

## Urban Flooding

### Why in news?

Due to climate change, urban population growth there has been increase in the urban flooding.

### What is urban flooding?

- The flooding of land or property in a built environment, especially in densely populated cities where rainfall exceeds capacity of drainage system is known as urban flooding.
- It is a *man-made disaster* which is caused not only by higher precipitation but also by unplanned urbanization.
- Urban flooding is significantly different from rural flooding as urbanization leads to developed catchments, which increases the
  - Flood peaks from 1.8 to 8 times and
  - Flood volumes by up to 6 times

### What is the status of urban flooding in India?

- There has been an *increasing trend of urban flood disasters* in India over the past several years whereby major cities in India have been severely affected.
- **Special feature in India**
  - Heavy rainfall during monsoons
  - Storm surge affect coastal cities/ towns
  - Urban heat island due to global warming
  - Sea surge increase the level of sea in coastal cities

| Urban flooding in India | Reasons  |
|-------------------------|--|
| 2015 Chennai flood      | Floodplain encroachment                        |
| 2020 Hyderabad flood    | Depression and flash flood                     |
| 2022 Bengaluru flood    | Poor urban management                          |
| 2023 Delhi flood        | Prolonged rainfall and floodplain encroachment |

*As per Ministry of Housing and Urban Affairs India will have 50% urban population by the end of 2050, so India must adopt sustainable practices to cope up the pressure.*

### What are the causes of urban flooding?

- **Hydrological factors-** It is caused by change in river course, presence of high tide

and synchronisation of runoffs of various parts of watershed.

- **Urban heat island-** It resulted in increase in rainfall leads to flash flood which is a cause of concern in low lying areas and urban cities where the damage inflicted is huge.
- **Sea surge-** Storm surge due to tropical cyclones causes sea water to overflow into cities nearby coastal regions.
  - *As per the Intergovernmental Panel on Climate Change (IPCC), it is estimated that before 2030, large parts of Kolkata could face immense flooding, causing the city to submerge.*
- **Concretisation-** Building huge structures in urban areas leads to insufficient drainage infrastructure leading to urban flooding.
  - Example- 2021 Chennai flood.
- **Pluvial flooding-** It is a rain-driven flooding that results from the excess of natural or engineered drainage capacity.
- **Deforestation-** Trees act like a sponge that helps to hold soil.
- As trees are being cut down at a fast pace to make way for urbanisation to grow, more water runs towards a river during heavy rainfall and causes flood.
- **Floodplain encroachment-** This reduces the water carrying capacity of rivers which is brought from upper catchment areas and cause flooding.
  - One of the reasons for *2015 Chennai floods* is floodplain encroachment.
- **Drainage systems** - Stormwater drainage systems in the past were designed for rainfall intensity of 12 - 20 mm.
- These capacities have been getting very easily overwhelmed whenever rainfall of higher intensity has been experienced.
- **Unplanned release of water from dam-** Kerala flood in 2018 is due to prolonged rainfall accompanied by unplanned release of water from Idukki dam.
- **Climate change** - Influence of urban microclimate and climate change are other factors.

*Urban flooding is the highest reported climate hazard facing C40 cities with 92% of C40 cities experiencing flash or surface flooding due to rainfall or riverine flooding.*

### **What are the consequences of urban flooding?**

- **Loss of life and property** - Urban area has high population density and huge infrastructure.
- Every year, millions of people become homeless and washed away due to floods.
- **Disruption of Communication-** Flood causes damage to transportation links such as bridges, rail, power plants etc., thus causing communication disruption in those areas.
- **Economic and Social Disruption-** Urban area is the key centre for economic activity, the economy comes to a standstill as people are forced to move to another place.
- **Hygiene-** Detoriation of water quality which would result in the spread of communicable disease and water borne diseases.
- **Epidemics-** Waterborne diseases (cholera, typhoid fever, hepatitis) and vector-borne

diseases (dengue, malaria) are caused due to floods.

| International Practices to Mitigate Urban Flooding |   |
|--|---|
| Country  | Best practices  |
| South Africa                                       | Water Sensitive Urban Design and Sustainable Drainage Systems   |
| China  | Sponge city initiative to reduce flood and enhance water supply security                                      |
| Rotterdam  | Raingardens and permeable pavements   |
| Dutch model  | The country is dotted with ponds, lakes, seaside parking garages and city plazas that double up water storage |

### What steps were taken to mitigate urban flooding?

- **NDMA** - After the Mumbai floods of 2005, NDMA has for the first time decided to address urban flooding as a separate disaster, delinking it from floods.
- **Atal Mission for Rejuvenation of Urban Transformation (AMRUT)**- It is an initiative to provide basic civic amenities to the urban areas to improve the quality of life.
- **Smart Cities Mission**- It is initiated to drive economic growth and improve the quality of life of people by enabling local development and harnessing technology as a means to create smart outcomes for citizens.
- **HRIDAY Misison**- National Heritage City Development and Augumentation Yojana which aims to conserve heritage, urban planning and increase the economic growth of the heritage cities.

### What lies ahead?

- **Legal Enforcement**- India should enforce laws to check on encroachment of lands in the urban areas.
- **Climate resilient structures**- It should be in line with ***SDG 11-Sustainable cities and communities***.
- **Proper drainage infrastructure**- Conduct monsoon audits regularly to mitigate the flood effects.
  - Tamil Nadu has appointed ***Tirupugazh Committee*** to recommend on flood mitigation.
- **Greening cities** -East Kolkata's wetlands have been an effective flood defence mechanism that help treat a large share of the city's sewage, produce half of the city's fresh vegetables.
- **Flood plain mapping**- It improves flood management response and helps the community to understand their flood risk.
- **Rain Water Harvesting (RWH)** - Adopt RWH in all infrastructure constructions to ensure better water management.
- **Bioswales**- It must be constructed for percolation of rainwater into the ground.
- **Blue-Green Infrastructure**- It uses infrastructure, ecological restoration, and urban design to connect people with nature to solve urban and climate problems.

## References

1. [Down to Earth| India's place in urban flooding](#)
2. [Down to Earth| Urban flooding management in cities](#)
3. [Down to Earth| North India urban flood](#)
4. [NDMA| Urban floods](#)

