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