



## Decoding Urban Flooding

This editorial is based on [“Number Theory: Behind the systemic roots of urban flooding in India”](#) which was published in Hindustan Times on 07/09/2022. It talks about Urban Flooding in India and related challenges.

**For Prelims:** Urban Flooding, Climate Change, Urban Heat island, Riverbank Erosion, Blue Green Infrastructure, Rainwater Harvesting, Bioswales

**For Mains:** Causes of Urban Flooding in India, Mitigation Measures for Urban Flooding

As India reaches the tipping point of **transitioning from a mostly rural to an urban society**, [Urbanisation](#) is intrinsic to development and often serves as a major driver of economic growth. By **2030**, 40.76% of the country's population is expected to reside in urban areas.

However, Urban planning machinery has not evolved at the pace of urbanisation and technological advancements. **Unplanned development** and [climate change](#) are driving many tragic events, including [urban flooding](#), requiring serious attention.

In the **2020 floods in Hyderabad**, thousands of houses were submerged. The **2015 Chennai flood** is a stark reminder of how rapid urbanisation is making cities prone to urban floods. And most recently, **Bengaluru has been the site of many such flooding incidents** during this [monsoon](#) season.

### What is Urban Flooding?

- Urban flooding is the **inundation of land or property in a built environment**, particularly in **more densely populated areas (like cities)**, caused by rainfall overwhelming the capacity of drainage systems.
- Unlike [rural floods](#) (**Heavy rain over a flat or low-lying area**), urban flooding is not only caused by just higher precipitation but also unplanned urbanisation (catchments) that:
  - increases the flood **peaks from 1.8 to 8 times**
  - increases the flood **volumes by up to 6 times**.

### What are the Causes of Urban Flooding in India?

- **Encroachments on Drainage Channels:** In Indian cities and towns, due to **increased land prices** and **less availability of land** in the city centre. New developments are coming up in low-lying areas, usually as [encroachments over lakes](#), [wetlands](#) and [riverbeds](#).
  - Ideally, the natural drains should have been widened (**similar to road widening for increased traffic**) to accommodate the higher flows of stormwater.
    - But on the contrary, **there have been large scale encroachments without**

**widening the natural drains.** Consequently, the capacity of the natural drains has decreased, **resulting in flooding.**

- **Climate Change:** Exacerbated by changing climate, resulting in extreme events. The [climate change](#) has caused an increase in the frequency of short duration heavy rainfall leading to higher water run-off.
  - **NASA** studies indicate that the [urban heat island](#) effect also results in increased rainfall over urban areas that in turn leads to flooding.
    - Whenever the rain bearing clouds pass over the urban heat island, **the hot air pushes the clouds up, resulting in highly localised rainfall** which may sometimes be of high intensity.
- **Unplanned Tourism Activities:** Water bodies have been used as an attraction for [tourism](#) development for decades. Water plants that reduce the [runoff speed](#) are being removed from rivers and lakes for maintaining tourism activity.
  - Throwing [non-bio degradable matter](#) into the rivers and lakes during religious and cultural activities reduces the water quality. In the event of floods, the **suspended particles and pollutants** overflow into the cities posing health risks.
    - **Example:** Ashtamudi Lake in Kollam, Kerala polluted from [oil spillage](#) from boats.
- **Uninformed Release of Water from Dams:** Unplanned and [sudden release of water from dams](#) and lakes lead to floods in an urban area, without giving the public enough time to respond.
  - **Example: Chennai Floods 2015** due to release of water from Chembarambakkam Lake.
- **Illegal Mining Activities:** Illegal [mining](#) of river sand and quartzite for use in building construction **deplete the natural bed of the rivers and lakes.**
  - It causes **soil erosion** and **reduces the water retention capacity** of the waterbody increasing the speed and scale of water flow.
  - **Example:** Jaisamand Lake- Jodhpur, Cauvery river- Tamil Nadu.

## What are the Impacts of Urban Flooding?

- **Loss of Life and Property:** Urban floods are often associated with loss of life and physical injury either directly due to the effect of floods or indirectly due to **infections by water-borne diseases spreading during the inundated period.**
  - Urban flooding has localised impacts like structural damage to buildings, property, crops. Besides, it causes disruptions of **water supply, sewerage, power and transmission lines, communication,** traffic- road and railways and other infrastructure.
- **Ecological Impacts:** Trees and plants are washed away during extreme flood events and [riverbank erosion](#) is caused by high-speed flood water.
- **Impact on Animal and Human Health: Stagnation of stormwater** in the localities, and [contamination of consumable water](#) leads to various health problems resulting in plagues/epidemics.
  - The [sewage and solid waste](#) washing into houses and neighbourhoods also causes a variety of diseases to spread.
- **Psychological Impacts:** Loss of shelter and relatives creates emotional turmoil in the mental health of the stranded. The **recovery process in case of such incidents is a tiresome process** and time consuming that often leads to long lasting **psychological trauma.**

## What Should be the Way Forward?

- **Developing Blue Green Infrastructure:** [Blue Green Infrastructure](#) is an effective way of providing a sustainable natural solution to urban and climatic challenges.
  - **Water management and robust infrastructure development** should be emphasised equally, in order to create more pleasant, less stressful living environments.
  - Also, ensuring every building in the city shall have [Rainwater Harvesting](#) as an integral component of the building utility
    - **Blue** indicates water bodies such as rivers and tanks
    - **Green** indicates trees, parks, and gardens.
- **Flood vulnerability Mapping: Identification of the vulnerable areas** can be done by analysing topography and historical data of inundations at city level.
  - Maintaining **a record of all the water bodies** and wetlands at city and village levels is equally important for **flood- avoidance, tolerance and resilience.**

- **Effective Water-Shed Management: Construction of flood walls**, raised platforms along flood prone river basins, timely cleaning and **deepening of drainage channels** should be **taken up along the whole river basin instead of just the urban areas.**
  - **Bioswales** can be made along roadsides so that rainwater from the road flows towards them and percolates into the ground.
  - Also, **catchment areas** of water bodies need to be maintained well and should be **free from encroachment and pollution**, thus keeping the course of water free from obstructions.
- **Disaster Resilient Public Utility:** Public facilities like **hospitals and schools** and basic services such as **food, water, health and sanitation** should be made disaster resilient.
  - They should be located or relocated such that they are able to function without hindrance during inundations.
- **Sensitization and Rehabilitation:** Awareness should be created about flood preparedness and mitigation measures along with **response drills.**
  - **Educating residents** on the risks involved in illegal constructions along drains and water bodies is necessary. The government should also consider **relocation of the poor to other areas.**
- **Institutional Arrangements** - It is essential to form a **unified flood control implementing agency** at city level, which will include **city administrative officials, doctors, police, firefighters, NGOs**, and other emergency services providers.

### ***Drishti Mains Question***

India's urban planning machinery has not evolved at the rate of urbanisation. Provide appropriate arguments to support the statement.

## **UPSC Civil Services Examination, Previous Year Questions (PYQ)**

### **Prelims**

**Q. La Nina is suspected to have caused recent floods in Australia. How is La Nina different from El Nino? (2011)**

1. La Nina is characterised by an usually cold ocean temperature in the equatorial Indian Ocean whereas El Nino is characterised by unusually warm ocean temperature in the equatorial Pacific Ocean.
2. El Nino has an adverse effect on the south-west monsoon of India but La Nina has no effect on the monsoon climate.

**Which of the statements given above is/are correct?**

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

**Ans: (d)**

### **Mains**

**Q. With reference to the National Disaster Management Authority (NDMA) guidelines, discuss the measures to be adopted to mitigate the impact of recent incidents of cloudbursts in many places of Uttarakhand. (2016)**

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