**Floods in India: causes, effects & solution**

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**Abstract:**

Floods have been considered one of the most recurrent and frequent disasters in the world. Due to the recurrent prevalence, the economic losses and personal damages caused by the floods weighed more on the economy than any other natural disaster. India has also continually suffered numerous floods that have caused enormous loss of life and the economy. It has been discovered that the incidence of floods is increasing very rapidly. The causes can be climate change, the explosion of clouds, a tsunami or poor management of rivers, the accumulation of sediments, etc. But the devastation is increasing both in terms of lives and savings. The management of disasters in India has very organized and structured programs and policies, but the administration and implementation of these programs requires more efficiency. Over the past decade, floods have damaged more lives and economies than any other disaster. This article is an analysis of the trend and flood preparedness in India. The CRED data are used to analyze the tendency of the floods and other disasters during the last ten years and the damage caused by these events.

**Introduction:**

A flood is an overflow of water that submerges land that is usually dry. The European Union (EU) Floods Directive defines a flood as a covering by water of land not normally covered by water. In the sense of "flowing water", the word may also be applied to the inflow of the tide. Floods are an area of study of the discipline hydrology and are of significant concern in agriculture, civil engineering and public health.

Flooding may occur as an overflow of water from water bodies, such as a river, lake, or ocean, in which the water overtops or breaks levees, resulting in some of that water escaping its usual boundaries, or it may occur due to an accumulation of rainwater on saturated ground in an aerial flood. While the size of a lake or other body of water will vary with seasonal changes in precipitation and snow melt, these changes in size are unlikely to be considered significant unless they flood property or drown domestic animals.

Floods can also occur in rivers when the flow rate exceeds the capacity of the river channel, particularly at bends or meanders in the waterway. Floods often cause damage to homes and businesses if they are in the natural flood plains of rivers. While riverine flood damage can be eliminated by moving away from rivers and other bodies of water, people have traditionally lived and worked by rivers because the land is usually flat and fertile and because rivers provide easy travel and access to commerce and industry.

Some floods develop slowly, while others such as flash floods, can develop in just a few minutes and without visible signs of rain. Additionally, floods can be local, impacting a neighbourhood or community, or very large, affecting entire river basins.

**Objectives of study:**

Main objectives of this paper are to present:

1. Analysis of flood problems in India,
2. Locate flood prone areas in India,
3. Causes, effects and solution of flood in India.

**Research Methodology:**

The present study focused on the environmental and health status analysis due to climate change. As environmental analysis is the study of air, land and water, the impact of climate change on these are important. As regards the methodology, the tools and technique employed has been determined in consonance with the set objectives. During the course of the study both the descriptive and analytical technique have been used. To achieve of the study on the other hand, the significant part of the study is based on the secondary data obtained from the official websites and other websites. The data is also attained from research papers, articles and newspapers.

**Flood Prone areas in India:**

Indian subcontinent has specific geographical structure which makes various part of the nation prone to the flood. The snow-clad Himalaya in the North encompasses one of the largest glaciers of the world which are source of various perennial rivers. These rivers constitute a large plain which is habituated by millions of the Indians. These gigantic plains are very prone to the flood brings by the rivers which swell due to heavy rainfall in Monsoon. According to NIDM, the average rainfall in India is 1150 mm with significant variation across the country. The annual rainfall along the western coast and Western Ghats, Khasi hills and over most of the Brahmaputra valley amounts to more than 2500 mm. Most of the river floods occur during the monsoon period and are usually associated with tropical storms or depressions, active monsoon conditions and break monsoon situations. Besides the river flood, heavy rainfall, cloud bursting, out-burst of glacial lakes and tsunami is other causes of the flood. If we look at the Vulnerability atlas of flood zone in India, issued by Central Water Commission we finds that the flood prone areas in India are mainly the Indo-Ganga-Brahmaputra plain and the coastal areas in the Eastern and Western coastal regions. River flood is result of gathering of water from various tributaries of the river which brings huge silts and sands with them and deposits it on the bed of the river. The deposited slits reduce the pace of the flow of river and it starts expanding horizontally and submerging the nearby habitats. In most flood prone state, land depression, low-pressure areas are the two most important synoptic systems responsible for floods. NIDM mentioned in its document that in Bihar 100% and in U.P. 82% flood is caused due to land depression and well-marked low pressure. In W. Bengal main reason for flood is cyclonic circulation. Whereas in Punjab, Gujarat, Rajasthan & Jammu & Kashmir the main reason of frequent flooding is low pressure areas. Flood in Orissa and Andhra Pradesh is due to monsoon depression. Now days metropolitan cities are facing repeating episodes of the flood. This flood is caused by mismanaged drainage and sewer system which get chocked due to careless dumping of the wastes in the drains and poor maintenance by the responsible agencies. The coastal flood is mainly because of the cyclones and tsunami.

Rashtriya Barh Aayog (1980), mentioned that India’s 12 % land comes under the flooded areas which were comprised nearly 40 million hectare of land. This has exceeded upto 49.815mha as per the database maintained by CWC based on the flood damage data reported by States for the period from 1953-2010 (Report of Working Group on Flood Management and Region Specific Issues for XII Plan (2011).Annual average area and population affected due to flood: 7.2 M ha and 3.19 million respectively.



Source: [WWW.google.com](http://WWW.google.com) (maps for flood prones zones and areas in India)

**Causes of Floods:**

There are several causes of floods and they differ from region to region. The causes may vary from a rural area to an urban area. Some of the major causes of floods in India are given below:

**1. Heavy precipitation:** Rainfall of about 15 cm or more in single day may be beyond the carrying capacity of the river and this causes the spilling of river over natural banks. Areas affected include west coast of Western Ghats, Assam and sub-Himalayan West Bengal and Indo-Gangetic plains.

**2. Rise in river bed:** Due to large gradients the Himalayan rivers carry a large amount of silt and sand which are ultimately deposited in the catchment area, and on the river bed. Siltation reduces the carrying capacity of river.

**3. Meandering tendency of river-flow:** In the flat terrain rivers have the tendency to meander or change the course within a specific boundary. Lower reaches of Gangetic plains and Brahmaputra.

**4. Cyclones:** Tropical cyclones accompanied by strong winds, high tidal bores causing inundation of coastal regions. Floods due to cyclone are common in the East coast of Tamil Nadu, Andhra Pradesh, Odisha and West Bengal.

**5. Silting in Delta areas:** Sea tides deposit silt on the river-mouths and discharge channels leading to steady deterioration of their discharge capacity.

**6. Obstruction of free-flow of rivers:** Embankments, railways, canals etc. obstruct the free flow of rivers leading to flood.

**7. Inadequate drainage arrangement:** After introduction of irrigation in some areas, the sub-soil water table rises fast unless adequate arrangement are simultaneously made for both surface and sub-surface drainage. Punjab, Haryana and Uttar Pradesh.

**8. Earthquake and Landslide:** These natural disaster change the river course and consequently cause flood.

**9. Deforestation:** Deforestation causes the acceleration of runoff and lowering of infiltration. Deforestation of hill slopes leads to greater run-off which raises the water level in rivers. Western Ghats, Siwaliks and Chotanagpur plateau region.

**10. Cloud burst:** Cloud bursts leads to high amount of rainfall within a short time leading to flash floods. Flash flood generally occurs in Himalayan region.

Approximately 60% of the flood damage in the country occurs from river floods, while 40% is due to heavy rainfall and cyclones. Damages by the Himalayan Rivers account for 60% of the total damage in the country. In the peninsular river basins, most of the damage is due to cyclones whereas in the Himalayan Rivers about 66% is due to floods and 34% by heavy rains. About 27% of the flood damage in the country is accounted for by Bihar, 33% by Uttar Pradesh and Uttarakhand and 15% by Punjab and Haryana.

**Effects of Floods:**

**Primary effects:**

The primary effects of flooding include loss of life, damage to buildings and other structures, including bridges, sewerage systems, roadways, and canals. Floods also frequently damage power transmission and sometimes power generation, which then has knock-on effects caused by the loss of power. This includes loss of drinking water treatment and water supply, which may result in loss of drinking water or severe water contamination. It may also cause the loss of sewage disposal facilities. Lack of clean water combined with human sewage in the flood waters raises the risk of waterborne diseases, which can include typhoid, giardia, cryptosporidium, cholera and many other diseases depending upon the location of the flood.

Damage to roads and transport infrastructure may make it difficult to mobilize aid to those affected or to provide emergency health treatment. Flood waters typically inundate farm land, making the land unworkable and preventing crops from being planted or harvested, which can lead to shortages of food both for humans and farm animals. Entire harvests for a country can be lost in extreme flood circumstances. Some tree species may not survive prolonged flooding of their root systems.

**Secondary and long-term effects:**

Economic hardship due to a temporary decline in tourism, rebuilding costs, or food shortages leading to price increases is a common after-effect of severe flooding. The impact on those affected may cause psychological damage to those affected, in particular where deaths, serious injuries and loss of property occur.

Urban flooding can lead to chronically wet houses, which are linked to an increase in respiratory problems and other illnesses. Urban flooding also has significant economic implications for affected neighborhoods. In the United States, industry experts estimate that wet basements can lower property values by 10%–25% and are cited among the top reasons for not purchasing a home.] According to the U.S. Federal Emergency Management Agency (FEMA), almost 40% of small businesses never reopen their doors following a flooding disaster. In the United States, insurance is available against flood damage to both homes and businesses.

**Some benefits of floods:**

Floods (in particular more frequent or smaller floods) can also bring many benefits, such as recharging ground water, making soil more fertile and increasing nutrients in some soils. Flood waters provide much needed water resources in arid and semi-arid regions where precipitation can be very unevenly distributed throughout the year and kills pests in the farming land. Freshwater floods particularly play an important role in maintaining ecosystems in river corridors and are a key factor in maintaining floodplain biodiversity. Flooding can spread nutrients to lakes and rivers, which can lead to increased biomass and improved fisheries for a few years.

For some fish species, an inundated floodplain may form a highly suitable location for spawning with few predators and enhanced levels of nutrients or food. Fish, such as the weather fish, make use of floods in order to reach new habitats. Bird populations may also profit from the boost in food production caused by flooding.

Periodic flooding was essential to the well-being of ancient communities along the Tigris-Euphrates Rivers, the Nile River, the Indus River, the Ganges and the Yellow River among others. The viability of hydropower, a renewable source of energy, is also higher in flood prone regions.

**Solution – Mitigation & Rehabilitation:**

The solution to the problem of recurrent floods lies in mitigation and rehabilitation measures. Some of the important measures are given below:

i. Mapping of the flood prone areas is a primary step involved in reducing the risk of the region. Historical records give the indication of the flood inundation areas and the period of occurrence and the extent of the coverage.

ii. Land use control will reduce danger of life and property when waters inundate the flood plains and the coastal areas.

iii. The number of casualties is related to the population in the area at risk. Hence, in areas where people already have built their settlements, measures should be taken to relocate to better sites so as to reduce vulnerability.

iv. No major development should be permitted in the areas which are subjected to high flooding. Important facilities like hospitals, schools should be built in safe areas. In urban areas, water holding areas can be created like ponds, lakes or low-lying areas.

v. The buildings should be constructed on an elevated area. If necessary build on stilts or platform.

vi. The amount of runoff can be decreased with the help of reforestation, protection of vegetation, clearing of debris from streams and other water holding areas, conservation of ponds and lakes etc.

vii. Flood diversion measures like construction of levees, embankments and dams should be undertaken.

**Conclusion:**

As per an estimate, 12% of India’s land is prone to floods. As per the Central Water Commission (CWC), floods resulted in a loss of 0.86% of the total GDP in the 1970s and 1980s. However, in the present decade, this share has come down to 0.1% of the GDP. Taking into account the growing size of the economy, still, the loss is huge. Hence the administration should take concrete measures on a long term basis to tame the menace of recurrent floods.

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