Environmental Emergencies NEWS

UNEP

Issue 3 September 2004

In this issue:

Dear Readers,

Svein Tveitdal,

Director, Division of Environmental Policy Implementation (DEPI)

With the increasing intensity and frequency of water related disasters, and the requirement for the efficient management of water related threats, we have decided to focus this issue on floods. Such a topic is pertinent as floods accounted for half of the total water-related disasters that occurred globally from 1990-2001.

Floods endanger human life, property, the environment, the economy and even a country's political and social well-being. We are all vulnerable to the impact of floods but it is the poor who are the most severely affected. Floods are often caused by or exacerbated by poor environmental management, such as excessive deforestation, and flood events can further degrade the environment leaving it more prone to future environmental emergencies.

Disruptions and threats from floods are a global concern and UNEP continues to develop plans and network with others in this field to address the need for prevention, preparedness, response and mitigation of the effects of floods.

In this issue, we share with our readers information about what floods are, their types and causes as well as selected flood events and their impacts.

We wish you informative reading.

©UNEP/ Randriamazoto

Rainy season in Atananarivo, Madagascar

What are floods?

Floods are categorised as hydrometeorological hazards. Floods are hard to predict. Some have a seasonal incidence occurring over wide geographical areas, such as the annual floods in the tropics; others such as flash floods are caused by torrential, local rainfall for which only short warning lead-times are possible. Extreme rainfall, caused by intense weather conditions such as rainstorms and tropical cyclones, are the most common causes of flooding.

Types of floods

There are five main types:

1. Flash floods: occur when there is heavy rainfall of short duration over a relatively small drainage area. When flash floods occur in small areas, the flood peak is high but short-lived. Floodwaters travel at high velocities. This type of flooding produces large volumes of water in both space and time. Flash floods are common in arid, hilly and steep areas, mountainous regions and metropolitan areas.

2. River floods: occur due to seasonal prolonged heavy rain, melting snow, or a combination of the two. Floating ice jams can reduce the capacity of rivers to cope with river flows. When these begin to melt or break up, there can be sudden shifts in the ice pack causing the jam to spontaneously release a flood wave. River floods usually cause a high flow of water that surpasses the coping capacities of natural or artificial banks of a river. If a dam breaks or bursts, this too can cause river flooding. Poor design and construction, landslides and earthquakes are some of the reasons for dam failures.

Flood victims in Bangladesh, July 2004
(Photo courtesy SDNP)

3. Coastal and estuarine floods: occur when the sea level rises beyond its normal fluctuations. Land subsidence and progressive sea level rise are also factors that increase the height of the sea level beyond its normal fluctuations. The main causes of these abnormal sea level rises are ocean storm surges and tsunamis. Tsunamis are caused by earthquakes or volcano outbreaks on the ocean floor. They can be devastating if they coincide with high tides. Low-lying island states and coastal areas are vulnerable to this type of flooding.

4. Glacial lake outburst floods: occur in high mountainous glacial environments. They are caused by sudden discharges of large volumes of water and debris due to the rapid accumulation of water in glacial lakes. This type of flooding has been attributed to glacial warming.

5. Ponding: occurs when water accumulates in closed depressions as a result of soil saturation or impermeability, typically on manmade surfaces or soils with a slow water percolation rate such those with a high clay content. In urban areas, large paved surfaces lose their ability to absorb water, resulting in impassable streets and flooded basements.

Impact of floods

The fertile soil found in floodplains often makes these areas desirable places for human settlement. Not only in agricultural societies but also in industrialised countries, floodplains host cities and towns that use the river water for industry or transport. The tendency for populations to settle in floodplains is therefore an important contributing factor to the impact of floods. The following landscape settings are considered vulnerable to floods *(Source: Smith, K. (2001), Environmental Hazards: Assessing Risk and Reducing Disaster. Pub: Routledge, London)*:

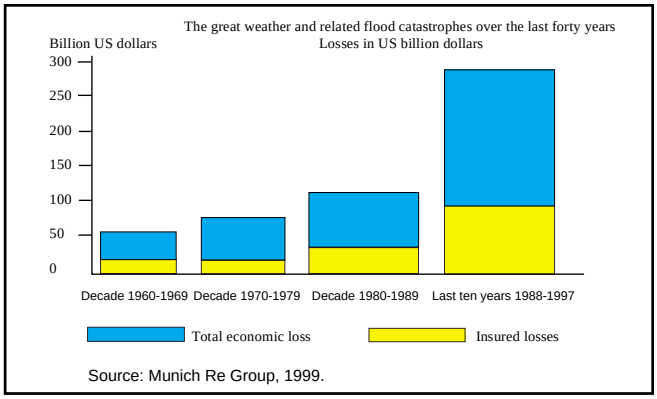
Indian flood victims request medical care, July 2004
(Photo courtesy SDNP)

a. Low-lying parts of floodplains;
b. Low-lying coasts and deltas;
c. Small basins subject to flash floods;
d. Areas below unsafe and inadequately sized dams;
e. Low-lying inland shorelines;
f. Alluvial fans.

In addition, climate change caused by rising greenhouse gas concentrations as a result of environmental degradation is also very closely associated with the increase in frequency and severity of floods.

Economic loss

During the ten-year period from 1986 to 1995, floods caused a global economic loss of about US$195.3 billion. The greatest losses were incurred as a result of the flooding of cities or large areas of farmland (*Source: http://www.unisdr.org).* Asia accounted for about 44 per cent of the global flood disasters between 1987-1996 costing its economy billions of dollars. Individual nations must spend large amounts of money to rehabilitate their economies following the damages caused by floods. Examples include USA: US$3.7 billion annually between 1988-1997; China: June 2002 total loss estimated to exceed US$ 2.02 billion (*Source: http://www.reliefweb.int).*



As indicated in the figure above, non-insured weather related and flood losses have been increasing at a much higher rate than the insured ones.

Flood mitigation

Flood mitigation focuses on reducing the vulnerability of the environment to damage by flooding. Flood mitigation measures are categorised into two groups: structural and non-structural. Structural measures range from traditional or indigenous to the more advanced engineered methods. A classical example of

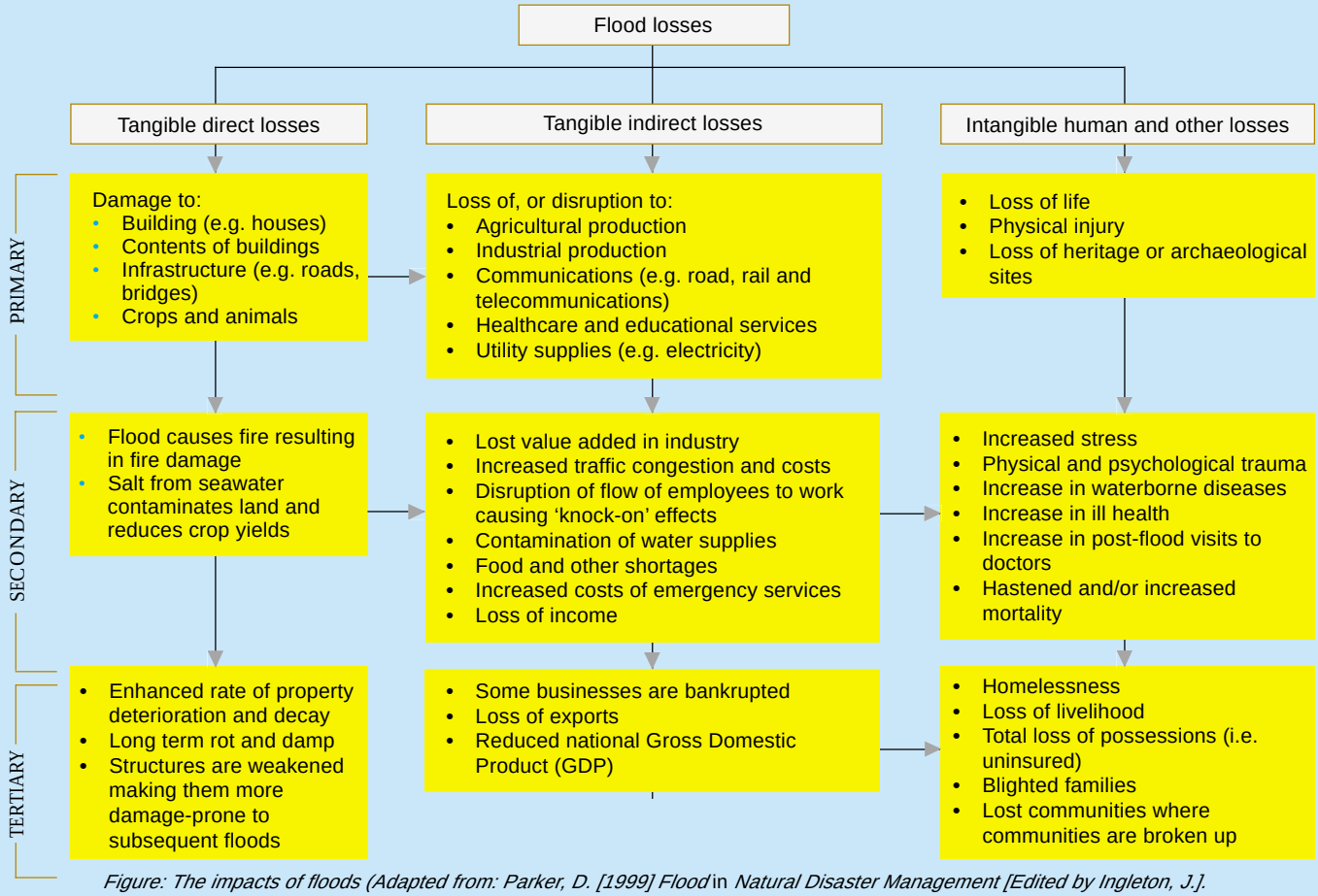


Figure: The impacts of floods (Adapted from: Parker, D. [1999] Flood in *Natural Disaster Management [Edited by Ingleton, J.]. Publisher: Tudor Rose, Leicester)*

traditional structural method is the stilt house used by Malaysian families. It originally evolved as an adaptation to living in swamplands and frequently flooding riverside or coastal areas. Stilt houses are still predominant in rural areas where flooding is common. Traditional methods are generally basic and inexpensive. A universal method is to seal doorways by the use of earth bags that keep flood waters away from structures and roads.

Advanced engineered methods are usually large scale and require some kind of capital investment. These include lev»es, channel enlargements, reservoirs, and flood control dams.

In coastal areas, 'environmentally friendly' defences such as protective sand dunes, salt marshes, and the artificial repositioning of sand on beaches are being opted for instead of large-scale man-made flood defences such as breakwaters and seawalls. The latter have a tendency to alter and interfere with natural coastal processes such as sediment movement and the natural renourishment of beaches.

Non-structural measures require a change in lifestyles and behaviour of the endangered population in order to reduce the risk and the impact of flooding. These include floodplain management, watershed management and planning for floods.

Floodplain management is based on:
Zoning of flood plains based on risk analysis, usually expressed in the form of risk maps so that land use is related to the different levels of risk of flooding; and,
Differences between risk zones which serve as guidelines for the regulation of economic activity, establishment of human settlements and the introduction of appropriate building codes.
Insurance incentives promote floodplain management.

Watershed management involves the introduction of favourable land use practices and include strategies such as:
Reafforestation or reseeding of forest land;
Protection of vegetation from overgrazing and wildfires;
Terracing to reduce water run-off.

Emergency planning is an important non-structural measure for flood mitigation. There should be a well-maintained system for response preparedness including vigilant early warning programmes to ensure that residents have enough time to respond.

Attitudes towards floods (Adapted from: http://www.pbs.org/wgbh/nova/flood/deluge.html)

The Yellow River, China

Three thousand miles long, the Yellow River has been dubbed "China's Sorrow" due to its flooding history. Much of the problem is due to the high silt content of the river that in some stretches reaches 60% by weight. Over the years, attempts have been made to control the river flow by building higher lev»es, digging channels and building dams. All this has culminated in the Xiaolangdi Multipurpose Dam Project that boasts 10 intake towers, nine flood and sediment tunnels, six power tunnels and an underground powerhouse. The project may finally mitigate the river floods that over centuries have killed more people than any other river in the world.

The Nile, Egypt (Adapted from: *http://www.pbs.org/wgbh/nova/flood/nileimage.html)*

On the other side of the spectrum, the Egyptians have referred to the Nile's annual flooding as the'"Gift of the Nile". When flooding occurred, the river overtopped a strip of land on either

side of its banks. When the water receded, a thin layer of evenly spread black fertile mud was left behind. Farmers immediately planted their crops, never needing fertilisers because the flood soil was rich in nutrients. Like clockwork the flooding occurred every summer. However, since the 1970s, the agricultural area has struggled with erosion and high levels of soil salinity due to the construction of the Aswan Dam, increased population density and pressure on farm land productivity.

Selected flood events and their impacts*

Month/Year	Location	Impact of the floods
2003		
August	Sudan	4,000 people without shelter, 22 injured and 11 killed. Crops in three states lost due to failure of drainage canals and rupture of main channel.
April / May	Kenya	Floods inundated much of Kenya collapsing dykes and causing landslides.
2002		
June	Syria	On 4 June, the large Zeizoun dam in the Al-Gab region burst, causing severe damage in nearby populated areas, 20 people killed, over 10,000 directly affected with 2,000 people rendered homeless.
2001		
August	Iran	On 10 August torrential rains triggered flash floods in Gorgan and Doogh Rivers in Golestan killing 247 people, over 10,000 people rendered homeless, 15,000ha of farmland and 10,000ha of forest/rangeland destroyed.
2000		
February	Mozambique	Late January torrential rainfall caused flooding of the Incomati, Umbeluzi, and Limpopo rivers in Maputo and Gaza Provinces. Heavy rains in February compounded the flooding already caused by seasonal rainfall, leading to the worst flooding in southern Mozambique in nearly half a century. Amidst this flooding, Cyclone Elaine hit Inhambane and Sofala Province from 21 to 22 February causing extensive infrastructural damage, 70 people were reported killed by drowning; 350, 000 displaced and left homeless. Severe impacts on agriculture, natural vegetation, indirect effects on health and economy, compounded by environmental degradation, including soil erosion, water pollution and deforestation.
1999		
December	Venezuela	Torrential rains caused massive landslides and severe flooding that impacted a chemical storage warehouse causing drums of chemicals to be washed into the water impacting the marine environment, drinking water supply and contaminating the shoreline.
1998		
June-September	China	By July rainfall in the middle and lower reaches of Yangtze River did not follow no rmal patterns. Approximately 25.78 million km^2 of land were affected. The damaged area was 15.85 million km^2, affecting a population of 230 million; 3,656 killed, and 13.8 million internally displaced.

* UNEP and its collaborating agencies were able to respond to these emergencies at the request of governments.

Selected websites related to floods

- Global Water Partnership (GWP) @ http://www.gwpforum.org
- World Meteorological Organization (WMO) / GWP Associated Programme on Flood Management (APFM) @ http://www.wmo.ch/apfm
- International Commission on Irrigation & Drainage (ICID) @ http://www.icid.org
- World Water Council @ http://www.worldwatercouncil.org
- Flood Hazard Research Centre @ http://www.fhrc.mdx.ac.uk
- Association of State Floodplain Managers @ http://www.floods.org
- University of Wisconsin Disaster Management Center @ http://dmc.engr.wisc.edu/courses/hazards/BB02-06.html

Published by the Disaster Management Branch, Division of Environmental Policy Implementation (DEPI)
United Nations Environment Programme
P.O. Box 30552 Nairobi, Kenya Tel: +254 (20) 623507/623508 Fax: +254 (20) 624249/623794
Website: http://www.unep.org/depi/disastermanagement.asp

Published on recycled paper

Design and layout by Division of Communications and Public Information (DCPI)