Cheat Sheet

Floods: Types, Causes and Mitigation Measures

WHAT IS A FLOOD?

A flood refers to "high-water stage in which water overflows its natural or artificial banks onto normally dry land, such as a river inundating its floodplain"[1].

When flooding occurs, a piece of area gets submerged under water suddenly because the amount of water is too much for the land (within the confines of the affected area) to absorb or when natural watercourses do not have the capacity to convey the excess water.

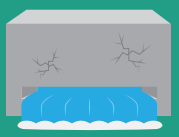
While the occurrence of a flood is usually due to an act of nature such as heavy rainfall, it can also occur in situations when a dam is damaged (usually caused by earthquakes) causing flooding in downstream areas. Floods can occur in almost anywhere including deserts.

CAUSES OF FLOODS

Heavy rains especially during monsoon seasons.

Raising sea water levels due to storm surges and tsunamis.

Melting ice and glaciers from mountainous regions and sea ice in the Artic.



Man-made accidents such as failure of facilities of water supply (dams) and sanitary sewerage.

Benefits of Floods

In the past, the inundation (flooding) of rivers such as the Nile and Yangtze provides rich natural fertilisation for the land areas along these rivers. Thus providing a welcome relief for farmers, as the soil enrichment was needed for good harvests[2].

Devastating consequences of floods

As a result of torrential rains brought on by typhoons, floods often result in the loss of lives, homes and livelihood. For example, the failure of levees and floodwalls due to a heavy storm, as in the case of the Netherlands in 1953[3], resulted in the following:

Economic Loss
Estimated amount of
1 billion Dutch guiders

Damage to the Environment
Homes destroyed: 47,000
Farmland: 800,000 acres

Effects on People and Animals
Drowned: 1,800 Dutch Citizens
Displaced: 72,000 homes and
250,000 cattle, hogs and poultry

Types of Floods

Flash Floods

Flash floods often occur in urban areas after an intense thunderstorm. Within minutes or a few hours of a heavy rainfall, an area could be flooded quickly and often catching the dwellers by surprise [4].

Storm Surges

These occur particularly in coastal areas when there is abnormal rise in water levels over and above the regular astronomical tides caused by forces generated from a severe storm's wind, waves, and low atmospheric pressure. Storm surges may coincide with unusual high tides, resulting in storm tides reaching up to 20 feet or more in some cases[4].

Slow on-set Floods

This type of flood is usually a result of water bodies over flooding their banks. They tend to develop slowly and can last for days and weeks. They usually spread over many kilometres and occur more in flood plains (fields prone to floods in low-lying areas). The effects of this kind of flooding on people are more likely to be water-borne diseases, malnutrition or snakebites [4].

Rapid on-set Floods

In mountain and coastal river flooding, water rushes down the steep hills and valleys more rapidly, causing areas to be flooded more quickly. This type of flood takes slightly longer to develop and the flood can last for a day or two only. It is also very destructive, but does not usually surprise people like in the occurrence of flash floods [4].

River Floods

Occurs when the water level in an existing river rises more than the river can handle. Causes of river floods include heavy rainfall, tropical storms, ice jams, and snow melts [4].

HELLO

my name is ...

DID YOU KNOW?

Naming system for hurricanes

- Started during the World War II period, the practice of naming hurricanes was initially confined to female names. However this practice was changed in 1978.
- The World Meteorological Organization draws up alphabetical lists of names for both Atlantic and Pacific storms. A name is used once only [5].

Mitigating measures: Highlights

Flood mitigation requires management of flood water flow, such as redirecting the excess water. While it may not be completely possible to prevent floods from happening, measures can be taken to reduce the impact of floods in future. Flood mitigation can be divided into structural and non-structural measures. Constructing sturdy dams across rivers, artificial reservoirs or artificial lakes and canals are some examples of structural measures. In some countries like the Netherlands, levees and dikes are constructed to prevent overflowing of water. To reduce the effect of strong waves, sea walls are constructed on the coastal areas.

Examples of Structural Measures:

SINGAPORE

Flooding and flash floods do occur in Singapore. The Singapore River and the basin around it is sometimes subjected to torrential rains. Heavy rainfall, coupled with high tide, was cited as the main reason for the flooding in the Orchard Road area in June 2010. It was understood that the underground drainage along the Stamford Road canal was also badly blocked by debris.

The Marina Barrage was built to increase Singapore's capacity to catch and store water. It is also a flood mitigation initiative where the water level in the Barrage could be adjusted to mitigate the effect of tides on the water level within the city areas and thus reduce the occurrence of floods [6].

MALAYSIA

Flash floods in the city of Kuala Lumpur are a regular occurrence. The Malaysian government's solution was the implementation of a dual purpose tunnel called SMART which stands for Stormwater Management And Road Tunnel in 2007.

It is understood that the SMART tunnel is one of a kind at the time it was built, as it combined the wet and dry system. On sunny days, the tunnel is used as a pathway or road for light vehicles such as cars and motorcycles; and during heavy downpours or storms, stormwater in the city areas is diverted and stored in the tunnel [7].

Non - Structural Approaches

- City planners and engineers would embark on careful planning of development involving construction projects in potentially flood prone areas. Other measures are also implemented such as those involving legislation specifying the use of land zones for proper use of land for catchment and buildings.
- Implementing warning systems such as weather forecasting and warning system of storms and tides levels.
- Continuous education efforts on the consequences of irresponsible disposal of garbage which may block drainage systems.

Citing News Articles

Information Literacy

A picture is worth a thousand words. By looking at images of the aftermath of the natural disaster brought on by Super Typhoon Haiyan, we get some ideas on the impact it had on the people, lives, environment and government of Tacloban in the Philippines. However, information presented in the form of statistical data and monetary value will deepen our understanding much further, in terms of assessing the magnitude of the impact of this disaster when Haiyan made landfall and the sea surged ashore. According to a news article published on November 20, 2013, the estimated costs for rebuilding the city was some $7 billion Singapore dollars and in terms of casualties, an estimated number of 3,900 people were killed [8].

In today's context where information is easily accessible at the touch of our fingertips, which sources should we use?

1. At the start of your research, news articles and reports will provide you with first hand updates on the initial impact of a disaster.
2. To get deeper understanding of the magnitude of the disaster, do refer to official reports released by the relevant authorities such as the government of the affected country or international organisations (which play a major part in the relief efforts). However, do take note that investigations would require time and hence reports are released only until much later.
3. Cite your references correctly as the information will help your readers to retrieve the document for the benefit of their very own reference in future research.

Here are some tips on how to cite news articles:

	Samples
News article with author	Cheong, Kash (2013, November 28). $4.6m raised in Singapore for typhoon victims. The Straits Times, p. A6.
News article with no author	Post-typhoon rebuilding may cost $7b. 2013, November 20. The Straits Times, p. A18.
News article accessed from the Internet	Lowe, Aya. (2015, August 10). Philippines' Haiyan survivors still await housing almost two years after typhoon. Channel NewsAsia. Retrieved on 12 December 2015 from http://www.channelnewsasia.com/news/asiapacific/philippines-haiyan/2041240.html

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3. Angus, M.Gunn. c2010. A student guide to climate and weather. Santa Barbara, Calif.:Greenwood/ABC-CLIO. Call no. 551.5 GUN
4. Menon, Sujatha. 2008. Fire and Flood. New York: PowerKids Press. Call no. 363.37 MEN
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7. A Study and Evaluation on SMART Project, Malaysia. A dissertation submitted by Ram Kumar M. KANNAPIRAN. Retrieved on 7 Dec 2015 from http://eprints.usq.edu.au/617/1/RamKumarM.KANNAPIRAN-2005.pdf
8. Post-typhoon rebuilding may cost $7b. 2013, November 20. The Straits Times, p. A18.