

Shrinking Waterbodies and Urban Flooding in Gurugram

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Water is the basis of civilization. Throughout history, it has been seen that people settled near water bodies to fulfill their basic needs. Being rich in topographic and geographic variability, India has several waterbodies in the form of lakes, streams, ponds, reservoirs, wetlands, and many more. These water bodies not only store water for survival but also support meeting challenges associated with water-related disasters including climate change. Besides meeting the needs of their residents, the natural and artificially developed water bodies also regulate the stormwater, sustain baseflows, and control flooding. Being rich in culture, Indians have always given due weightage to water bodies by worshipping them and showing their association with water in festivals like “Chatt Pooja”. The baseflow of the 10 largest rivers of Asia is sustained by the Wetlands of the Himalayas. Udaipur, the city of lakes, has developed several waterbodies to collect water from the arid landscape. The lakes in Raipur harvest the rainwater. The Deeper Beel and Sola Beel, lakes of Assam, act as a buffer to accommodate the water of the Brahmaputra river against hydrological extremes.

Waterbodies also enrich the flora and fauna, support to replenish groundwater recharge, improve water quality, and promote biodiversity. Besides, they are also used for agriculture, aquaculture, treating wastewater, promoting recreational opportunities, and generating an economy through tourism.

Considering the fast-growing population and rampant unplanned urbanization, the loss of water bodies has become a crucial challenge, and conservation and rejuvenation of water bodies, especially in urban areas, is the only solution. Even a small quantity of rain causes havoc in big cities like Mumbai, Gurugram, Hyderabad, and Chennai to a halt.

STATE OF URBAN WATER BODIES

In the past few decades, the number of urban water

bodies has declined steeply. In 2022, the Union Ministry of Jal Shakti mentioned that around 37,000 waterbodies are encroached across India. 60 percent of the wetlands and waterbodies of Delhi are now without water. The areas of Wular Lake and Dal Lake in Srinagar have been reduced by 40 percent. The famous Dipor beel of Guwahati has been choked on the edge of the lake with the garbage of the city. Most of the water bodies of Kolkata, out of 8700, are lost now. Out of 2857 water bodies of Hyderabad, most of them are encroached with concrete, sewage, and waste and are used as a dumping ground. The status of Chennai is also not good. Out of about 650 water bodies, the existing ones are less than 30. The lifeline of the city i.e. Chennai airport, is built on the floodplains of the river Adyar affected by floods and left shut down in 2023. According to a report submitted to NGT by the Gurugram administration, the district has lost 389 water bodies in the last 60 years. There are places where embankments have disconnected the waterbodies from the river.

WHY ARE WE SUFFERING?

There are many reasons responsible for the worsening situation. It has been seen that excessive human intervention and mindless construction for expanding economic activities have increased the water demand from finite water sources, and accommodating the growing population in the catchment areas has destroyed the waterbodies. Concretization of drains and a misdirected approach lead to an overload of drainage and sewerage systems, causing flooding on roads and societies. The absence of rainwater harvesting structures to percolate water for groundwater recharge is another hurdle. The situation has deteriorated with the entry of untreated sewage into water bodies. In a report, the National Green Tribunal mentioned that more than 60 percent of the sewage of urban India enters into water bodies. In the absence of legal identification and protection, the

drainage channels are encroached by development in the city and subjected to garbage dumping and wastewater.

ABOUT GURUGRAM

Widely known as Millennium City, Gurugram is a tier-2 satellite city of Delhi situated near the Delhi-Haryana border and is a part of the National Capital Region of India. As of the 2011 census, Gurgaon had a population of 876,969. It is also known for being India's second- largest information technology hub, largest civil aviation hub, largest hospitality hub, and second-largest management consulting hub. It also stands at the 8th position in the country in terms of total wealth and accounts for almost 70% of the total annual economic investments in Haryana state.

The district comprises hills on the one hand and depressions on the other, forming an irregular and diverse nature of topography. Two ridges, i.e. Firozpur Jhirka-Delhi ridge forms the western boundary and the Delhi ridge forms the eastern boundary of the district. These hills are a northern continuation of the Aravalli hills. The north-western part of the district is covered with sand dunes lying in the westerly direction due to south-western winds.

The drainage pattern of the district is typical of the arid and semi-arid areas. It comprises large depressions and streams. The drainage is peculiarly complex owing to most of the streams tend to converge towards inland depressions instead of flowing into Yamuna. The important depression in the level of the district in this region is the Najafgarh Lake. Sabi and Indrori are two important seasonal streams of the district.

If we take a glance at the background of over 40-45 years of urban growth in Gurgaon city, the scenario is very different. Referring to the topographic sheets of the entire Gurgaon city area and also analyzing a Multi-Spectral Scanner satellite imagery of 1973 onwards, it was found that Gurgaon city was spread in a small area around its bus stand and civil lines, and the outer town had only agricultural fields and village settlements. On the eastern side, agricultural fields and natural streams came from the Aravalli hills. The Aravalli hills were the lifeline of Gurugram city, and these agriculture fields, through 5-6 streams, used to bring water during the rainy season. There were two or three streams in Nathupur, one in Sikandarpur, and a

couple in Wazirabad. There was the entire catchment area of Ghata Lake, which covered a 90 sq. km area and used to get water even from the Asola Wildlife Sanctuary. This lake was the major source of water in Gurgaon city.

FLOODS IN GURUGRAM

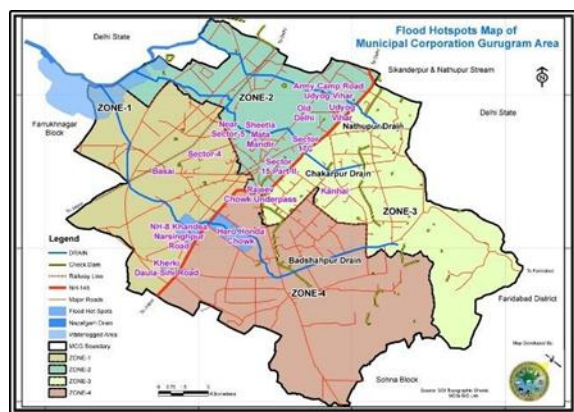
The occurrence of floods in Gurugram is directly linked with the summer monsoon activity. The normal annual rainfall in Gurugram district is about 596 mm and the highest goes up to 650-700mm which spreads over 28 days. More than 77% of annual rainfall is received during the monsoon months. The southwest monsoon sets in the last week of June and withdraws towards the end of September and contributes about 85% of the annual rainfall. July and August are the wettest months. 15% of the annual rainfall occurs during the non-monsoon months in the wake of thunderstorms and western disturbances. Severe floods have taken place in the Gurugram basin notably in the year 1967 and consecutive years 1975-77 as well as 1995-96.

The main cause of floods can be attributed to the heterogeneous topography of the Gurugram district. It consists of hillocks, valleys, big and small land-locked depressions, and undulated terrain. Another interesting feature of the topography of the Gurugram is that no perennial river flows through it. However, there are a number of *Barsati Nallahs*/hill torrents, that crisscross the entire district.

During the last 25 years of urban development, i.e., with the uninterrupted construction of malls, high-rise buildings, flyovers, metro, etc., the natural channels of water flow are blocked. With heavy pressure on infrastructural development, almost all the natural drainage systems become defunct & encroached upon. Further, with the garbage disposal in the stormwater drains, the situation has worsened and choked the water-carrying capacity.

Therefore, nowadays Gurgaon doesn't face flash floods that were once generated by the Aravalli Hills or streams but the defunct streams and surface runoff from buildings and roads within the city area cause the flood-like situation in the city. During the monsoon season, the drainage system developed by civic bodies is unable to channel the rainwater. The artificial water

bodies were created to compensate for the encroachment of three water bodies named Gurgaon's Ghata jheel, Badshapur jheel, and Khandsa talab, which were linked to Najafgarh drain and ultimately linked to the Yamuna River, via natural water channels and drains do not handle the water that accumulates in low-lying areas and creates panic. Due to its physiography, climate, and urban conditions, most of the city areas, especially low-lying, pond areas and natural drain-obstructed areas, are prone to water logging, which ultimately leads to urban flooding. Unfortunately, the master plan of Gurugram was created after its development by a private developer, and the complete development of the city was done by builders in different patches, hence no record of stormwater drains was stored.



On 28 July 2016, with a rainfall of 48 millimeters in a short duration of 75 minutes, Gurgaon city was inundated with floods leading to a 25 km jam. It haunts the people of Gurugram about the mayhem caused by the floods which brought the metropolis to a standstill, forcing a large number of people to remain stranded on the roads for more than 16 hours.

Studies revealed that the main reason for this urban flooding was the concretisation of the Badshapur drain, which is the main stormwater drain in the city, and does not allow rainwater to seep into the ground. It is also mentioned that while considering the 1983 Gurugram gazetteer, the width of 28 kilometers of Badshapur drain was 45 meters, now claimed as 30 meters wide, but in the Khandsa stretch it has the chicken neck of 600 meters compromising its drainage capacity leading to overflowing on to the NH-8 and causing urban flooding. After the flood situation, a report was submitted to the Ministry of Urban Development, which mentioned that several points in

the Najafgarh drain were blocked by silt deposits raising the stream bed and affecting the natural flow of water at the junction of the two drains.

Inappropriately, in 2010, the riverine land of the Sabi River, which used to flow through Ghata, Gwal Pahadi, Behrampur, Maidwas, and Nangli, reaching Badshapur, was included in the R (residential) zone of the city's Master Plan 2025. The development agencies have replaced the river with a covered drain and a road running over it. The river, with a clear course till Pataudi railway station and thereafter spread into distributaries, used to soak water during monsoon showers, and in case of heavy rainfall, its course took the flow to Nazafgarh drain and then the Yamuna. Unfortunately, the only source of natural drainage was completely vanished by the land mafia and administration, and this covered drain proved to be inadequate to take a load of heavy rainfall connected with rapid urbanization and mad industrialization. Even the land of dry ponds was allocated to builders for the development of malls, high-rise buildings, and residential flats, leaving people to suffer for a long.

Infrastructural development in the catchment area of the drainage basin of Badshapur has increased the runoff generated from the region. In the absence of a proper rainwater drainage system, the city faced disrupted economic activity, miles-long gridlock of traffic, closure of schools, issued advisories to avoid movement in water-logged areas and threw normal life out of gear. It reflects the crippling life and shabby infrastructure posing a threat to investment destinations.

INTERVENTIONS

The land of justice and the state government have made various attempts to protect and revive water bodies and ensure the drainage of stormwater. However, due to poor enforcement of land use laws and failure of plans, the success rate is very low. In 2012, the Punjab & Haryana High Court banned groundwater usage for construction activity and NGT has reprimanded authorities for drain concretization. In 2019, the NGT directed the state to take steps for the proper maintenance and restoration of 123 water bodies which are owned by the state. It was also directed to undertake a study in the entire State of Haryana to identify water bodies, assign Unique Identification (UID) numbers, and initiate

steps for restoration.

After the Gurugram in 2016, the state government started working on three major initiatives to resolve the water logging with a budget of more than Rs. 1000 crore. This included widening the existing Badshapur stormwater drain at Khandsa, constructing another stormwater drain parallel to the Badshapur one, and forming a new agency to streamline the city's development work. The widening of the Badshapur drain was sanctioned in 2018 and is underway in constructing drains and wells along the Southern Peripheral Road and Dwarka Expressway. The construction of another stormwater drain is still in the conception phase. To streamline the city's development work, the Gurugram Metropolitan Development Authority was created in 2017, implementing the solutions with the construction of check dams and revival of water bodies in the Aravalis since 2020 to prevent water runoff, recharge the city's groundwater table and overcome the issues related to a standstill of Gurugram with every downpour. It also started working on desilting and cleaning the master drains, repairing the stormwater drain near sector 9A, building a drain network in sectors 68 to 80, 37 to 37D, and sector 112 to 115 along with redevelopment of the stormwater drain between Rezag La Chowk and Railway Culvert 47.

The Gurgaon Metropolitan Development Authority (GMDA) has mentioned in a report that restoration of 123 water bodies has also been started, which has been widened to improve 647 water bodies. It also mentions that 20% of the water bodies are at risk due to the discharge of untreated sewage, industrial effluents, or wastewater. The steps required for restoration would include preparation and implementation of catchment area treatment plants, setting up of green belt, wherever viable, setting up of biodiversity parks around the water bodies, and cleaning up of the garbage/debris.

SUGGESTIONS

Urban planning is of utmost importance. Restoration of the ecosystem within urban cities can provide the substructure to support sustainable urban water drainage and storage. Floodplains of urban waterbodies play a crucial role in absorbing the runoff during monsoons. But the city administration has not

given importance to them. There is no demarcation of flood zones, which leads to construction and encroachment in these low-lying areas.

There is a need to reconnect the larger catchment to the water bodies to accommodate higher flows during floods. With the support of the Public Private Partnership, the basin of the Najafgarh drain should be rejuvenated. It could also be developed as a lake that can be used for water recharging and other recreational activities and can also fulfil the water needs of Gurgaon and Delhi. It could be restored as a biodiversity habitat and created as a water-based landscape for public use.

Innovative approaches like sponge cities, wetland restoration, permeable roads and pavements, green roofs, and harvesting systems at all scales, should be given priority in urban areas. Conservation of water bodies is an important aspect of the management of urban flooding. With the citizen's participation, practicing proper water disposal, control of construction over natural water bodies, and the dumping of solid waste in waterbodies and in stormwater drains could be restricted. Rainwater harvesting systems, permeable pavements, and bio-swales can be introduced to improve the city's capacity for rainwater absorption and diversion to check waterlogging.

CONCLUSION

It has been seen that there is a close link between floods, stormwater drainage, solid waste management, sanitation, health, and roads. Urban flooding is a direct impact of unplanned urbanization, changes in land use, encroachment on water bodies, loss of green cover and concretization, lack of regulation on floodplains, and unpredictable rainfall patterns due to climate change. Heightened vulnerabilities to disaster risk upsurge with expanding population, development of unauthorized colonies at mass level, and environmental degradation.

It is important to develop climate-resilient infrastructure to improve the capacity to handle the crisis arising due to floods and climate change. We need to understand the holistic urban growth pattern to overcome the need for potable water and rejuvenate traditional water bodies for sustainable water resource management and green infrastructure-based solutions

to urban flooding. Studying the status of past and present waterbodies, the flow of rainwater and place drains, check-dams, embankments, and implementation of remedial measures for the areas badly affected by water logging is the need of the hour. Short-term measures are temporary. It is high time to prepare a strong long-term visionary document to take action. Clarity about the geography of the district, the movement of natural water flow, the status of water bodies, and the development of the area to accommodate population growth are some of them. We also need to design systems to help water percolate into the ground, including more and more rainwater harvesting structures to be constructed, since 90 percent of the rainwater of the average rainfall of 595 mm goes to waste. With the proper implementation of flood control measures, the issue of urban flooding can be mitigated and a more robust city can be developed for citizens.

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