

# Hyderabad- A failed floodproof city.

How the city gets ready to relieve the potential harm that future rains will bring is to be seen.

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Following heavy rains buildings and vehicles lie partially submerged in floodwater, in Hyderabad-Indian Express.

A 36-year-old woman's corpse was found at a sewage treatment plant. Later on, it was found out that she was swept away after slipping into an open manhole while descending from the pillion rider's seat on her husband's bike. The manhole covers were known to have been opened by the locals to allow the rainwater to flow faster and avoid flooding in their houses. The news of this event was horrifying as the rainfall on that day, the 15th of July 2005 in Hyderabad was only 5cm. (Chigurupati, 2008)

Since the beginning of history, to meet the daily needs of society and industry, civilizations have been established on the banks of the rivers and around water bodies. While this pattern changed over time due to the development of roadways and railways, we are constantly dependent on water.

Hyderabad, also used to be known as the “City of Lakes”, is one such city built on the banks of the River Musi. It is reported to be home to around 7000 water bodies, both natural and manmade.

Over time, Hyderabad has become vulnerable to floods due to the gradual destruction of a framework built by its erstwhile Nizam rulers to make the city "flood-proof".The flood of 1908, during which raging waters from the Musi river claimed 15,000 lives, spurred this initiative. (Sadam, 2020)

To begin with, a century ago in September 1908, a tropical storm in the Bay of Bengal produced heavy rains which then moved inland creating cloudbursts on the upstream of Hyderabad. As a result, the city experienced disastrous floods due to the overflowing of the Musi river. About 430mm of rainfall was recorded within a day and the water level reached around 3m in several places. (Cohen, 2011)

After the flood, the Hyderabad Government set a course of action for a series of changes to prevent a further disaster. They appointed M.Visvesvaraya, the then Dewan of Mysore state, for 6 months to draw a report with suggestions to avoid further flooding. Adopting his suggestions, storage reservoirs 100 feet above the city which would control floods by storing the excess water from the Musi, were designed to be constructed. As a result Osman Sagar and Himayat Sagar, the two reservoirs that now serve as a major source of drinking water for a significant part of the city, were constructed in 1920 and 1927 respectively. The river's catchment has been changed considering long term environmental impacts. Along with that, around 3,000 small lakes were developed in Hyderabad in addition to the already existing irrigation lakes in the city. These water bodies deployed an interconnected network to protect the city from floods. (Cohen, 2011)

Benjamin Cohen from the Department of History, University of Utah argues that “The Musi river flooding in 1908 acted as a watershed moment to the then rulers of Hyderabad state and helped in rebuilding the city and the river”.

Although Hyderabad has not witnessed similar amounts of precipitation ever since Musi floods, the problem has not been solved. (Rangari et al., 2021)

Endowed with water bodies, the city of Hyderabad, located in the Deccan plateau of peninsular India now had a rich number of storage reservoirs that fulfilled the need for water for drinking, irrigation and groundwater Recharge. (Chigurupati, 2008)

But these water bodies have disappeared over time. Studies suggest that the city has lost over 3000 lakes since the 1990s. Rapid urban growth, encroachments, industrial effluents and residential wastes contribute to the disappearance of the crucial sustenance of the region; the reservoirs.

The urban growth in the past 4 decades has resulted in the destruction of this physical heritage on a large scale. The government, private agencies and individuals, have encroached these lake beds and converted them into built-up areas by filling them. (Chigurupati, 2008)

They have also encroached many water channels that acted as floodwater carriers between adjacent lakes in a catchment area. It is the improper implementation of building regulations and pollution control laws that led to these encroachments and water bodies pollution.

Remote sensing studies revealed that the increase in the built-up area went from being 245 km<sup>2</sup> in 1973 to 587 km<sup>2</sup> in 1996; an overall increase by about 136 percent in 2 decades. (Rangari et al., 2021)

Hussain Sagar, originally constructed to supply drinking water to the city has not been used as a source of drinking water since 1930. It is observed that this lake, which is marked as the centre of the city, has shrunk by 40 percent due to encroachments. Satellite data-based evidence revealed that in the last 25 years, the lake has lost about 121ha. (EPTRI, 1996:48) (Ramachandraiah & Prasad, 2004)

While the volume of the Musi river has been controlled, pollutants from human activity such as dumping have continued. The river was unable to carry these toxins which led to a sludgy composition along the banks and eventually led to the pollution of the lake. This wastewater made Musi an open sewer. (Cohen, 2011)

It can be observed from the satellite imagery that the water bodies and drainage paths along with open fertile lands have transformed into a built-up environment.

The floods in the August of 2000 had led to submerging of around 90 residential colonies, caused huge property loss and left at least 20 people dead. (Sadam, 2020)

The recent floods of October 2020 in Hyderabad which occurred due to the pouring of the low-pressure system formed in the Bay of Bengal, has been a witness to the highest ever October rains and has resulted in massive flooding leaving at least 80 people dead and several casualties. (Vinay Ashok Rangari)

As per the readings from the Begumpet weather monitoring station, 192 mm of rainfall was recorded in 24 hours, the second-highest after 241.5 mm on 24th August 2000.

Despite being less serious than the August 2000 event, the October 2020 flooding caused more human deaths and 8.42% more flood damage comparatively.

Climate change, uncontrolled urbanization, and land-use changes resulting from anthropogenic activities all contributed to the October 2020 Hyderabad flood event and its resulting damages. (Rangari et al., 2021)

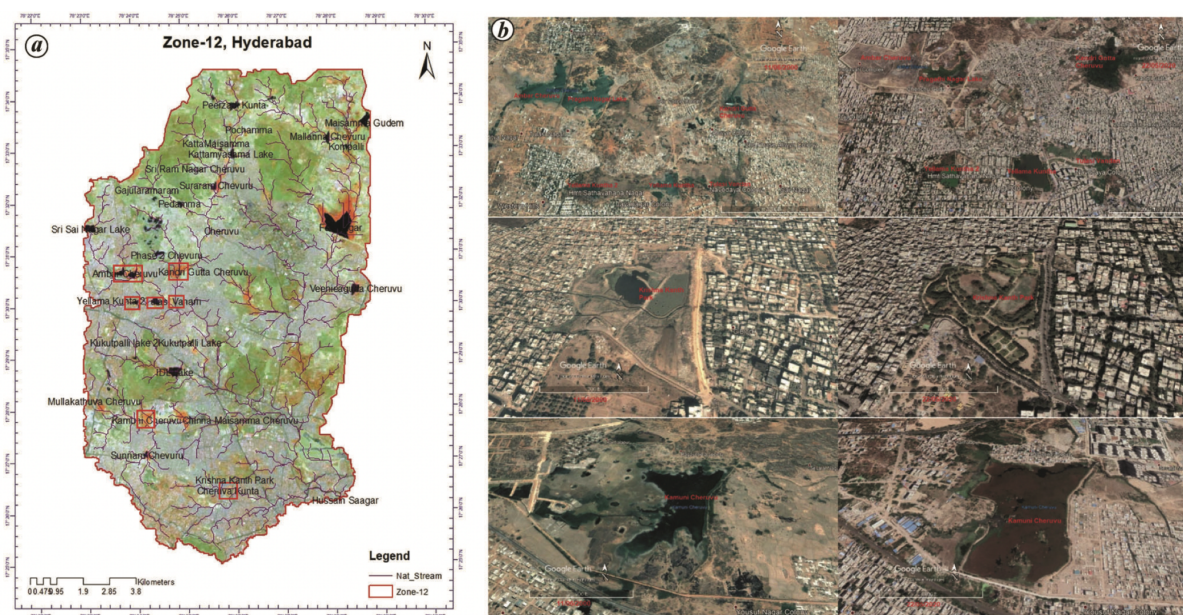


Figure 6. a, Sentinel-2 satellite image of 28 February 2020. b, Encroachment in lake command area from 2001 to 2020 (source: Google Earth).

In Hyderabad, floodwaters were carried from one lake to another by a cascade system and a strong natural stream network. Today, many of these lakes have vanished from the ground, and the streams linking them are no longer evident.

Hyderabad, with the disappearance of these streams and dried lakes, has lost its identity of being called 'The City of Lakes' said Vinay Rangari of Department of Civil Engineering, SVEC, Tirupathi in India who is also the study's first author.

Even though the October 2020 event (192 mm) wasn't as severe as the August 2000 event, which saw greater rainfall, rapid urbanisation (16.5% increase) in the last two decades has significantly contributed to the severity of the flood. (Ramachandraiah & Prasad, 2004)

The study by Vinay Ashok Rangari suggests that urbanization needs to be regulated and equally supported with adequate stormwater drains, to deal with the growing population. Streams and water bodies need to be rejuvenated to absorb excess water flow during monsoon seasons.

In the future, too, extreme daily rainfall in the city will continue to be a recurring phenomenon, according to the Department of Civil Engineering at BITS Pilani, Hyderabad Campus. According to the study, the city may experience intense rainfall ranging between 27 cm and 69 cm in 2040, 2045, 2068, 2088, and 2098. (Vadlamudi & Mohammed, 2020)

Ramachandraiah Chigurupati (2008) said that "Indian cities, over time, have lost their capacity to withstand heavy rains".

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