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Q17

Major cities of India are becoming vulnerable to flood conditions. Discuss.

UPSC Civil Services Mains 2016 · GS I · 12 marks · Geophysical Phenomena

Important Geophysical phenomena such as earthquakes, tsunami, volcanic activity, cyclone etc., geographical features and their location-changes in critical geographical features (including water-bodies and ice-caps) and in flora and fauna and the effects of such changes.

Core demand of the question

- Discuss why major Indian cities are growing more vulnerable to floods
- Cover rainfall, drainage, encroachment, and climate, with city examples

Revision summary

Metros flood after short, intense rain because drains and storage have not kept up.

Mumbai 2005, Srinagar 2014, and Chennai 2015 showed coastal, river, and marsh failures.

Filled lakes, paved catchments, and garbage in nallas manufacture the flood.

Climate change and sea level add a further load on coasts.

Mitigation is wetland revival, drain capacity, zoning, and ward-level warning.

Introduction

Indian metros now flood after a few hours of hard rain, not only after a river in spate. **Mumbai (2005), Srinagar (2014), Chennai (2015)**, and later bouts in Bengaluru, Hyderabad, and Delhi show that the city itself has become a floodplain of concrete and blocked drains.

Body

Hydro-climatic pressure

- **Many large cities sit on coasts, deltas, or river terraces:** Mumbai, Chennai, Kolkata, Kochi, and parts of Surat are exposed to the sea, the tide, and cyclone rain.
- Monsoon bursts and cloudbursts now often dump a large share of monthly rain in a day, which older storm drains were not sized to carry.
- Climate change raises the chance of extreme rain and, on the coast, of higher sea levels and storm surge that hold river water back.
- Himalayan and foothill cities such as Srinagar and parts of Guwahati face river floods plus slope debris that chokes channels.

Urban form that creates the flood

- Lakes, tanks, wetlands, and floodplains have been filled for housing and IT parks; Chennai's Pallikaranai marsh and Bengaluru's tank chain are textbook losses of storage.
- Natural drains (nullahs, nallas) are narrowed, covered, or used as sewer lines, so peak flow has nowhere to go.

- Paved catchments and high-rise plots raise **runoff coefficient**; rain that once soaked laterite or alluvium now hits the road in minutes.
- Solid waste and construction debris sit in drains; a blocked grill turns a 50 mm shower into a street river.
- Informal housing on riverbanks and nala edges puts the poorest in the deepest water and also squeezes the channel.

Governance and infrastructure gaps

- Storm water and sewage are mixed in many wards, so a flood is also a health event.
- Municipal maps of micro-drains are incomplete; pumping stations fail when power or maintenance fails, as Mumbai's Mithi story after 2005 showed.
- Upstream dams and barrages, if operated without city warning, can worsen a downstream urban flood.
- Insurance, early warning, and last-mile alerts still miss slum pockets even when the IMD issues a red warning.

Why 'major cities' in particular

- High population density means the same water depth harms more lives and more GDP in a few hours.
- Underground metros, flyovers, and basements add new traps for water that old towns did not have.
- Peri-urban sprawl beyond municipal limits grows faster than drainage plans, so the flood starts in the suburb and enters the core.

What discussion should recommend

- Restore tanks and wetlands as infrastructure, desilt and widen primary drains, and separate storm water from sewage.
- Enforce floodplain and tank-bed zoning; stop regularisation of marsh fill.
- Design roads as temporary channels with safe ponding parks, and keep pumping and power backup for the lowest wards.
- Link IMD nowcasts to ward-level sirens and to the urban poor, not only to television.

Way forward for the answer

- Argue that vulnerability is extreme rain plus a sealed, encroached city, illustrated by Mumbai, Chennai, Srinagar, and Bengaluru.

Flow diagram

Extreme monsoon rain -> Urban flood
Paving wetland fill -> Urban flood
Choked mixed drains -> Urban flood
Coast river siting climate -> Urban flood
Restore tanks desilt warn -> Lower vulnerability

Conclusion

Major Indian cities are flood-vulnerable because extreme rain now hits a paved, encroached, and poorly drained urban basin. Wetland loss, choked nalas, mixed sewage, and coastal or river siting turn a monsoon burst into a metropolitan disaster.

Facts & figures

Mumbai floods, 2005

Record rain and the choked Mithi river that became a national marker of urban flood risk.

Chennai floods, 2015

Reservoir release plus loss of marshes and tanks that drowned a coastal metro.

Srinagar floods, 2014

Jhelum overflow in a Himalayan city where floodways and wetlands had been squeezed.

Runoff coefficient

Share of rain that becomes immediate flow; it rises as cities pave soil and fill tanks.

IMD nowcast

Short-range rainfall warning that cities must turn into ward action to cut flood deaths.

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