Nature-based Solutions (NbS) for urban flooding

> ***Mains syllabus:*** *GS II- Urbanization, their problems, and their remedies ;GS III- Disaster and Disaster Management.*

Why in the News?

Recent increase in disruptive urban flooding including 2024 Bengaluru floods prompts to explore opportunities about nature-based solutions in controlling urban flooding

What is urban flooding?

- **Definition** - United Nations (UN) defines urban floods as the *inundation of land or property in a built environment*, particularly in densely populated areas, caused by rainfall exceeding the capacity of drainage systems.
- **Causes**
  - Systemic gaps in planning, land use, and infrastructure management.
  - Prioritising efficient stormwater drainage rather than local water retention or recharge.
  - Extensive concretisation of stormwater drains.
  - Reduced natural water-holding capacity of the stormwater drains and water bodies.
  - Encroachment of water bodies and stormwater channels.
  - Climate change and erratic monsoons.
- **Consequences –** It leads to widespread *waterlogging and traffic congestion,* thereby severely affecting daily mobility.
- It also results in *temporary road closures* across the city.

Recent urban floods in India	
2015	Chennai
2020	Mumbai
2020	Hyderabad
2023	Delhi
2024	Bengaluru

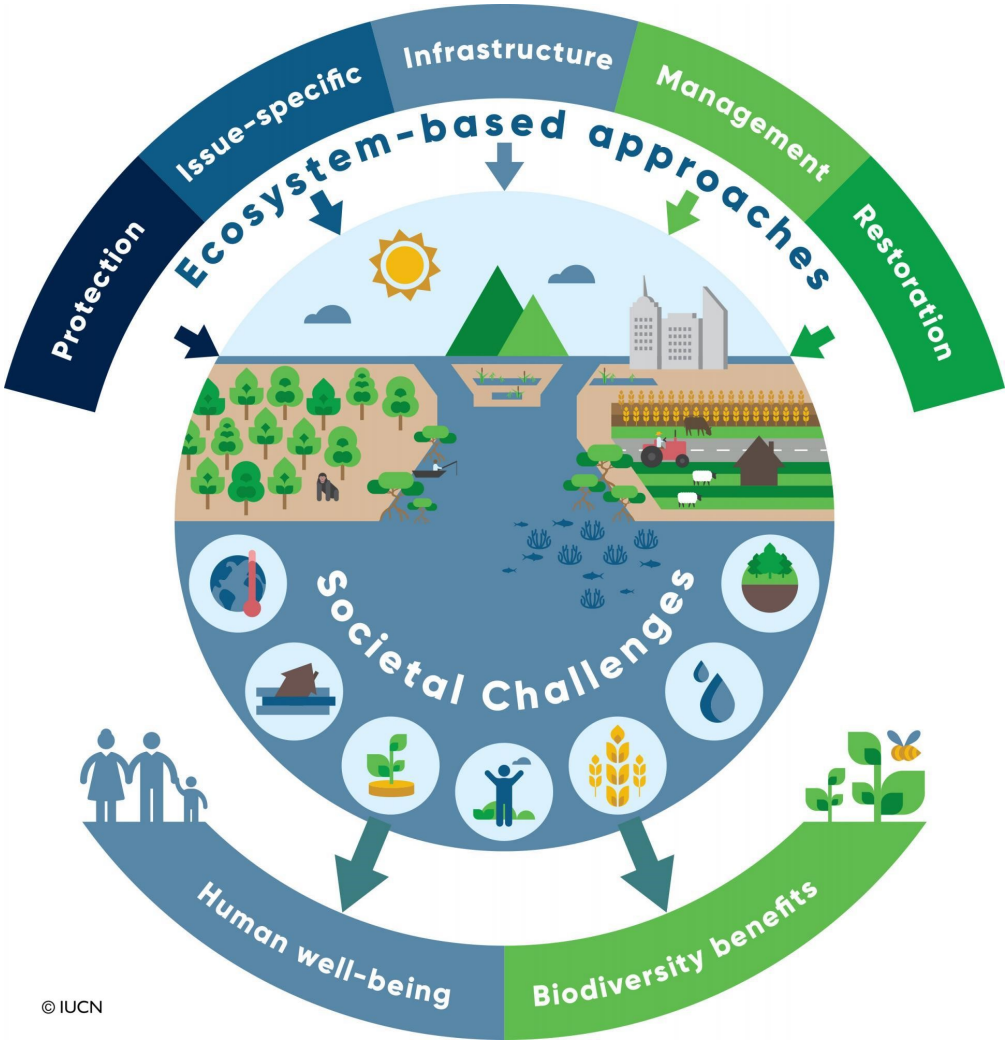
- **Vulnerable cities -** Mumbai, Chennai, and Kolkata, are situated along the coast,

making them vulnerable to both sea level rise and land subsidence.

To know more about urban flooding, click here

What is Nature-based Solutions (NbS)?

- **Definition –** They are actions to *protect, conserve, restore, and sustainably use and manage ecosystems* in a way that addresses social, economic, and environmental challenges while simultaneously benefiting human well-being and biodiversity.
    - **For example**, Renewable energy, Beekeeping, Ecotourism, Agroforestry are some examples of nature-based solutions.
- **Global support** – The design, implementation, and evaluation of Nature-based Solutions are supported ***by the IUCN Global Standard for Nature-based Solutions.***
- The Global Standard helps users shape their solutions and make them truly effective through 8 criteria and 28 indicators, supported by guiding questions.
- **Importance** – They target major challenges like climate change, disaster risk reduction, food and water security, biodiversity loss and human health, and are critical to sustainable development.
- **Benefits –** It can *support biodiversity, enhance groundwater recharge, mitigate urban heat,* and create opportunities for local employment and community stewardship.
- **Challenges**
    - Absence of standardised design frameworks
    - Limited documentation of long-term impacts
    - A disconnect between pilot initiatives and citywide planning or investment decisions.



MGNREGS (Mahatma Gandhi National Rural Employment Guarantee Scheme) of India is a major contributor to global Nature-based Solutions, says report released at COP16 in Riyadh. MGNREGS fosters sustainable development, promotes environmental conservation and social inclusion in rural areas.

How it can be used for controlling urban flooding?

- NbS approach will *help the city manage stormwater more sustainably*, while also contributing to water security and climate resilience.
- It also guide the strategic integration of green and blue infrastructure within the existing urban area, *optimising flood resilience* without requiring large-scale redevelopment.
- **Developing green infrastructure** – It includes initiatives like like *rain gardens, wetlands, bioswales, green roofs,* and permeable pavements
- **Creating sponge cities** – They are the cities that uses green infrastructure to absorb and purify rainwater, reducing flood risks and improving urban quality.
    - Guangming District in China incorporated Nature-based solutions interventions, which have resulted in a 72% annual runoff control rate and a 62% reduction in diffuse pollution.
- It also involves decentralised green infrastructure, *improvements to water and wastewater systems*, and active community engagement.

NbS based Urban Flooding Control in Bengaluru
• **Existing potential** – It has more *parks and playgrounds* which can act as water retention geographical feature. • Many apartment complexes and educational institutions also contain *green spaces* that could be repurposed or enhanced *for stormwater retention*. • These existing assets offer a strong foundation for redesigning how the city absorbs and manages runoff.

> *Bengaluru is known as the "**Garden City**," because it has more than 1,100 parks and over 250 playgrounds.*

What lies ahead?

- A practical way forward would involve piloting studies coupled with monitoring and evaluation.
- Integrating these findings into municipal planning frameworks that are supported by cross-departmental coordination.
- Developing hydrological modelling to simulate different rainfall scenarios and determine the types, scales, and locations of NbS needed to reduce flood inundation and water depth.
- Targeted funding will be critical for moving beyond demonstration projects toward systemic change

Reference

The Hindu | Nature Based Solution for Mitigating Urban floods