of malnutrition among children in the squatter settlements, a situation that probably existed before the flooding but that might have deteriorated owing to the disruption of food supplies.

Lessons from Khartoum Natural disasters often have the greatest impact on poor segments of society Not only does their poverty give them little physical protection from sudden events such as earthquakes, hurricanes, and floods but their meager resources also make them completely dependent on external assistance. The Sudanese government had not provided adequate support using its own resources to the displaced persons in Khartoum prior to the floods Thus, a gradual-onset disaster was compounded by the terrible destruction wreaked by the heavy rains on the poorly built, flimsy houses of the displaced persons Relief efforts quite rightly focused on this high-risk population, although certain local political factions attempted to obstruct the channeling of food aid to these people.

Hurricanes Gilbert and Joan

Hurricane Gilbert swept across the Caribbean on Sept. 11–19, 1988, and caused severe structural damage in Jamaica, Haiti, and the Yucatán Peninsula of Mexico Before the storm hit the Yucatán Peninsula, the U.S. National Hurricane Center estimated wind gusts up to 320 km/h (200 mph). Measured surface winds in Cozumel were reported at 240–260 km/h (150–160 mph) In Jamaica approximately 810,000 people were affected by the hurricane, their houses either destroyed or heavily damaged A total of 500,000

C. W. Griffin—The Miami Herald/Matrix

An airplane at Jamaica's Kingston airport ended up wedged between trees after being tossed and downed by Hurricane Gilbert, which hit the island on Sept 12, 1988 heavy rains and winds up to 320 kilometers (200 miles) per hour caused massive destruction and affected an estimated 810,000 inhabitants Gilbert also caused major damage and hundreds of deaths in Haiti and on Mexico's Yucatán Peninsula

...Hudson—Sygma, (right) Sygma

...after a bomb exploded on Pan Am Flight 103 on Dec. 21, 1988, the plane crashed into a residential area of ... Scotland, the "sudden-impact, man-made disaster" killed all 259 persons aboard. By contrast, there were ... survivors among the 296 persons aboard a DC-10 that crash-landed in Sioux City, Iowa, on July 19, 1989 ... even before the pilot made his final approach, an emergency rescue team was in place.

...e made homeless, and 45 deaths were reported. ...aiti 50 deaths and 300 injuries were reported, and ...Mexico there were 200 deaths and 530 injuries. ...cuation of certain areas of Mexico, especially in the ...atan Peninsula, was quite successful in prevent... ...further casualties, although structural damage was ... Scarcely two months later, Hurricane Joan left ...l of destruction from coast to coast in Nicaragua, ...ing 185,000 people and causing 116 deaths.

...ons of Gilbert and Joan. Hurricanes, or cyclones, ...sudden in onset but are usually more predictable ...affect a wider area than earthquakes. Of all acute ...ters hurricanes have a ratio of deaths to affected ...ation second only to earthquakes. Deaths and ...us injuries may be due to trauma inflicted by ...g debris or collapsed man-made structures, how... ...most hurricane deaths are due to drowning in ...floods that often result from severe storm surges. ...or preventive measures consist of early detection, ...tracking, the issuing of timely warnings, and ...evacuation of those in the path of the hurricane. ...ricultural countries like Jamaica, the damage to ...s may lead to long-term food deficits, malnutrition, ...the other health consequences of flooding, as ...ssed above.

...dden-impact, man-made disasters

...category includes sudden chemical or nuclear ...ters (such as the accidents at Bhopal, India, and ...Chernobyl nuclear power plant in the U.S.S.R.); ...boat and airplane accidents; terrorist attacks, ...reaks of civil strife; major fires; and industrial ac... The most dramatic examples of this category ...g 1988 occurred when civil disturbances took ...n the African countries of Somalia and Burundi.

During May and June, fighting broke out between Somali government forces and the rebel Somali National Movement in the northwestern part of the country. In the aftermath, which included extensive bombing of three towns—Hargeysa, Burao, and Berbera—an estimated 20,000 people died and approximately 800,000 people were displaced, 300,000 of whom fled into neighboring Ethiopia. Little is known of relief efforts inside Somalia, as access was barred to almost all foreigners. As is often the case, the exodus of refugees into camps in the adjacent country led to an emergency relief program there. (Refugee relief is discussed below.) In Burundi serious intertribal violence occurred in mid-August, leading to massacres of the civilian population. The final death toll is unknown but is thought to be at least 5,000. This violence, in turn, led 55,000 ethnic Hutu to flee to nearby Rwanda, where international relief aid was provided.

No major chemical or industrial accidents occurred during 1988, however, several incidents involving airplanes occurred, including the much-publicized bombing of a Pan Am Boeing 747 jet over Lockerbie, Scotland, which killed 259 passengers and crew and 11 people on the ground. Although such incidents usually leave few or no survivors, many countries have developed preparedness plans that involve the evacuation, triage, and treatment of mass casualties. The major long-term health effects of these acute disasters relate to the displacement that follows war and civil strife.

Sudden epidemics

Acute outbreaks of infectious diseases often overwhelm the public health response capacity of the affected countries, particularly less developed ones. The most common of such epidemics, frequently requiring

external assistance, are cholera, meningitis, certain hemorrhagic fevers, and yellow fever. During 1988 the worst epidemic reported was that of bacterial meningitis, with approximately 18,000 cases reported in The Sudan, 7,500 cases in Chad, and 7,000 cases in Ethiopia. An estimated 2,000 deaths resulted. The response to this epidemic, which affected three countries in what is called the "meningitis belt" of sub-Saharan Africa, comprised intensive surveillance, vaccination of the population in areas of risk, case-finding, and treatment of cases with appropriate antibiotics. Epidemics of this disease tend to occur every ten years in each of the 15 or so countries situated in the "belt." Careful surveillance and early detection of the outbreak require international cooperation and a willingness by Western donor governments to respond promptly and generously with sufficient vaccines and drugs.

Gradual-onset disasters

Drought, war, locust plagues, and ecological changes (desertification, deforestation, soil erosion) tend to have two outcomes in common: loss of access to food and mass migration by the affected populations. This migration may take two forms—flight into neighboring countries, where the people are often given refugee status, or internal displacement within the affected community's own country. The UNHCR estimates that 14 million refugees are receiving assistance today, mostly in Africa, Asia, and Latin America. In addition, an estimated five million people are displaced within their own countries.

During 1988 alone 708,000 new refugees sought asylum in four countries (Ethiopia, Malawi, Rwanda, and Turkey). These refugees fled war or civil strife in Somalia, Mozambique, Burundi, and Iraq, respectively. Assistance continued to be given to refugees who had arrived in The Sudan, Pakistan, Iran, Somalia, Thailand, Honduras, and many other countries prior to 1988. With the exception of Turkey and Iran, all these countries with large refugee populations are poor (with per capita gross national products of less than $400), thus, the quality of care provided to refugee populations depends largely on the relief assistance that is provided by the international community. The influx of refugees from Burundi into Rwanda took place with relatively few deaths; by December 1988 all had been successfully and voluntarily repatriated to their former homes. In Malawi, Mozambican refugees also experienced very low mortality rates and minimal malnutrition, as did ethnic Kurds who fled from Iraq to Turkey. In Ethiopia more than 300,000 Somali refugees were living in remote and poorly serviced camps, dependent on both water and food being transported long distances over poor roads. Malnutrition prevalence rates in this population deteriorated following their initial influx in July, and by the end of the year, 25% of children under the age of five years were identified as malnourished. Death rates in these camps have not been documented.

Assessment of care for refugees and displaced persons. The quality of care provided to new refugees in 1988 varied, depending to some degree on the extent to which lessons learned from past experience were put into practice. In several situations during the past ten years, refugees have experienced unusually high malnutrition prevalence and high death rates. Many young children have died of malnutrition, measles, diarrhea, malaria, and pneumonia—all either preventable or easily treated with low-cost medicines. The most important relief needs of these populations are adequate food supplies, clean water and sanitation, measles vaccination, oral rehydration therapy for diarrhea, and a basic primary care system with good coverage, standard treatment schedules and drugs, and training of community health workers.

The fate of internally displaced populations (who are usually fleeing war) may be even worse than that of refugees. Since these populations are not protected by international conventions, relief workers are often refused access to them by hostile governments or rebel forces. The worst example of this scenario occurred in southern Sudan, where an estimated 250,000 civilians displaced by a civil war died during 1988. In one displaced persons camp, El Meiram, the death rate reached a staggering 2% in the last week of August 1988, the highest ever recorded in a civilian relief camp setting. Other long-term internally displaced populations in Mozambique, Sri Lanka, and El Salvador require appropriate assistance; however, the long-term solution to this problem is not medical. It requires international protocols that guarantee these people protection from unfriendly armed forces and access to international assistance, free from political constraints and conditions.

1988 in focus

The vast majority of the communities affected by disasters in 1988 were in the third world. With the exception of Armenia, less developed countries bore the brunt of the year's natural and man-made disasters (hurricanes, floods, locust plagues, drought, war, and civil strife). Among the poor of these countries, displaced populations perhaps suffered the greatest. Deprived of their livelihood, they were totally dependent on the generosity of outsiders. These disasters will continue to occur and contribute to the already major obstacles to economic development in the third world. Development planners need to take account of this reality and to incorporate disaster preparedness into national development plans; otherwise, unnecessary setbacks will recur when either Nature or Man goes on the rampage.

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