

# Frequent Floods: Causes and Remedial Measures

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Floods in an urbanised landscape refer to the partial or complete inundation from the rapid accumulation or run-off resulting in the damage to property and loss of biotic elements (including humans). Urban flooding is a consequence of increased impermeable catchments resulting in higher catchment yield in a shorter duration and flood peaks sometimes reach up to three times.

Thus, flooding occurs quickly due to faster flow times (in a matter of minutes). Causal factors include combinations of loss of pervious area in urbanising landscapes, inadequate drainage systems, blockade due to indiscriminate disposal of solid waste and building debris, encroachment of storm water drains, loss of inter connectivity among lakes, housing in floodplains and natural drainage and loss of natural flood-storage sites. Flood mitigation in urban landscape entails integrated ecological approaches combining the watershed land-use planning with the regional development planning. This includes engineering measures and flood preparedness with the understanding of ecological and hydrological functions of the landscape.

Bengaluru is experiencing unprecedented urbanisation and sprawl in recent times due to concentrated developmental activities with impetus on industrialisation for the economic development of the region.

This concentrated growth has resulted in the increase in population and consequent pressure on infrastructure, natural resources and ultimately giving rise to many serious challenges such as climate change, enhanced green-house gases emissions, lack of appropriate infrastructure, traffic congestion, and lack of basic amenities (electricity, water, and sanitation) in many localities, etc.

It has been understood that there has been a growth of 1028% in urban areas of Greater Bengaluru across 45 years (1973 to 2017). Urban heat island phenomenon is evident from large number of localities with higher local temperatures.

A study unravelled that the pattern of growth in Greater Bengaluru and its implication on local climate (an increase of ~2 to 2.5 °C during the last decade) and also on the natural resources (88% decline in vegetation cover and 79% decline in water bodies), necessitating appropriate strategies for the sustainable management.

Frequent flooding (since 2000, even during normal rainfall) in Bengaluru is a consequence of the increase in impervious area with the high-density urban development in the catchment and loss of wetlands and vegetation.

This is coupled with narrow-



ing and concretising storm water drains, lack of appropriate drainage maintenance works with the changes in enhanced run-offs, the encroachment and filling in the floodplain on the waterways, obstruction by the sewer pipes and manholes and relevant structures, deposits of building materials and solid wastes with subsequent blockage of the system and also flow restrictions from under capacity road crossings (bridge and culverts).

The lack of planning and enforcement has resulted in significant narrowing of the waterways and filling in of the floodplain by illegal developments. Causal factors and remedial measures to mitigate impacts of flooding are:

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## Reasons

- Loss of interconnectivity among lakes due to encroachment of drains or dumping of solid wastes, Construction and Demolition (C & D) wastes
- Encroachment of flood plains and wetlands (construction in valley zones, flood plains and lake bed) and de-notifying lakes (under the guise of 'dead lakes'—no lake can be dead as it does the job of ground water recharge)
- Narrowing and concretising storm water drains impairing hydrological functions of the natural drains
- Loss of pervious areas—reduction of open spaces, wetlands and vegetation cover

## Solutions

- Ecological Management of Storm Water Drains and Wetlands to Mitigate Frequent Flooding in Bengaluru
- Re-establish interconnectivity among lakes by removing all blockades (encroachments, solid waste dumping)
  - Protect Valley zones and Buffer regions of wetlands; protect valley zones considering ecological function and these regions are 'No Development Zones' as per CDP 2005, 2015
  - Stop narrowing and concretising natural drains
  - Vegetation in the drain takes the load during peak monsoon, there is no need to concretise

the channel.

- Vegetation allows groundwater recharge while treating the water (bioremediation);
- Drains with vegetation without any bottlenecks (hindrances) would be the best option to mitigate floods.
- Narrowing channel and concretizing would only increase the quantum of water and velocity, which would be disastrous.
- Objective should be towards mitigation of floods and not to generate high overland flows (with increased quantum and flow velocity)

### Decongest Bangalore

- Shift major installations to other cities in Karnataka
- Stop further industrialisation and commercial establishments

in Bengaluru.

- Protect open spaces—lakes, parks, etc.
- Stop further growth of dying city—with water and oxygen scarcity
- BWSSB should stop issuing senselessly NOC (no objection certificate) to major building projects as there is not sufficient water in the city
- Environment clearance as per the norms of Environment Protection Act (2016), Wetlands (Conservation and Management) Rules, 2016, SWM 2016, C&D Wastes, 2016, Air act 1981, Water (Prevention of Pollution) Act, 1974.

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## CASE STUDY

Case study of select drains in the Kaikondanahalli Lake catchment, highlights the implications of narrowing and concretising storm water drains and the need for sensible interventions.

- Drains (trapezoidal) are to be designed in the city to optimise natural hydrological principles;
- No concretization of drain bed—natural bed (soil) would help in (i) retarding velocity, (ii) infiltration—recharge of ground water resources. This would help in mitigating floods. Soil also acts as membrane and aids in remediation, preventing the contamination of ground water resources
- Concretisation of storm water drain would increase the quantity of water flow (due to absence of infiltration) and enhances water velocity (10-12 times). This would certainly increase the city's flooding vulnerability with high intense rainfall coupled with the increase in paved surfaces (78% of Bengaluru land surface is paved!). Consequent of this would be higher instances of flooding with the damages to the property and human life
- Let the drain walls be either stone pitched (for structural stability) or turfed with grasses depending on the location
- Chain link fences to prevent un-authorised occupation of drains and also dumping of wastes
- Evolve appropriate policy

mechanisms to make dumping of solid waste, construction and demolition waste in the drains and lakebed cognizable and non-bailable offence

- Make drain and lakebed encroachments as cognizable and non-bailable offence and imprisonment of 12 months
- Need to move away from contractor with consultant driven design to maximise individual gains (through cement concretization etc.)

# Importance of an Effective Storm Drain Management System

Storm drains are known to be an extremely important component of a drainage system. They are especially effective to drain out any surplus water that starts to accumulate during any particular weather conditions such as excessive rainfall. It is important to have an effective storm drain management system, and it comes with its own benefits.

## It limits repair costs and maintains the quality of water

A storm drain that is well cleaned works well in lowering the pollution level in your property. Most homeowners believe that their storm drains are connected internally to the local, sewer treatment system. However, this is not true. In most neighborhoods, storm drains are directed to a water body like a stream or a lake that may be located close by.

These water bodies, most often, are the source of water that is supplied to the neighborhood. If the storm water is contaminated, it could hamper the quality of the water quite a bit. But if a storm drain is cleaned frequently, this crisis can be averted.

Contaminated water supply can be a healthcare issue and also ruin the quality of garden soil. In addition to that, water that is contaminated has a high level of chemical residues which has been known to affect the supply pipes of homes, causing unnecessary costs in terms of plumbing repairs.

## It stops private property from suffering any structural damage

If a storm drain is clogged with debris, it fails to perform optimally. This clogging normally takes place when the debris is

washed along with the storm water. When clogged or flooded storm drains accumulate water, this water tends to become directed towards the basement or foundation of the home in question.

When the basement of a home gets flooded, it leads to moisture seepage, which eventually ends up extending into the dry walls. This in turn causes the growth of mildew and mold within the lower slabs of the foundation, a condition which is particularly difficult to access and clean on a regular basis. Therefore, to keep concrete-based repair costs and plumbing costs at a minimum, it is important to keep storm drains clean and unclogged.

## It prevents homeowners from having to waste money on fines and tickets

If your storm drains are clogged, it can lead to the clogging and choking of other storm drains along the same street you live in. This could lead to severe damage to the landscape and the neighborhood, such as garden soil erosion, mixing regular water supply with the storm water, thereby contaminating it, and more. This localized flooding can lead to several civic penalties for a homeowner.

## It stops harmful odors and gases from building up

Usually, there is some form of organic waste content in storm water, especially when storm drains are located close to homes with gardens, and homeowners haven't bothered to keep the drain away from the shredded vegetation. There are fertilizers used in gardens which is deposited into the storm drains, resulting in harmful gases when this gas decomposes.

