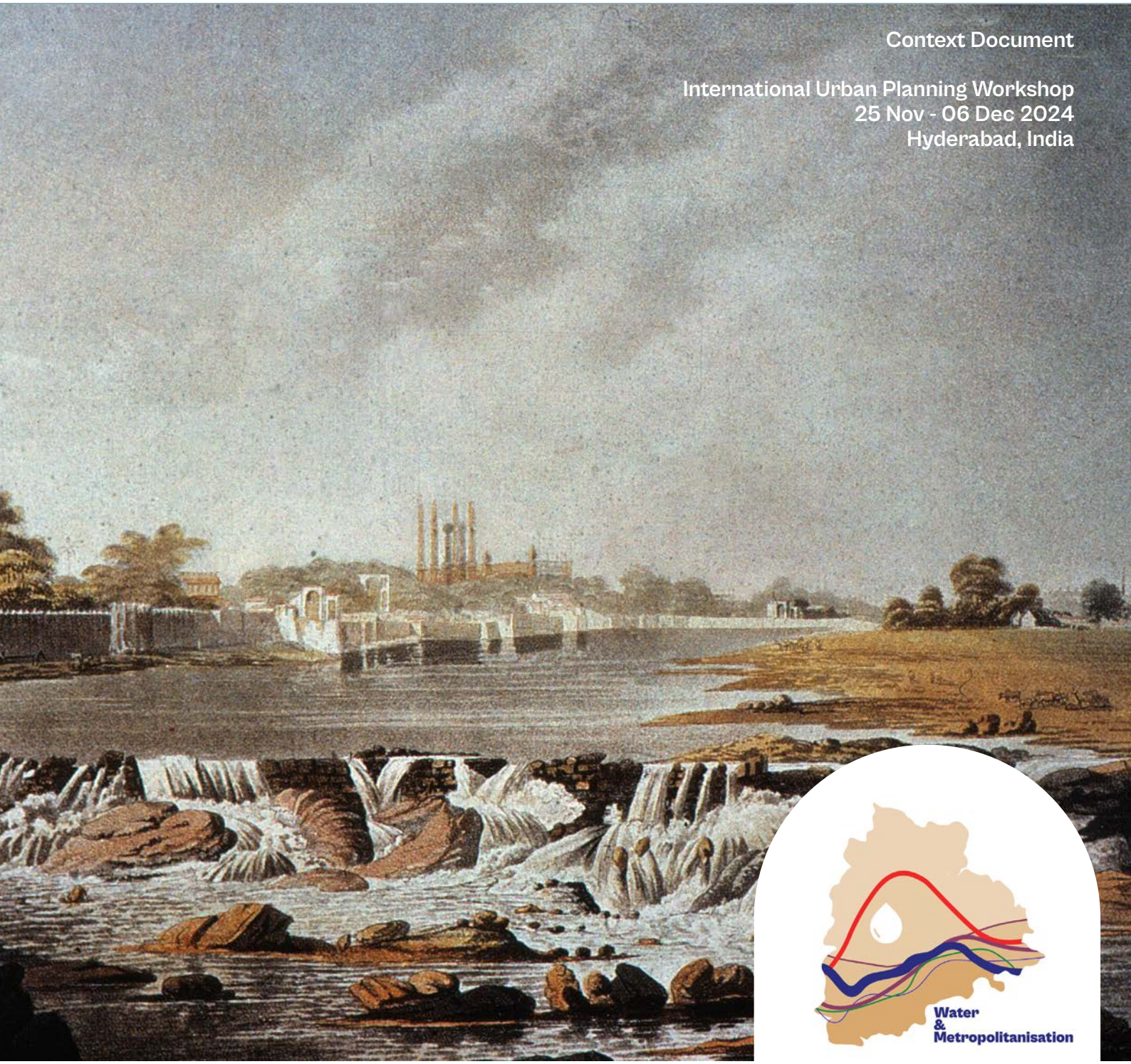
Water & Metropolitanisation

A bioclimatic city of lakes, Hyderabad comes full circle as Health Capital of the world



Context Document

International Urban Planning Workshop
25 Nov - 06 Dec 2024
Hyderabad, India

GOVERNMENT OF TELANGANA

AMBASSADE DE FRANCE EN INDE
Liberté
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les Ateliers
maîtrise d'œuvre urbaine

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Les Ateliers de Cergy is a non-profit association created in 1982 at the initiative of the urban planners of the New Town of Cergy- Pontoise. Today, it is an international network of professionals, academics and decision-makers in urban planning. Focused on the practice of urban project management, the association organises workshops conceived as spaces for collective design and creativity. In France and abroad, these workshops provide project managers with an international perspective and illustrated proposals for territorial strategies and urban development projects. Through the convergence of different professions and cultures, they also serve to question learning processes and provide exchange opportunities at the highest level.

Front cover page image and source:
North east view of Hyderabad (1799)
British Library, Painting by Major General Sir Thomas Anburey and Francis Tukes, London

Back cover page image and source:
Elevation map of Hyderabad wirh Waterbodies
Shuttle Radar Topography Mission (SRTM) Global. Distributed by OpenTopography; and created by Les Ateliers team

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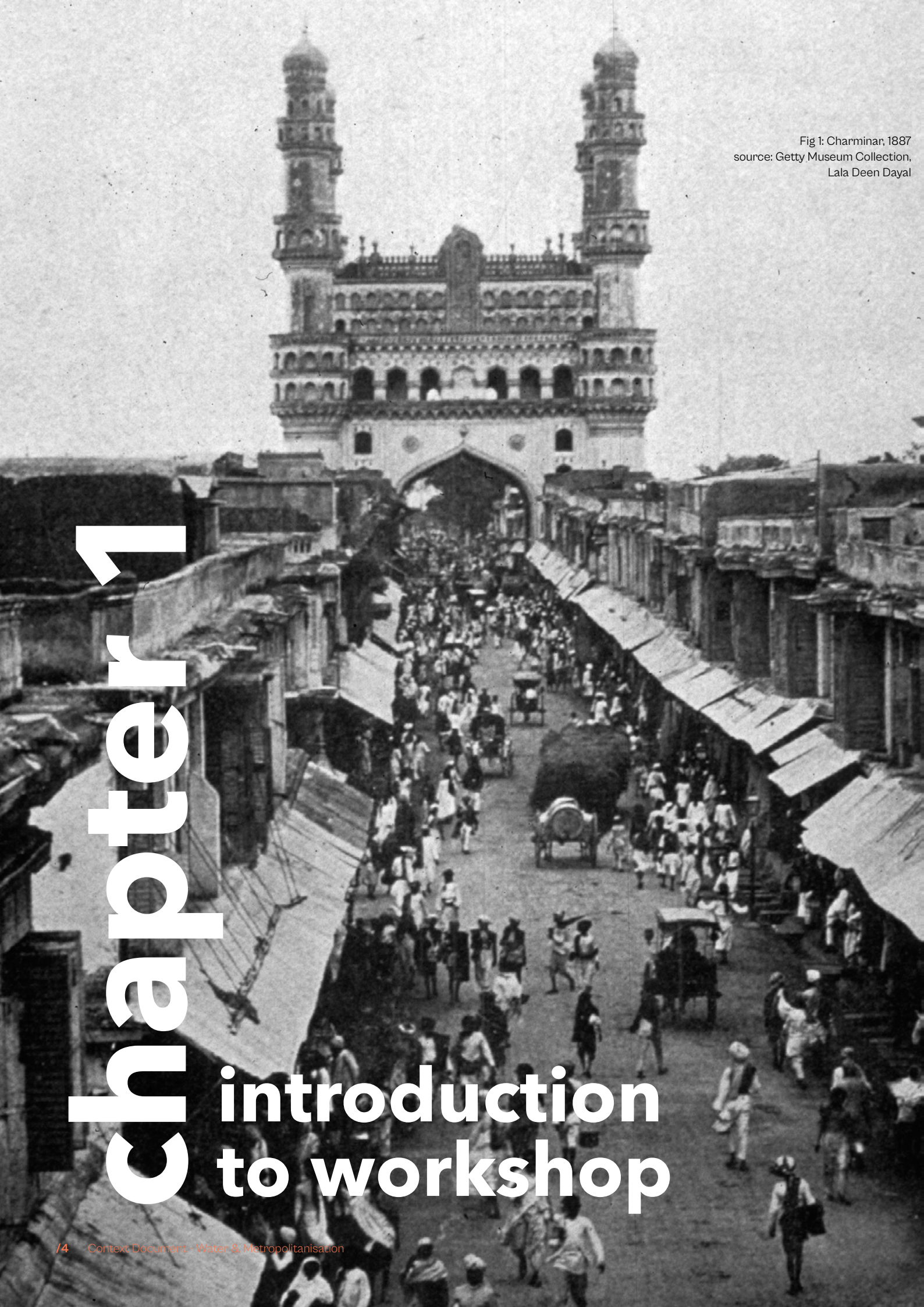


Fig 1: Charminar, 1887
source: Getty Museum Collection,
Lala Deen Dayal

chapter 1
introduction to workshop

Hyderabad, one of India's fastest-growing megacities, is the fifth-largest metropolitan city of India and the capital of Telangana. The historic city is the fourth most populous city in India, and is home to more than 11 million people expanding over an area of 650 square kilometers. (UN – World Population Prospects 2020). It is expected to be one of the 30 most populous cities in the world by 2030. A racially, ethnically, socially, and linguistically diverse city, Hyderabad is a hub of trade and commerce and an international centre for knowledge-based industries such as Biotechnology, Pharmaceuticals, and Information Technology. Hyderabad Pharma City is the world's largest integrated cluster for bulk drug manufacturing. Hyderabad also boasts the world's largest metro project to be built through a public-private partnership.

Located in the heart of the Deccan plateau, a semi-arid region devoid of perennial rivers, the city was established on the banks of the Musi River and has a rich legacy spanning over 500 years. With an average altitude of 542 m, much of Hyderabad is situated on hilly terrain (refer Map-3). Its geographical context has historically determined that life was sustained through a combination of natural and manmade networks of water harvesting systems comprising lakes, tanks, and stepwells (refer Map-2&4). Hyderabad was a bioclimatic city at its inception. Its water architecture enabled a green and livable microclimate in an otherwise hot and dry climate.

Along with its glorious past and an evident influence of Nizam's rule, Hyderabad has observed a steady progression towards the pharmaceutical and manufacturing industries and later into the service industry. The city's inception in the late 16th century was in itself the beginning of urban sprawl from the fortified city of Golconda. Muhammad Quli Qutb Shah established Hyderabad in 1591 to extend the capital beyond the fortified Golconda. In 1687, the city was annexed by the Mughals. In 1724, Mughal Viceroy Nizam Asaf Jah I declared his sovereignty and founded the Asaf Jahi dynasty, also known as the Nizams. Hyderabad served as the imperial capital of the Asaf Jahis from 1769 to 1948. In the post-independent India it served as a capital city for Hyderabad state till 1956, then to Andhra Pradesh, and after the bifurcation of the telugu states in 2014, till now, serving as a capital city for Telangana state.

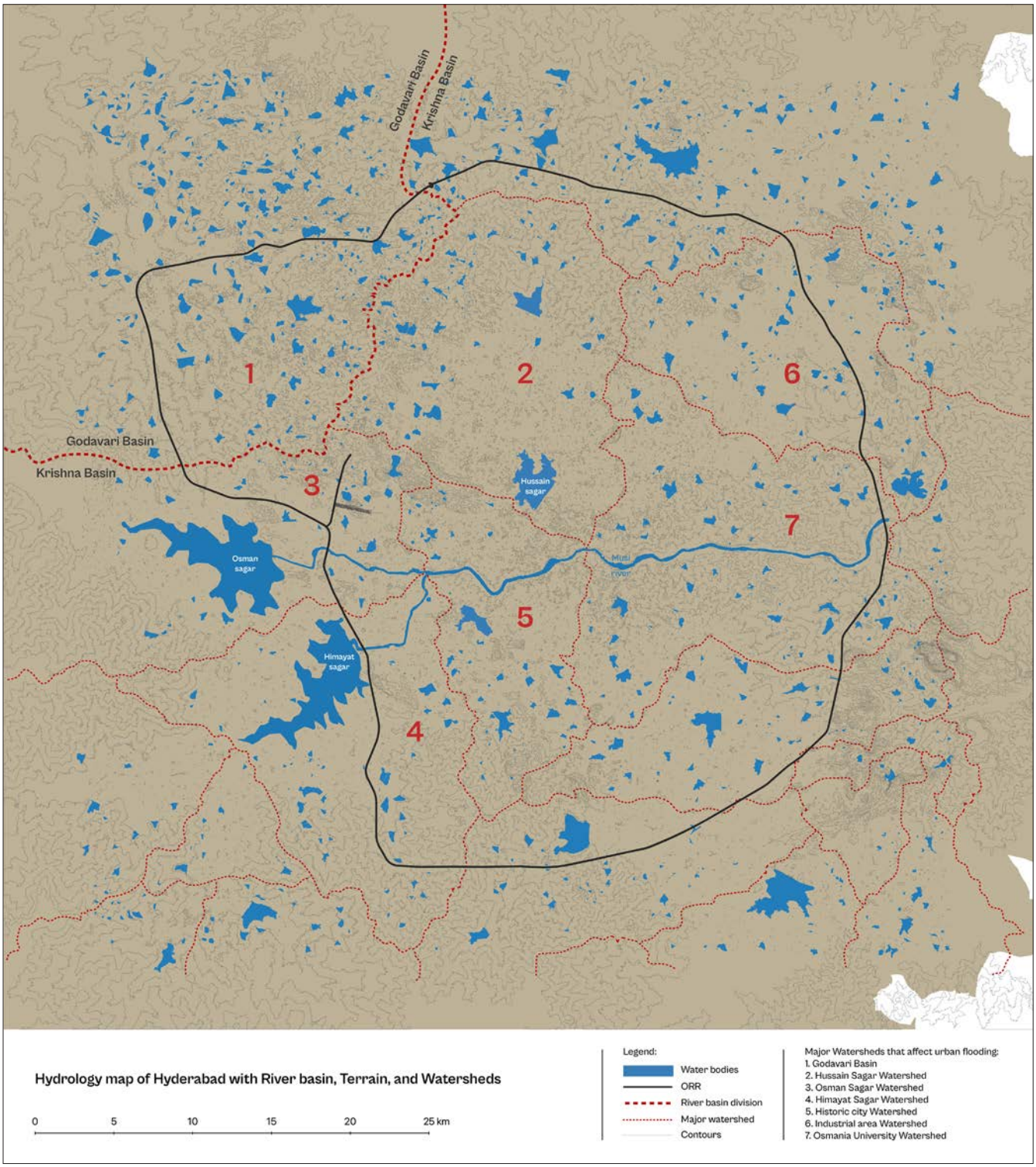
Over the past two decades, these water bodies and their associated ecosystems have shrunk immensely under the tremendous strain of rapid urbanisation, demographic growth, and diverse sources of pollution.

It is ironic that the city that houses the largest pharmaceutical cluster in the world continues to have household sewerage and medical waste released directly into its water bodies, a toxic combination that endangers both human health and the health of the ecosystem. This has sparked international outrage and Hyderabad has been at the receiving end of considerable negative media coverage, be it regarding the unabated pollution levels of the Musi River, declining groundwater levels, acute water shortage during dry months, or traffic jams during flash floods.

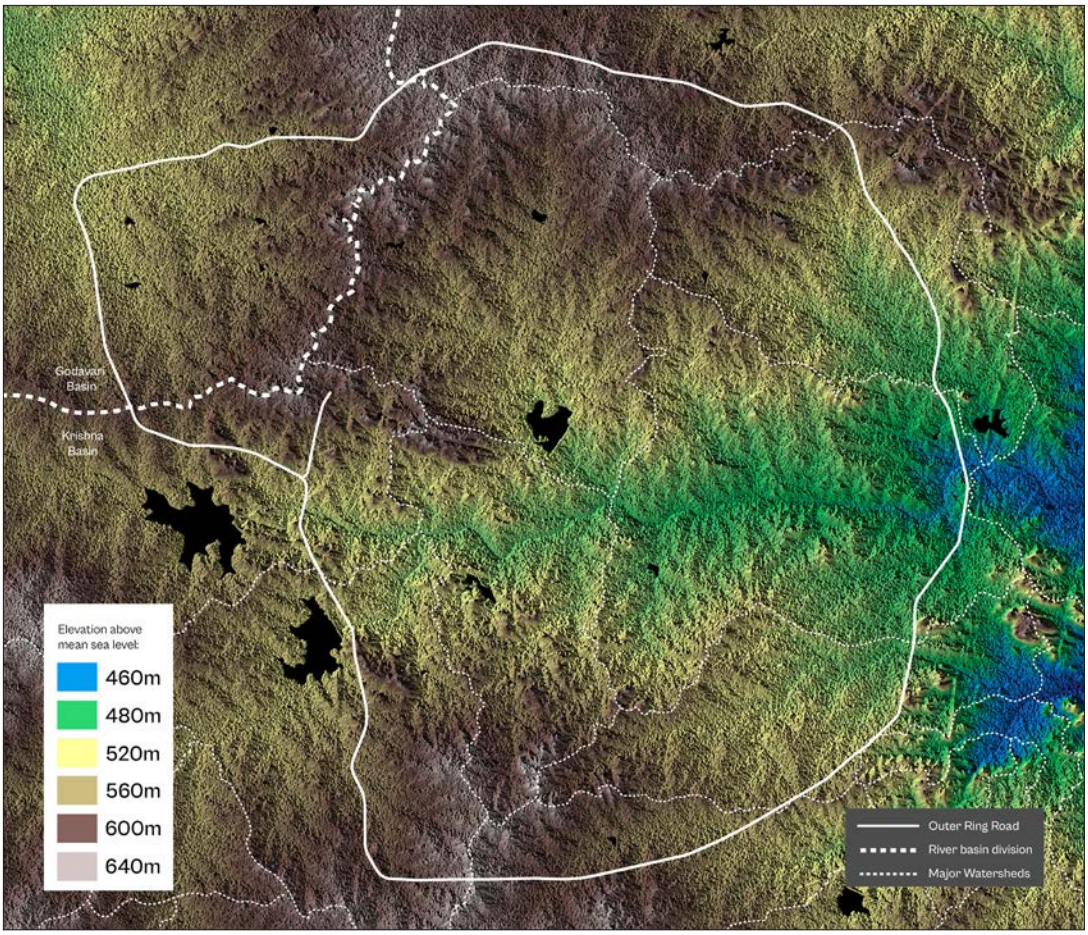
Map 1: Location of Hyderabad with respect to Telangana state and political map of India

Make my city full of people, like you keep the river full of fish

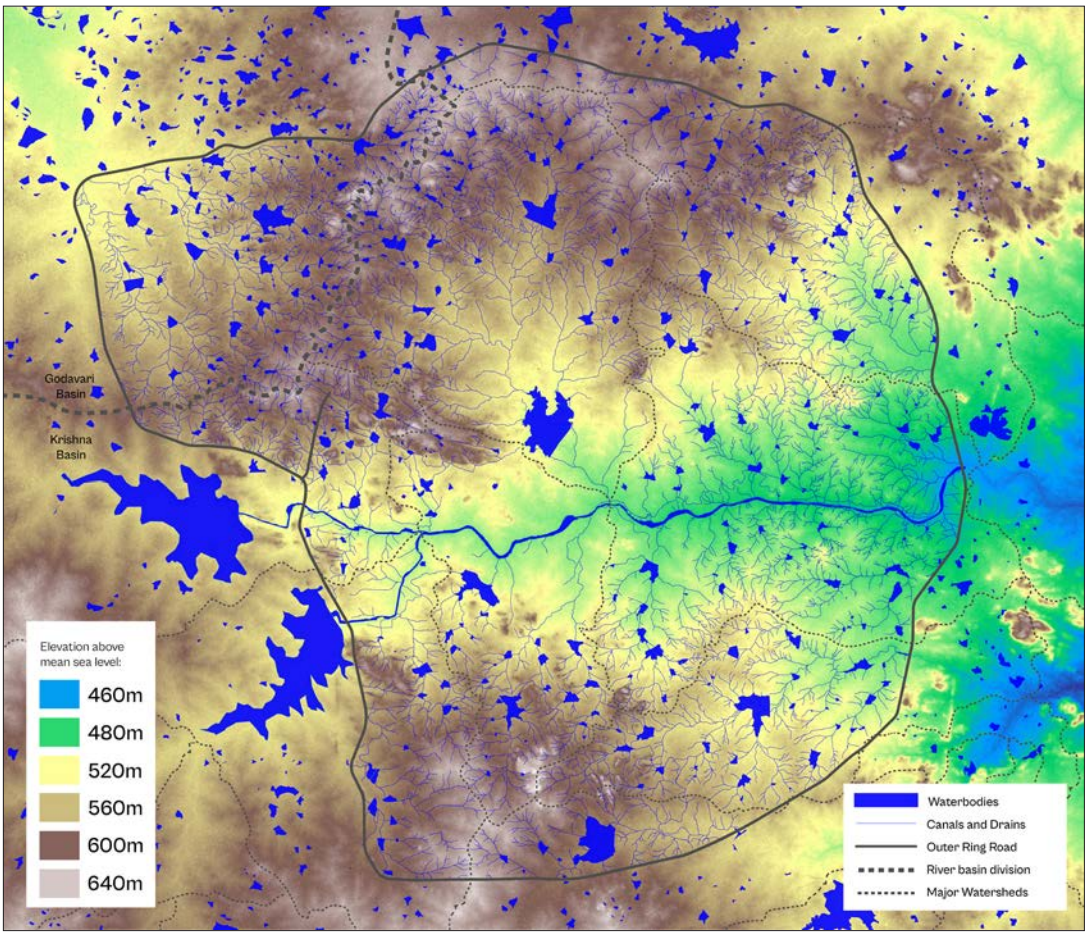
- Muhammad Quli Qutub Shah, Founder of Hyderabad



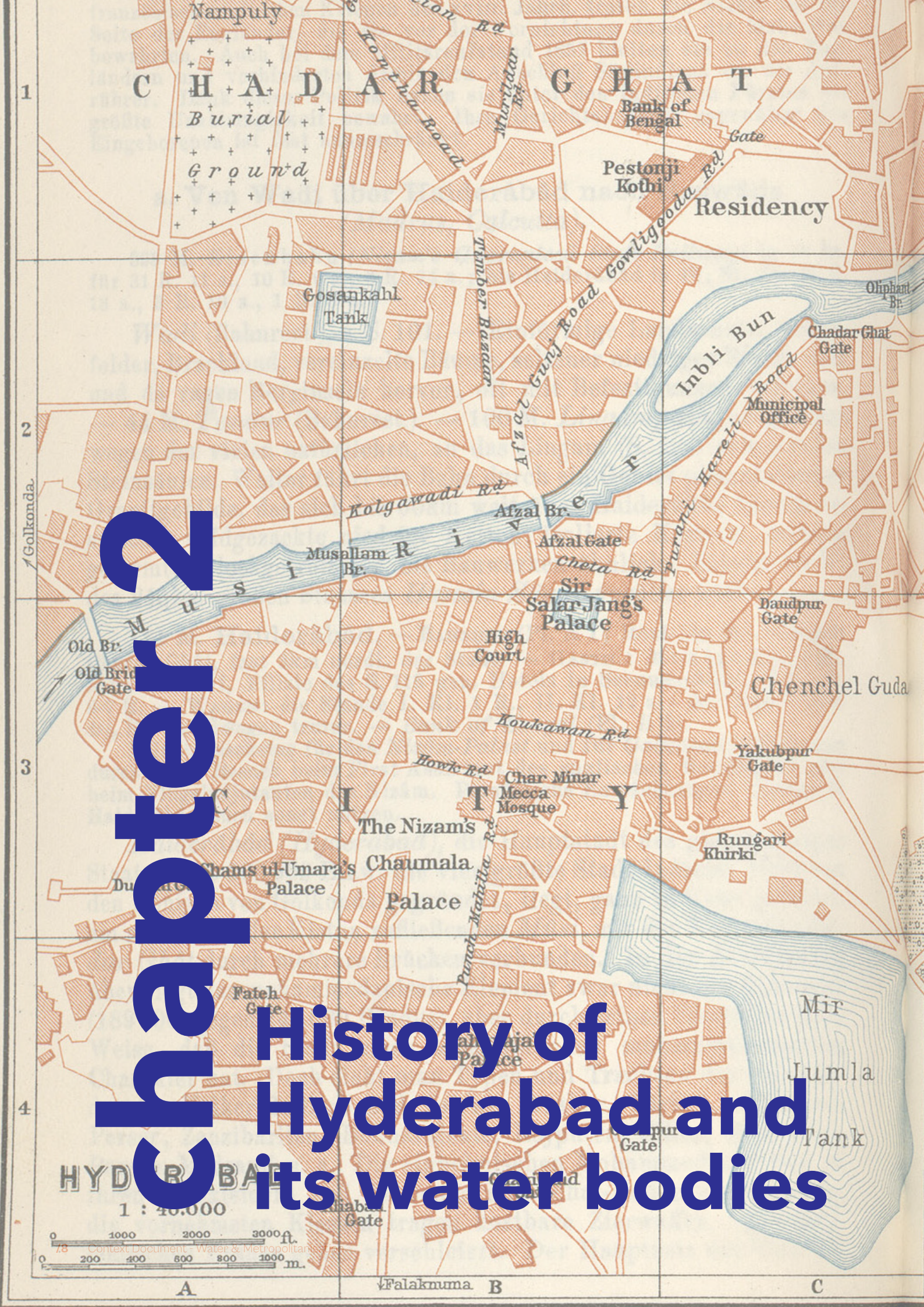
Map 2: Hydrology map of Hyderabad
Source: Data gathered from NIUM; and created by Les Ateliers team



Map 3: Elevation and Terrain map of Hyderabad above mean sea-level
Source: Shuttle Radar Topography Mission (SRTM) Global. Distributed by OpenTopography; and created by Les Ateliers team



Map 4: Elevation map of Hyderabad wirh Waterbodies
Source: Shuttle Radar Topography Mission (SRTM) Global. Distributed by OpenTopography; and created by Les Ateliers team



chapter 2

History of Hyderabad and its water bodies

Map 5: Map of Hyderabad and its Environs (1914)
Source: Verlag von Karl Baedeker in Leipzig

2.1 The walled city of Golconda

The popular heritage site of the Golconda fort, famous for its diamond and pearl markets was first built in the twelfth century during the reign of the Kakatiya dynasty for defense. However, Golconda rose to its prominence during the sixteenth and seventeenth centuries under the Bahmani[1] Sultanate, when it observed major expansions. Sultan Quli Qutb-ul-Mulk was the appointed governor of the Bahmanis. He established Golconda as the seat of his government in 1501. As the Bahmani rule gradually lost its power, Sultan Quli announced himself as an independent ruler, forming the Qutb shahi dynasty in 1538. Golconda flourished under the Qutb Shahi dynasty for over half a century, until the formation of the new capital city of Hyderabad in 1591.

The Golconda Fort is a significant historical site that highlights the crucial role of water in sustaining settlements in the Deccan region. Positioned on a hill just north of the Musi River, the fort was vital for the protection and survival of the city until the mid-17th century. The Musi River is called so as two of its streams, Musa and Esi, converge at the Tipu Khan Bridge near the fort. Local traditions emphasize the fort's impressive defense mechanisms and the importance of rainwater harvesting in maintaining its water supply. A key example of its resilience occurred during Aurangzeb's siege in 1687, after he had already conquered two other Deccan kingdoms–Ahmednagar and Bijapur.

The siege lasted eight months, during which the Mughal Army repeatedly attacked the fort, hoping to force its surrender by cutting off its water supply. However, the fort's ingenious architecture made it extremely difficult to breach. The narrow, winding entryways prevented elephants from charging at full force, and the fort's design included an acoustic system that allowed guards to communicate across long distances. Its massive granite walls, spanning eight miles, also withstood heavy artillery attacks.

"Water travelled through subterranean terracotta aqueducts from Durgam Cheruvu to the Qutb Shahi Tombs Complex and eventually to the lakes in and around the Naya Quila fortification, which was built as an annex to the Golconda Fort" (Subba Rao 2022).

Rather than storming the fort, the Mughals waited outside, expecting water shortages to weaken the defenders. But Golconda had a secret advantage–a constant water supply from Durgam Cheruvu, a lake about five kilometers away (refer Map-8). Water flowed through underground terracotta pipes, passing through the Qutb Shahi Tombs and reaching lakes inside the Naya Quila fort annex.

This system provided enough water for drinking and agriculture, making Golconda a self-sustaining settlement during the siege. Despite the Mughal army facing resource shortages and famine, Golconda held out until it was betrayed from within.

Though the Mughals eventually captured the fort, Golconda's water management strategy became a lasting influence, shaping the city's future urban planning, especially in terms of its cascading network of lakes.

Fig 2: Emperor Aurangazeb at the sieze of Golconda, 1687;
Source: Anna S.K. Brown Military Collection, Brown Digital Repository, Brown University Library

1 The Bahmani Sultanate was a Muslim empire in the Deccan region of South India that ruled from 1347 to 1527.

2.2 City along the river

The next significant shift in Hyderabad's development occurred with the formation of the city itself. As the population inside Golconda's walled city grew, it strained the existing sanitation systems, leading to outbreaks of diseases like cholera and plague. This forced the Qutb Shahis to expand beyond the fort. In 1591, the foundation stone of Hyderabad was laid two and a half miles east of Golconda, near the Musi River. The location, chosen for its sloping land and proximity to major trade routes, allowed efficient stormwater drainage and the creation of irrigation tanks for domestic water use. Higher lands to the west and north discouraged expansion in those directions.

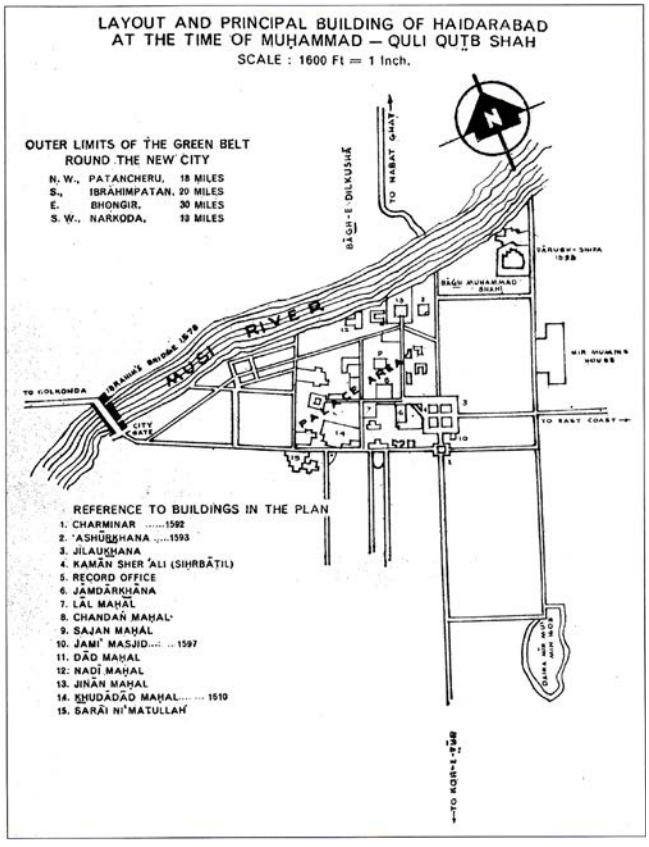
The new city was designed in a grid, with two main streets crossing at Charminar, a grand structure with four arches and minarets. The four quarters around Charminar each served different purposes: the north-western quarter housed royal palaces and state institutions, the northeastern quarter was reserved for nobility, and the other two contained homes, schools, mosques, and rest houses (refer Map-6). By the mid-17th century, Hyderabad had grown into a major trade center, attracting merchants, artisans, and jewelers.

Travelers like Tavernier in 1652 and Thevenot in 1669 described Hyderabad's urban form and gradual expansion. Thevenot noted the long streets, low houses, and lovely gardens. He measured the city's length from the bridge to Charminar and beyond, highlighting the town's cross-like layout and the suburb beyond its gates.

Hyderabad's establishment marked a shift in priorities from defense to trade and urban growth. While Golconda's hilltop location was ideal for protection, Hyderabad's flat layout facilitated commerce. Although a city wall was partially built for security, construction halted after Aurangzeb's siege in 1687. With the Mughal capital moved to Aurangabad, Hyderabad's growth slowed, entering a period of decline.

"You cross the large river (Musi), at Bhagnagar (the garden city) by a grand stone bridge (Puranapul). There are beautiful gardens and such large trees (on terraces)... The Puranapul bridge, an edifice scarcely less beautiful than the Pont Neuf at Paris"(Tavernier, 1652).

Fig 3: Principal street with Charminar and Mecca Masjid in background, and Gulzar Houz fountain in the foreground, 1887;
source: Getty Museum Collection, Lala Deen Dayal



Map 6: Layout and principal buildings of Hyderabad during the reign of Muhammad Quli Qutb Shah (reg. 1591-1600s)
source: Sherwani, Haroon Khan, MIT Archives, 1976

2.3 The Asaf-Jahi period and the contractual twin city

After Aurangzeb's death in 1707, the Mughal Empire quickly weakened and fragmented. During this time, the Mughal Governor of the Deccan declared independence, becoming the first Nizam and founding the Asaf Jahi Dynasty, which ruled Hyderabad for over two centuries until it was annexed into the Indian Union after independence. One of the first major initiatives under Nizam Mulk Asaf Jah I, the dynasty's founder, was completing the city wall around Hyderabad, similar to the fortifications of Golconda. This wall defined the city's core and provided security, encouraging residents, many of whom had moved back to Golconda, to return to Hyderabad (refer Map-7).

The return of the court and nobility from Aurangabad further solidified Hyderabad's importance as a key city in the Deccan. Under the Nizams, the city experienced a period of rebuilding and economic growth, reclaiming its status as a major commercial center. By 1798, Hyderabad had expanded, increasing its tax revenues and supporting three bustling grand bazaars and a wholesale district in its northern suburb, highlighting its economic revival.

The Subsidiary Alliance between the Nizam and the British in 1798 spurred the northern expansion of Hyderabad. As part of this agreement, the British established the military cantonment of Secunderabad, located northeast of Hussain Sagar Lake, while British residences were built along the Musi River's north bank (refer Map-13). The location was strategically chosen by both the Nizam and the East India Company (EIC) to maintain distance for security while staying close enough for oversight. This marked the transformation of the twin cities of Golconda and Hyderabad into the twin cities of Hyderabad and Secunderabad.

Two bridges were constructed to connect Hyderabad with the British Residency, an area covering four square miles and housing 5,000 troops. Many merchants moved to Secunderabad to benefit from the economic advantages under British rule, and over the next sixty years, the population of this northern settlement grew to 50,000. The two cities coexisted side by side–Secunderabad under British control and Hyderabad under the Asaf Jahi rulers.

The construction of a railway terminal in Secunderabad connected Hyderabad to Mumbai in the north and Chennai in the south, boosting the twin cities' growth. By 1874, the railway reached Hyderabad, further expanding by 1900, strengthening regional connections and encouraging urbanization, especially to the north and west. This shift reduced the focus on the old walled city, driving Hyderabad's growth outward.

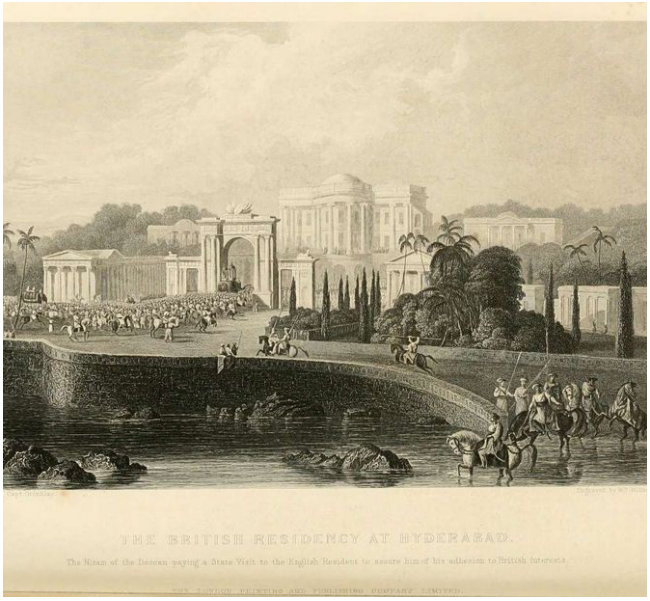


Fig 4: British Residency on the Northern banks of the Musi river - Administrative headquarters, 1835;
Engraving by Captain Robert M Grindlay

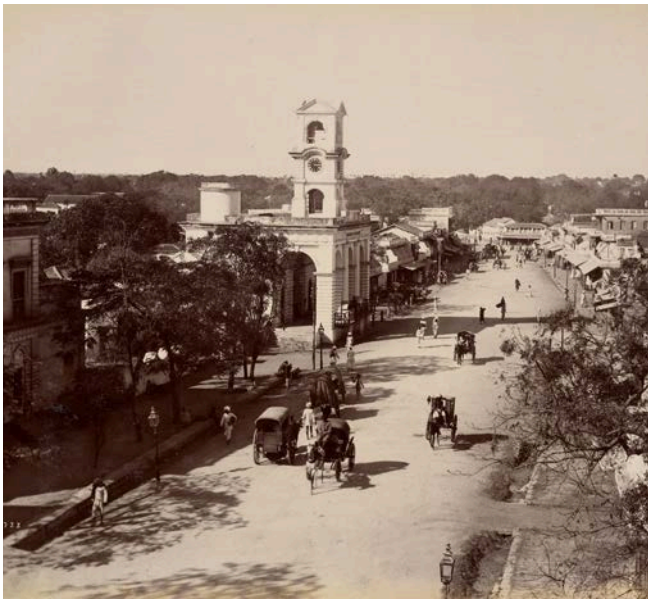
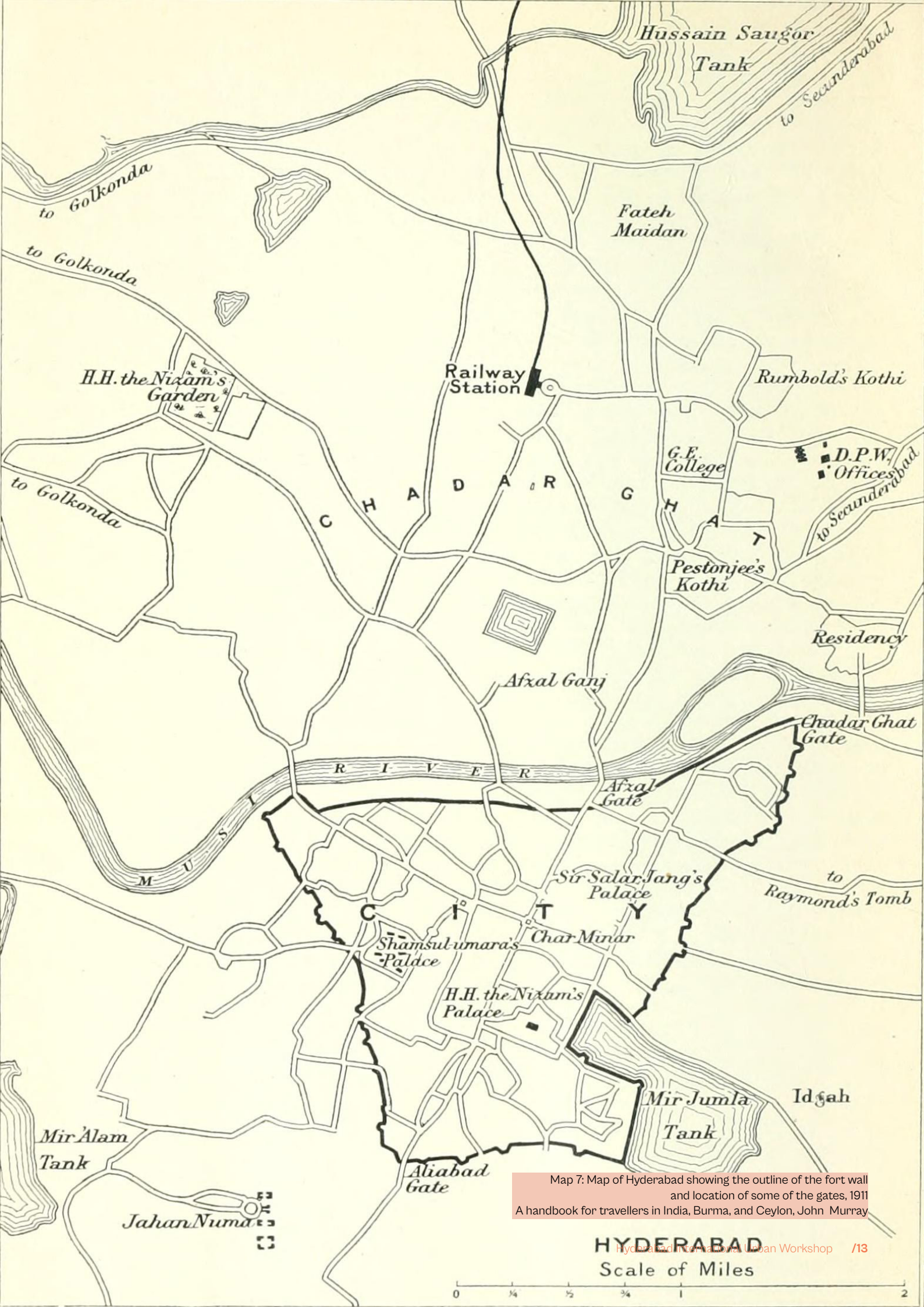
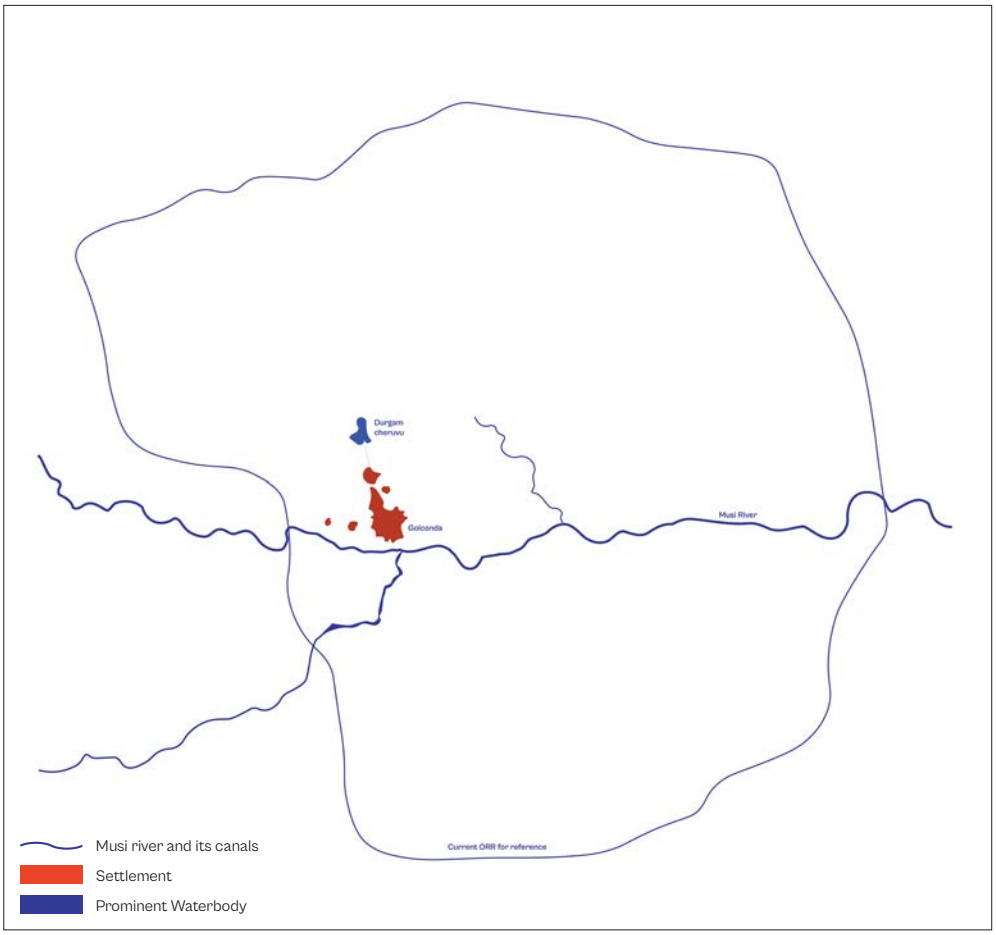


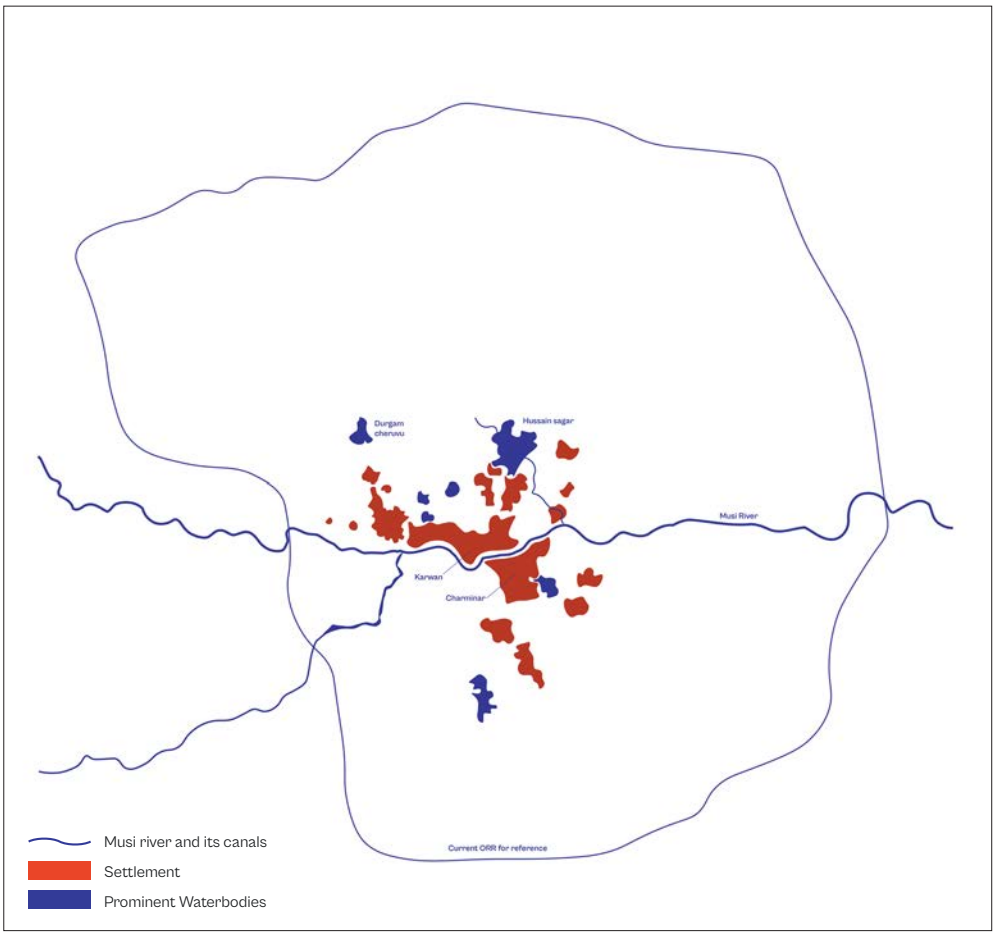
Fig 5: James Street Police Station with its clock tower, Secunderabad source: Getty Museum Collection, Lala Deen Dayal, 1887



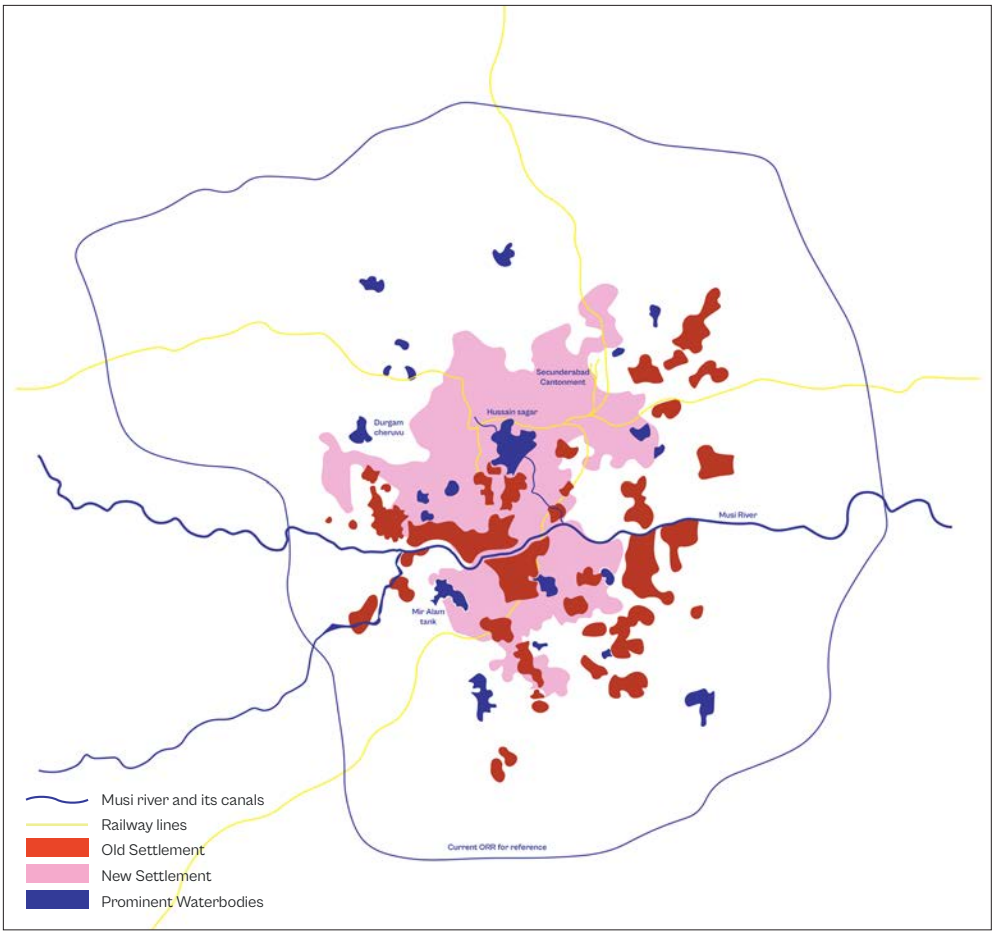
Map 7: Map of Hyderabad showing the outline of the fort wall and location of some of the gates, 1911
A handbook for travellers in India, Burma, and Ceylon, John Murray



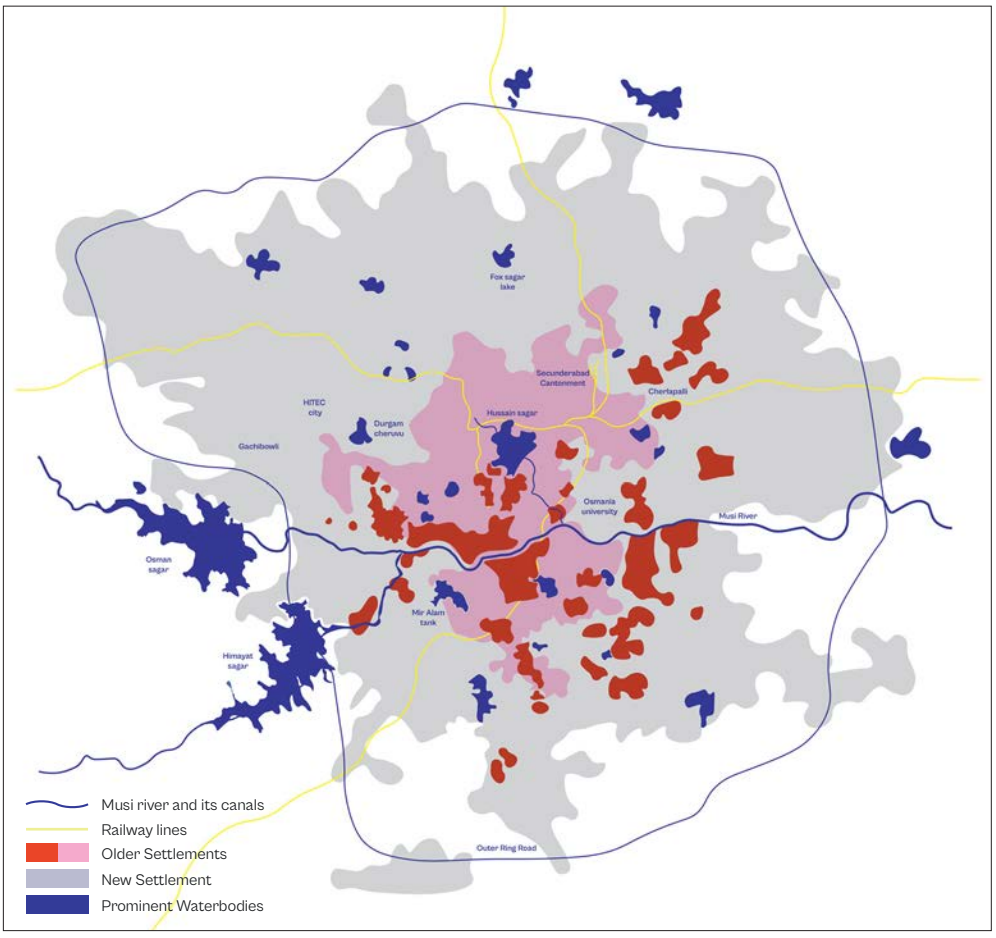
Map 8:
Hyderabad Before 1591
City: Golconda Fort
Prominent Waterbody: Durgam Cheruvu



Map 9:
Hyderabad 1591 - 1798
City Expansion: Charminar, Karwan
Prominent Waterbodies: Hussain Sagar, Mir Jhumla Tank



Map 10:
Hyderabad 1798 - 1908
City Expansion: Secunderabad and Northern expansion
Prominent Waterbody: Mir Alam Tank



Map 11:
Hyderabad 1908 - Till Date
City Expansion: Hitech City; Outer Ring Road and beyond
Prominent Waterbodies: Osman Sagar and Himayat Sagar

2.4 The inception of waterbodies during the Qutb Shahi and Asaf Jahi eras

The Deccan's dry climate, lacking snow-fed rivers, has historically depended on groundwater and monsoon rains. During the Qutb Shahi and Asaf Jahi eras, several stepwells were built for irrigation and domestic use. To retain monsoon water, artificial tanks were created by the Qutb Shahi kings (1518-1687), following earlier practices of the Bahmanis and Kakatiyas. These tanks, linked by channels, provided water for both irrigation and consumption.

The earliest waterworks in Hyderabad began with Sultan Quli, who commissioned Durgam Cheruvu (formerly Durg ka Talaab) to supply water to Golconda Fort. Water was transported through underground channels to the fort and surrounding areas. Though the Musi River was nearby, its erratic flow made it unreliable, prompting the construction of other tanks. The Karez system[1] in Bidar was the predecessor to the Golconda aqueducts. However, the water in the Bidri Karez is fed by underground springs while the Golconda system (in Hyderabad) depends on the water available in the Durg ka Talaab.

Under Sultan Ibrahim Qutb Shah (1580-1611), major irrigation projects began. Hussain Sagar was constructed in 1565, with water diverted through the Bulkapur Channel. This tank, built with granite bunds and sluices, provided drinking water for centuries, though it is now heavily polluted. Other notable Qutb Shahi tanks include Katora Houz, Ma Saheba's Tank, Mir Jumla Tank, and Gosha Mahal Tank. Many of these tanks are now polluted, defunct, or have disappeared.

During the Asaf Jahi era (1724-1948), additional irrigation projects were launched. The Mir Alam Tank (completed in 1805 - refer Map-13) became the city's primary water source, designed by French engineers with a unique bund of 21 granite arches. Afzal Sagar Tank, built by the fifth Nizam, has since disappeared, replaced by residential areas.

Records suggest that hundreds of tanks and smaller water bodies were created during these periods. These tanks regulated floods by expanding and contracting naturally, making them vital to the city's water management.

1 The karez system is a community-based water management system that uses gravity to transport water from underground to the surface. The system is made up of vertical shafts that tap into groundwater and are connected by sloping tunnels. The water is then delivered to the surface without the need for pumping.

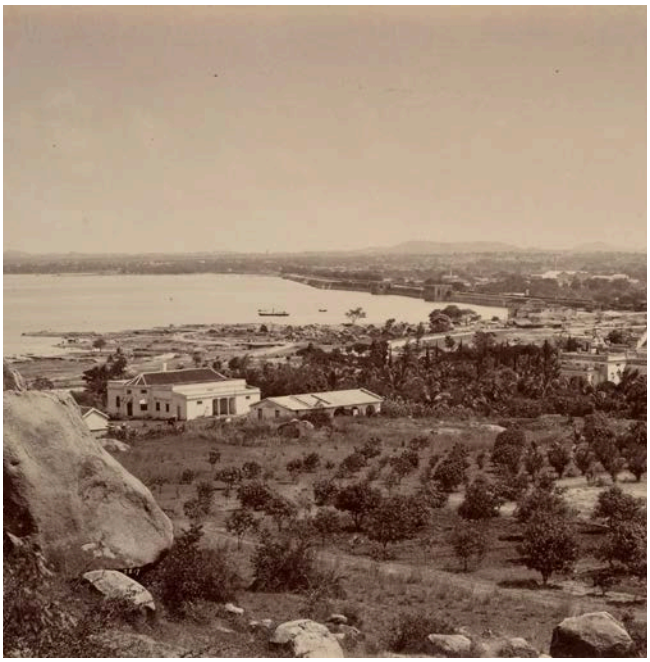


Fig 6: Hussain Sagar (1565), a man-made tank with its bund on one of its periphery, 1887
source: Getty Museum Collection, Lala Deen Dayal

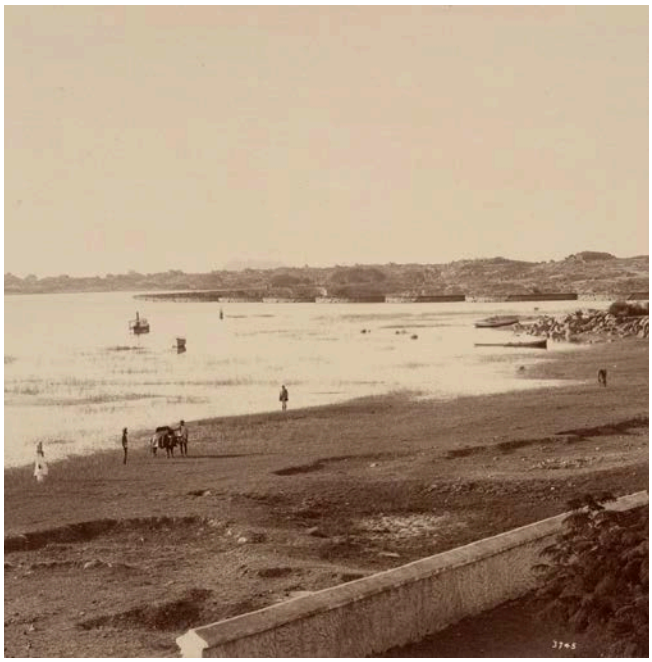
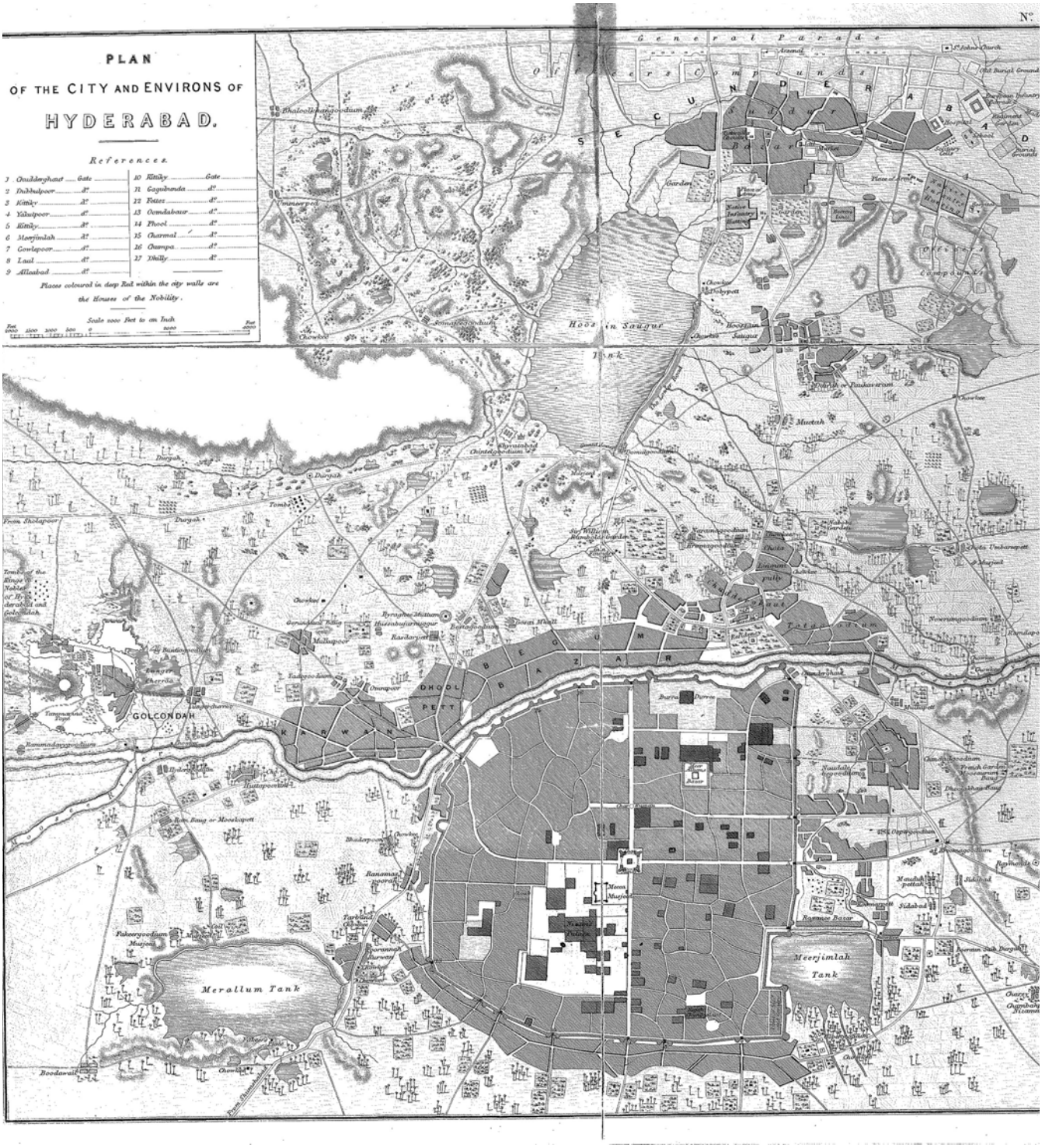


Fig 7: Mir Alam Tank (1805), a reservoir with arches along one section of its periphery, 1887
source: Getty Museum Collection, Lala Deen Dayal



Map 12: Map of the city and environs of Hyderabad, 1854
source: An atlas of the southern part of India including plans of all the principal towns and cantonments, Pharoah & Co., Madras

2.5 1908 Floods and the city of resilience

On September 26, 1908, a cyclone in the Bay of Bengal brought heavy rainfall to Hyderabad, causing the tanks and the Musi River to overflow. Over two days, the rising waters caused severe damage, submerging bridges and devastating neighborhoods. By the time the floodwaters receded, 15,000 people had died, and 19,000 homes were destroyed.

The legendary engineer M. Visvesvaraya later noted that 221 out of 788 tanks in the Musi River basin were breached, contributing to the destruction. Several water tanks on either bank of the river, around the old city, were neglected and infringed causing the floods to be catastrophic. Archival images from September 1908 show harrowing pictures of a broken Afzal Gunj bridge, damaged homes, and a flooded British Residency (now Koti Women's College) gate, among other things. The Afzal Gunj Hospital, over which Osmania Hospital stands today, was also believed to have been extensively wrecked during the floods (refer Fig-8&9).

In response, the 6th Nizam, Mahbub Ali Pasha, sought solutions to prevent future disasters. M. Visvesvaraya, appointed as a Special Consulting Engineer in 1909, was tasked with redesigning the city to become flood-resistant. This disaster marked a turning point in Hyderabad's infrastructure planning.

After conducting detailed surveys, engineer M. Visvesvaraya identified that the severe flooding in Hyderabad was due to breached water tanks. To prevent future floods, he recommended building two large storage reservoirs capable of "temporarily impounding all floods over what the Musi river channel could carry[1]". These reservoirs, later named Osman Sagar (Gandipet Lake) and Himayat Sagar, were built during the reign of the last Nizam, Mir Osman Ali Khan (refer Map-13). Osman Sagar was founded in 1913, while Himayat Sagar followed a few years later.

These reservoirs, alongside the earlier Hussain Sagar (constructed in the Qutb Shahi era), helped control the Musi River and stopped further flooding in Hyderabad. Although Osman and Himayat Sagar now provide a limited portion of the city's water supply, they played a critical role in taming the river. It should also be noted that the Hussain Sagar and Mir Alam tank were still lakes that supply drinking water.

Visveswaraya, who left Hyderabad in November 1909, was once again brought back in 1922 to design a new and modern sewerage system for which he had given a plan earlier, but it was not carried out. By this time, the Musi river used to turn into a huge sewer, especially in hot weather.

"The more important work that was first undertaken was the diversion of city sewage from both banks of the river through pipe ducts into a separate sewage farm. A site was selected for the farm on the left bank of the river and to the east of the city," wrote Viswesvaraya, in 'Memoirs of My Working Life', his autobiography.

1 M. Visveswaraya autobiography

Fig 8: The Afzal Gunj Darwaza stands behind the desolated remains of the Afzal Gunj Naya Pul after the floods, 1908.
Source: W. R Puplick & Co.

Fig 9: The ruins of the Afzal Gunj hospital, over which the Osmania General Hospital was founded.
Source: Deccan Archives

2.6 City Improvement Board: Hyderabad's ticket to transformation

Even after controlling the floods, Hyderabad faced new challenges. In 1911, a bubonic plague outbreak killed nearly 20% of the city's population in nine months. To address this, the Nizam established the City Improvement Board (CIB) in 1912, focusing on "improving the social, physical, and moral conditions of the citizens[1]". Guided by M. Visvesvaraya's recommendations on urban issues like housing and sanitation, the CIB began documenting the city through the Hyderabad Municipal Survey, led by Leonard Munn[2]. These detailed maps of the city's architecture, population density, and topography became the foundation for modernization efforts.

During this period, under the guidance of Chief architect Vincent Jerome Esch, architecture helped redefine the city's identity, with major landmarks like the Kachiguda Railway station (1914), High Court (1916), Secretariat (1913), Osmania University (1918), City College (1917-20), Osmania General Hospital (1918-21), and Moazzam Jahi Market (1935) taking shape (refer Map-13). These buildings, many situated along the Musi River, were complemented by public spaces and gardens along the riverbanks, which became important urban features. The 1908 flood also prompted the city's expansion northward, with state offices, nobility residences, and the Nizam's palace moving closer to the British Residency. Suburban railway and bus services, introduced in 1928 and 1932, further fueled northern growth.

1 Nanisetti, 2020

2 Munn maps, as they often referred as, are now available as a digital repository at MIT archives and Kalakriti archives.

The CIB played a key role in this expansion, focusing on structured housing schemes, adaptive reuse of buildings, creation of public spaces, and conservation of water and heritage sites. New townships were developed in areas like Sultan Shahi, Gunfoundry, Musallam Jung Gardens, Moghulpura, Begum Bazar, Pathanwadi, Feelkhana and Errannagunta to ensure equitable development.

This period also marked a shift in the city's relationship with water. While once viewed as a vital resource, water now became a force that needed control to ensure safety. The 1908 flood reinforced the importance of the Musi River and the lake system, not only as a water source but as a public space and essential part of the city's identity. The role of the riverine system became increasingly evident as a flood control mechanism, while the lake system continued to serve its purpose of feeding the river and providing water for domestic uses and agriculture.

> **"There is much yet to be done, I stated, to improve the city. When the improvements suggested were carried out and the city was equipped with clean houses, flush-down lavatories, dustless roads, paved footpaths and a plentiful supply of open spaces, parks and gardens, it was thought Hyderabad would be able to hold her head high among her sister cities in India. Progress, it was stated, would be achieved only if efficient men were put in charge and funds to meet all reasonable demands allotted for expenditure from time to time."** (Sir. M. Viswesvaraya, his autobiography)

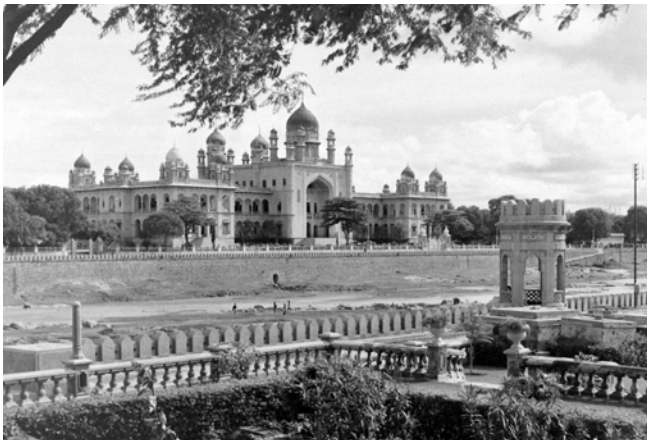


Fig 10: High Court on the southern bank of the Musi river; Kiosk on the northern bank in the foreground

Fig 11: Osmania General Hospital on the northern bank of the Musi river Raised Musi river banking in the foreground

2.7 Independence, I.T take over and the westward expansion of the city

India gained independence in 1947, ending British colonial rule, but Hyderabad state (or Nizam province) initially chose to remain independent. In 1948, India launched Operation Polo to integrate Hyderabad into the Union, leading to military intervention and clashes with the Razakars, a paramilitary force fighting for Hyderabad's autonomy. The annexation resulted in a death toll of 30,000-40,000. Following this, Hyderabad's public buildings retained their functions, while some palaces were repurposed for administration.

In 1956, Hyderabad became part of Andhra Pradesh after India restructured states on linguistic lines. The city saw steady growth as state-owned corporations such as the Electronics Corporation of India Limited (ECIL) in 1967, the Nuclear Fuel Complex (NFC) in 1971, and Hindustan Cables Limited (HCL) in 1972 were established, drawing people to the region (refer Map-13). From 1960 to 1980, the population doubled, growing at 3.5% annually, but urbanization remained decentralized, minimizing disruptions to the city's storm water network and water management systems despite the early signs of pollution caused by the industries.

The next phase of development sparked by the liberalization of the Indian economy in 1991 was the fastest and the most destructive to the city's hydrological network. The national level economic shift accelerated Hyderabad's growth, especially after the creation of HITEC City (Hyderabad Information Technology and Engineering Consultancy City) in 1998 in Madhapur (refer Map-13), a technology hub that attracted major global corporations. The city's population growth surged to 5.5% per year, driven by the booming IT sector and the arrival of tech giants like Facebook, Amazon, and Google. Unlike Hyderabad's growth between the 1960s and 80s, state owned corporations and institutions were not guiding development anymore. Housing and amenities for these tech employees was left almost entirely to the market which led to an explosion of new residential development on the vast, largely untouched landscape around HITEC City. Land prices around the city skyrocketed and construction swarmed the metropolitan region.

Infrastructure projects like the Hyderabad Multi-Modal Transport System (MMTS), a new international airport, and a city-wide expressway were undertaken to support the expansion. However, this growth came at the cost of Hyderabad's traditional water management system. The network of cascading lakes connected by surface level storm water connections which the city depended on for agriculture, water supply and most importantly, flood control, was disrupted.

Hyderabad's urban growth has been shaped by shifting nodal points, each creating a new identity for the city. The transition from the historical center around Charminar to the modern IT corridor in HITEC City reflects the city's evolving economic landscape. This multi-nodal development structure, driven by both local and foreign investment, has resulted in a diverse urban fabric where various sectors contribute significantly to the city's economy. The continuous influx of investments–from the film industry in the 1970s to today's IT giants–has transformed Hyderabad into a key economic hub.

The city's urban morphology has shifted multiple times throughout history. Initially founded in 1501 along an east-west axis, it expanded north-south when the Secunderabad cantonment was established in 1806. With the establishment of HITEC City, the urban growth pattern reverted to an east-west direction, further contributing to Hyderabad's sprawling character.

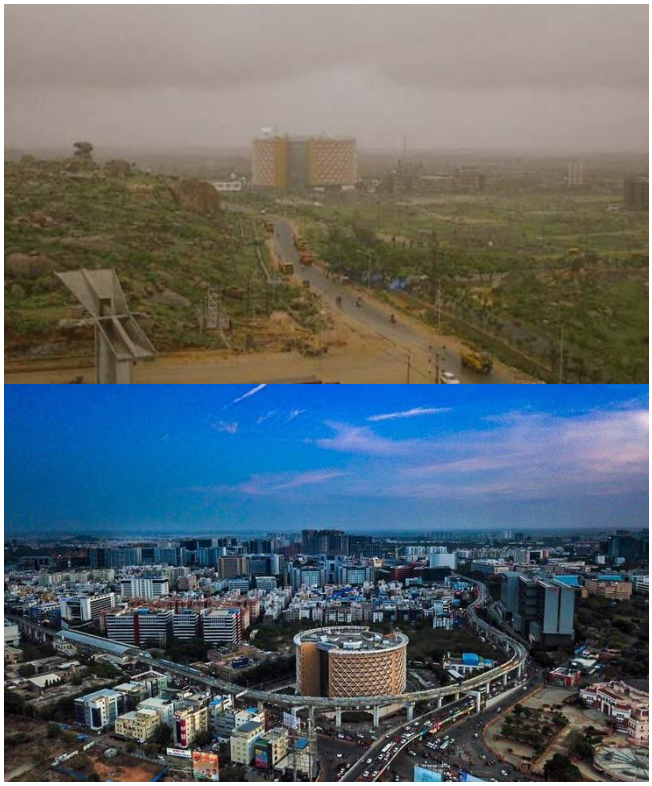


Fig 12: Hitec city and surroundings - above (1999) and below (2019)
Source: Reddit

2.8 Water's fundamental role in consolidating Hyderabad's identity

Water has played a pivotal role in shaping Hyderabad's identity throughout its history, constantly evolving in its significance to the city. Initially, it was the foundation of life in the Deccan region, a critical resource for the survival of early settlements. For Golconda's fort, water was indispensable, providing sustenance and protection. As the new Hyderabad city emerged, water became an organizational element, with the Musi River and surrounding tanks not only supporting life but structuring the city's development. Over time, water's role shifted, transforming into a powerful natural force that the city needed to negotiate with, particularly after the devastating floods of 1908.

In modern times, water in Hyderabad has taken on yet another identity–first as a spectacle that attracted investment and development, and now, increasingly, as a destructive force of nature that batters the city. This shift is closely tied to the city's rapid urbanization over the past three decades, which has fundamentally altered its relationship with water.

Today, Hyderabad faces three major water-related challenges that define its urban landscape: flooding, pollution, and the degradation of natural ecosystems. Seasonal and torrential rains, once manageable through the city's extensive network of lakes and tanks, now result in frequent and severe flooding due to haphazard development and the destruction of traditional water management systems. Urban expansion, driven by unchecked real estate development, has encroached upon natural drainage channels, wetlands, and lakes, exacerbating flood risks.

Water pollution has also reached alarming levels as the city's industrial and residential growth has outpaced the infrastructure needed to manage waste. Rivers and lakes, once vital sources of clean water, have become polluted with industrial effluents, untreated sewage, and garbage. The degradation of these water bodies not only threatens the city's water supply but also the health of its residents and natural habitats.

Lastly, the relentless urban development of the past three decades has led to the loss of natural ecosystems, leading to water scarcity too. Hyderabad's rapid expansion has displaced vast areas of green cover, wetlands, and open spaces that once helped regulate the flow of water and supported biodiversity. This environmental destruction has further strained the city's ability to cope with flooding.

These challenges–flooding, pollution, and the loss of ecosystems–are interconnected, all stemming from the city's aggressive development over the last thirty years. The disregard for Hyderabad's natural landscape, its people, and its historical relationship with water has not only reshaped the city's identity but has also created new vulnerabilities.

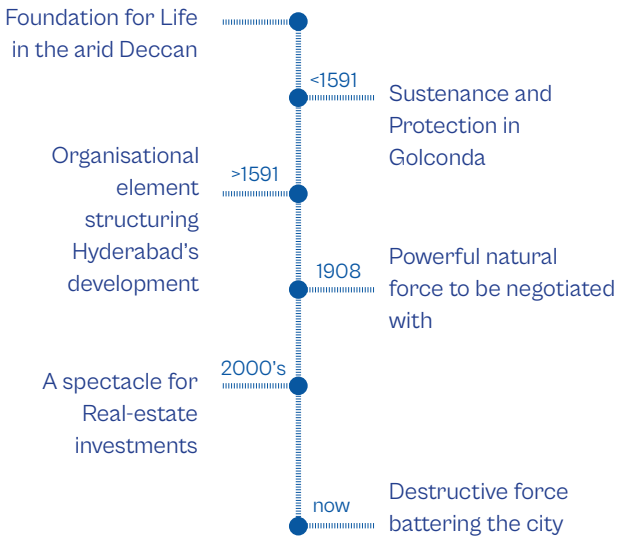
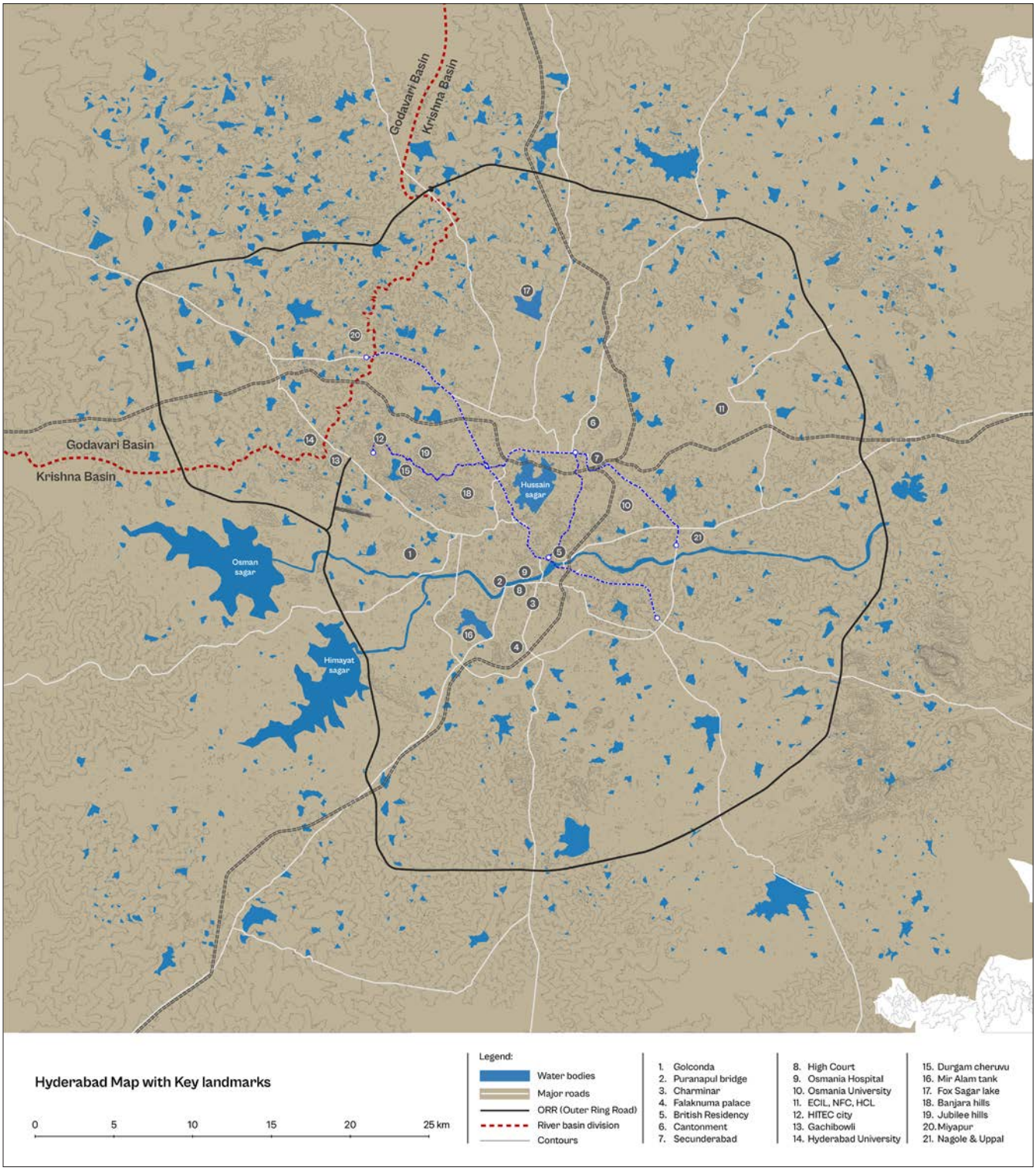


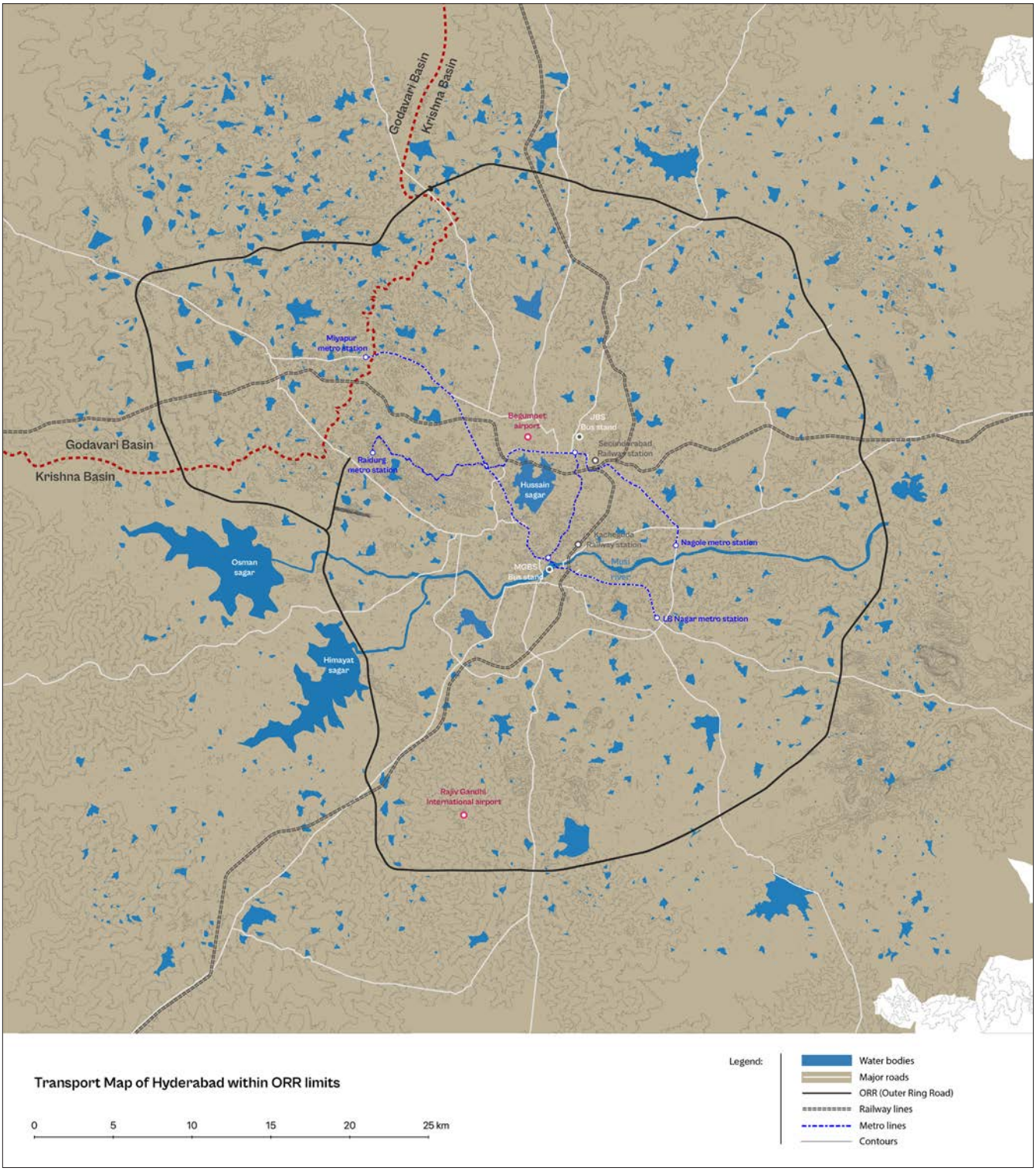
Fig 13: Water role in the transformation of Hyderabad city - from foundation of life in the Deccan region to a destructive force of nature

Fig 14: Financial district skyline behind the Khajaguda lake
Source: X account of Hyderabad Mojo

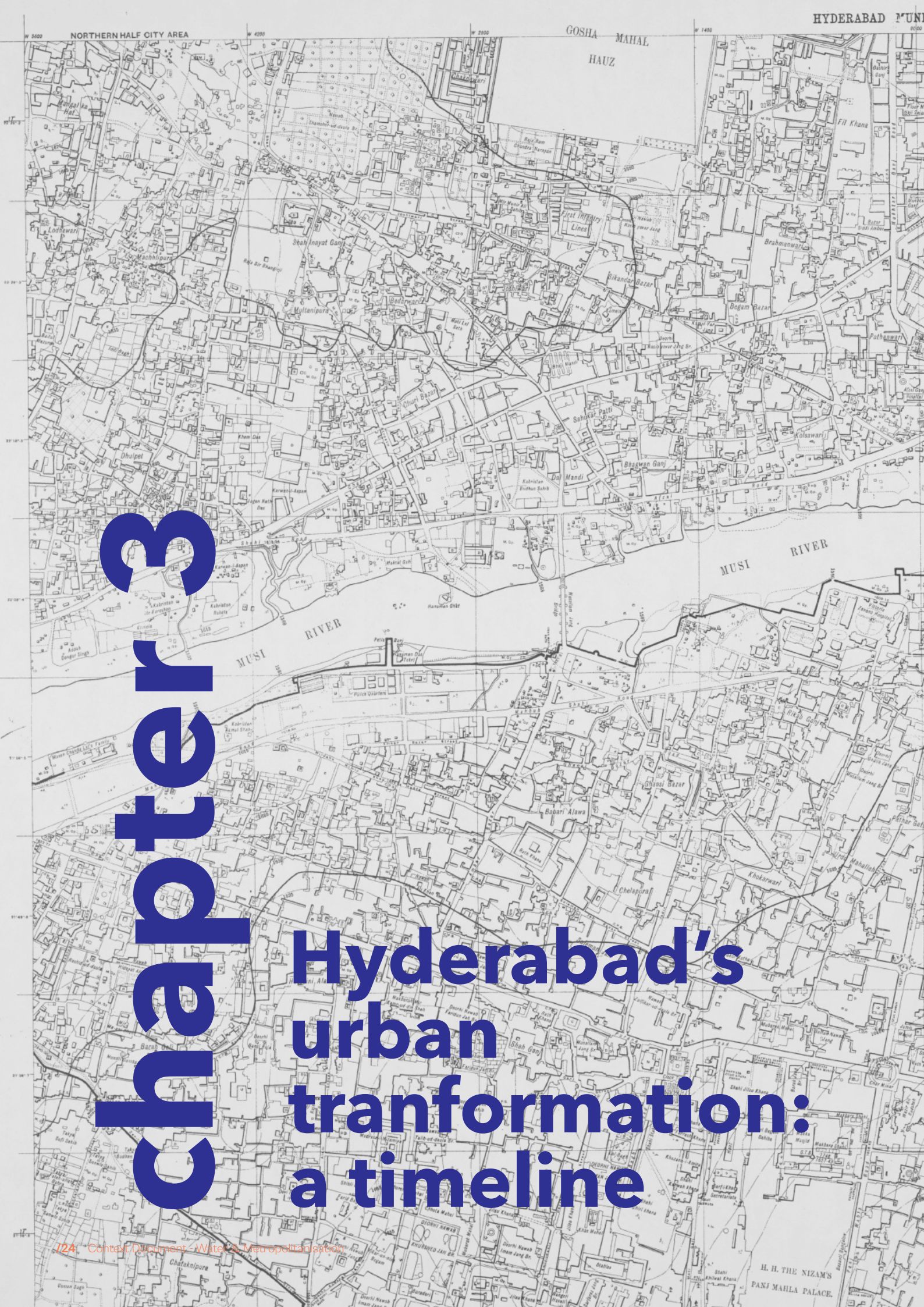
Hyderabad has four key pieces of water infrastructure that can help orient the reader: Osman Sagar and Himayat Sagar to the west, Hussain Sagar in the heart of the city and the Musi River running east to west, bisecting the city. Some important built land marks include the Golconda Fort, Charminar, Falaknuma Palace, High Tech City, Secunderabad Railway Station and Osmania University. The transportation infrastructure in the city is organized by two systems of roads: an inner and outer ring road and a series of radial roads that emerge from the core. The regional railway network dates to the late 19th century, built by the Nizam's Guaranteed State Railway and has continued to grow into an important node for the South-Central Railway. The city has also built an elevated metro rail in response to traffic congestion which began operating in 2017. Nine existing bridges over the Musi River connect the northern and southern sections of the city. Among them, Purana Pul built in 1578 is the oldest and connects the walled city of Hyderabad to the Golconda Fort.



Map 13: Map of Hyderabad with key landmarks



Map 14: Transport network of Hyderabad with its Major road networks, Railway lines, Metro lines, and airport



chapter 3

Hyderabad's urban tranformation: a timeline

Map 15: Sheet no.11, City Area, Northern Half (1914)
Source: Hyderabad Municipal Survey, Leonard Munn, MIT Dome Archives

The chapter explores the dynamic urban transformation of Hyderabad through a detailed graphical timeline that illustrates the city's evolving urban morphology. By focusing on key aspects such as urbanization, mobility, landscape, shifting urban nodes, water bodies, and major infrastructure transformations, the timeline captures the essence of Hyderabad's growth from its inception to the present day.

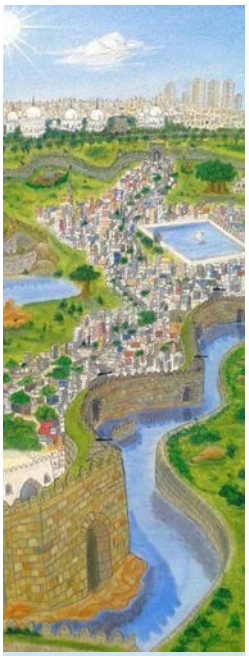
Each entry details important buildings, water bodies, infrastructure projects, historic events, and policy changes, emphasizing their impact on Hyderabad's urban landscape. For instance, the establishment of the Hussain Sagar Lake in the 16th century highlights the historical relationship between water bodies and urban planning, while the construction of the Hyderabad Metro Rail in 2017 marks a pivotal shift in urban mobility.

The timeline provides a comprehensive breakdown of urbanization trends, illustrating how the city's urban fabric has evolved through periods of rapid expansion and development. Key urban nodes, such as HITEC City, are highlighted to showcase how economic shifts have influenced spatial organization and land use. The inclusion of major infrastructure projects, like the Outer Ring Road, reflects the city's response to increasing mobility demands and urban sprawl.

Accompanying each timeline entry are photographs or illustrations that visually capture the essence of each milestone, enhancing the reader's understanding of the city's physical and cultural transformations.

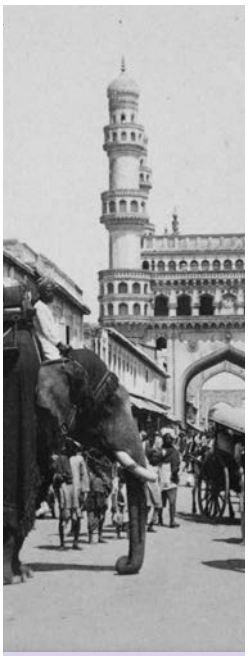
16th century

ORIGINS FROM 1TH CENTURY

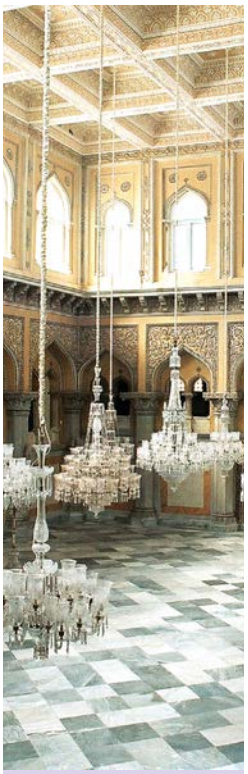


1501-1560

1562



1591



1750-1880

Golconda

Golconda Fort, built in the 16th century by the Qutb Shahi dynasty, holds immense historical significance in Hyderabad's timeline. Renowned for its robust architecture, it withstood various sieges due to its strategic hilltop location and massive defensive walls. The fort's intricate water supply system, sophisticated acoustics, and impregnable gates ensured its survival for over a century as a thriving hub of trade and politics. Golconda's decline in the late 17th century, after its conquest by the Mughal emperor Aurangzeb, marked a pivotal moment, leading to the establishment of Hyderabad city in 1591.

Katora Houz; Water canals and aquaducts

Built during the reign of the Qutb Shahi dynasty, Katora Houz is an artificial lake near the Golconda Fort. It served as a critical water reservoir for the fort and the surrounding areas.

The Qutb Shahi rulers utilized the Musi River as a key water source for Golconda and Hyderabad. They constructed an elaborate network of canals and aqueducts to divert water from the Musi into the walled city and surrounding settlements. This early system was essential for meeting the city's drinking and irrigation needs.

Hussain Sagar

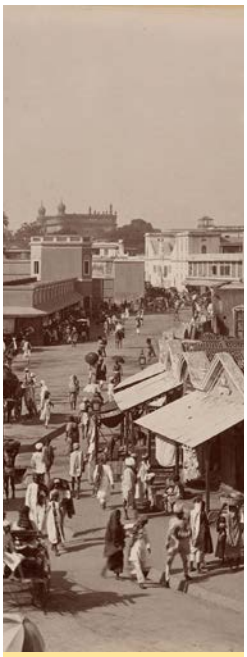
Built by Ibrahim Quli Qutb Shah in 1562, Hussain Sagar was initially constructed to supply irrigation water to the city and nearby villages. Over time, it became one of Hyderabad's most important water sources, providing drinking water to parts of the city until the 1930s. The lake is located between Hyderabad and Secunderabad, creating a natural and cultural landmark that facilitated the development of both cities.

Charminar and city core

Hyderabad was founded by the Qutb Shahi dynasty in 1591 on the banks of the Musi River. The city's early morphology was centered around the Charminar, forming a radial urban layout. It was designed as a fortified city with concentric layers of residential, commercial, and administrative zones.

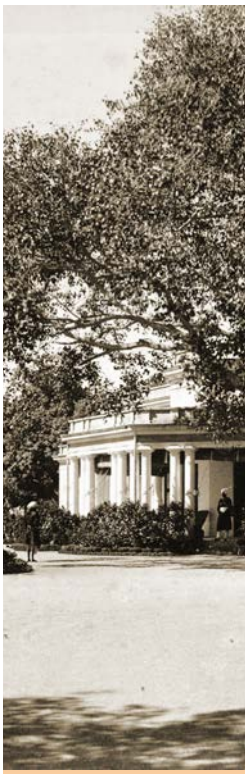
Chowmahalla Palace

Chowmahalla Palace, built in the 18th century, served as the official residence of the Nizams of Hyderabad. Renowned for its architectural grandeur, it reflects a blend of Mughal, Persian, and European styles. It was the site of official ceremonies, including the coronation of Nizams. Restored in recent years, Chowmahalla Palace remains a significant cultural landmark, symbolizing the opulence and political power of the Nizams.



1798

1805



1806

1806

Begum Bazaar

The growth of Begum Bazaar was integral to the westward expansion of Hyderabad. With the bazaar acting as a commercial magnet, surrounding neighborhoods like Mallepally, Asif Nagar, and Aghapura developed into dense, urbanized areas, expanding the city's footprint beyond its traditional core. This westward expansion laid the groundwork for future commercial and residential development in other western suburbs

Subsidiary Alliance

The Subsidiary Alliance of 1798 was a strategic agreement between the Nizam of Hyderabad and the British East India Company, orchestrated by Lord Wellesley. Under this treaty, the Nizam agreed to maintain British troops within his territory and pay for their upkeep. In return, the British promised military protection against external threats. This alliance effectively reduced the Nizam's autonomy, making Hyderabad a protectorate under British influence.

British Residency

During the Nizam's rule (1724-1948), the city expanded significantly, particularly after the British Residency was established. Key areas such as Begum Bazar and Secunderabad (the twin city, established in 1806) emerged during this period. The growth pattern during this time was largely organic and shaped by trade, with the bazaars and local markets playing a central role.

Secunderabad Cantonement

By stationing British troops in Secunderabad, the city expanded northwards with the development of a British military cantonment. This created a distinct urban axis between Hyderabad and Secunderabad, influencing mobility and infrastructure development.

Mir Alam Tank

Constructed by Mir Alam Bahadur, the then prime minister of Hyderabad, Mir Alam Tank is a 13-square-kilometer reservoir on the southern outskirts of the city. Its unique multi-arched bund made it a significant engineering feat for its time. Mir Alam Tank provided drinking water to Hyderabad for nearly 150 years and was one of the key sources of freshwater for the city during the 19th and early 20th centuries.

1846

1851

1874

1880s

1893

Public gardens / Bagh-e-Aam

Bagh-e-Aam, or Public Gardens, was built in 1846 during the Nizam's reign. Originally covering 54 acres, it included a 7-acre pond. Over time, parts of the garden were repurposed for Hyderabad Railway Station, Jubilee Hall, and various state buildings like the State Museum, Telugu University, State Legislative Assembly, Jawahar Bal Bhawan, Indira Priyadarshini Auditorium, and Lalitha Kala Thoranam.

Cantonment Hospital/ King Edward Memorial Hospital / Gandhi Hospital

Established in 1851 as King Edward Memorial Hospital, the Cantonment Hospital, later renamed Gandhi Hospital, was built to serve the medical needs of the British military stationed in Secunderabad. Over time, it expanded to cater to the local population and remains one of Hyderabad's major public healthcare institutions today.

Secunderabad Railway Station

Secunderabad Railway Station, established in 1874, is one of the oldest and most significant railway stations in South India. Originally built during the British era to serve the Secunderabad cantonment, it became a major transportation hub, connecting Hyderabad with various parts of India. The station's strategic location fueled the city's growth by enhancing trade, mobility, and urban expansion. Over the decades, it has undergone numerous upgrades, becoming a vital part of the South Central Railway network.

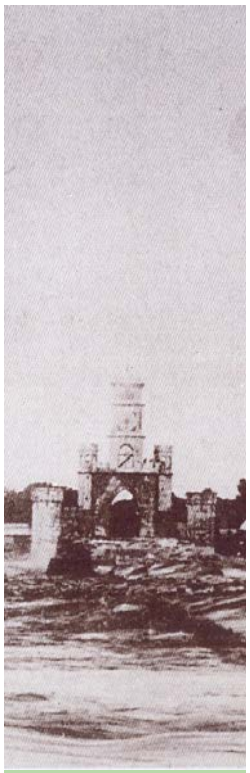
Factories/Mills around Hussain Sagar

In the 1880s, the Hussain Sagar area became an industrial hub with the establishment of mills like Hyderabad Spinning and Weaving Mills and Sirpur Paper Mills, drawn by access to water and transport routes. These industries boosted Hyderabad's economy but led to significant water pollution in Hussain Sagar. The factories einto the lake, gradually contaminating the water and damaging its ecological balance. The pollution also affected surrounding areas, compromising the lake's role as a water source and recreational space, and contributing to the environmental degradation of the Tank Bund region.

Falaknuma Palace

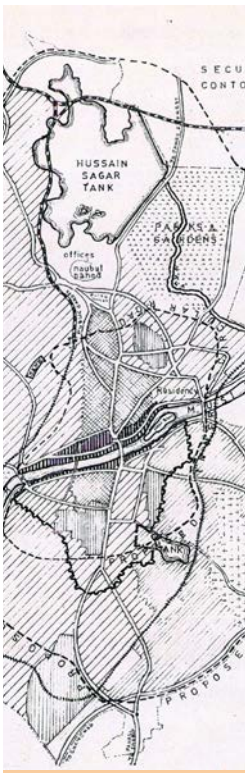
Falaknuma Palace, completed in 1893, played a significant role in the development of Hyderabad by symbolizing the Nizam's power and cultural sophistication. Built by Nawab Vikar-ul-Umra and later owned by Nizam Mahbub Ali Pasha, the palace showcased European architecture blended with Indian royal traditions. Its opulent design and strategic location atop a hill offered panoramic views of Hyderabad, reinforcing the city's status as a princely capital. As a center for hosting dignitaries and royal gatherings, Falaknuma Palace contributed to Hyderabad's global prestige and the expansion of its elite cultural and political networks during the late 19th century.

1897

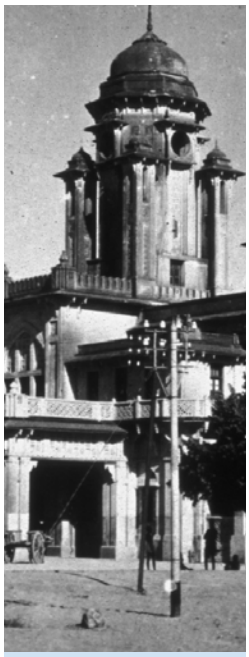


1908

1911



1912



1916

Fox Sagar Lake

Fox Sagar Lake, created in 1897, played a crucial role in Hyderabad's development towards north beyond Hussain Sagar, by providing water for irrigation and supporting industries around Jeedimetla and Kompally. The lake contributed to the growth of industries in the area, particularly in manufacturing and textiles. Over time, industrialization led to significant pollution, contaminating the lake with industrial waste and untreated sewage.

The Great Musi Floods

The Great Musi Flood of 1908 devastated Hyderabad when heavy rains caused the Musi River to overflow. On September 28, the floodwaters swept through the city, destroying homes, bridges, and infrastructure, and killing around 15,000 people. The disaster exposed the city's inadequate drainage systems and prompted reforms.

King Kothi

King Kothi Palace, built in 1911, served as the residence of the last Nizam of Hyderabad, Mir Osman Ali Khan. The palace played a significant role in Hyderabad's history as the seat of Nizam's governance and personal residence until he died in 1967. Its location also influenced the development of the surrounding area, contributing to Hyderabad's urban expansion during the early 20th century.

City Improvement Board

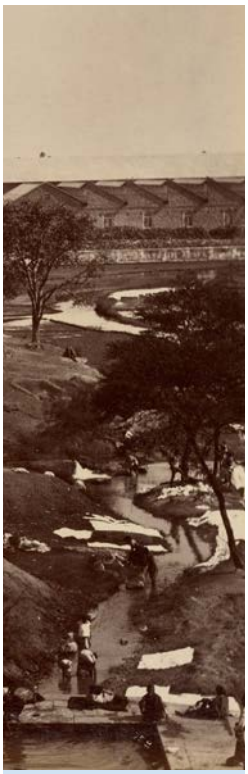
The Hyderabad City Improvement Board (CIB) was established in 1912 by the Nizam to address urban challenges following the devastation of the 1908 Musi River floods. Its primary goals were improving Hyderabad's sanitation, housing, and infrastructure. The CIB played a crucial role in modernizing the city by undertaking large-scale projects, such as constructing planned neighborhoods, widening roads, and creating public spaces along the Musi River. It also focused on water management and urban planning, laying the foundation for the city's organized growth and expansion throughout the 20th century.

Kachiguda Railway Station

Kachiguda Railway Station, built in 1916, is one of Hyderabad's oldest and most iconic railway stations. Designed during the reign of the Nizam, it was a critical junction connecting the city to the broader Deccan region and beyond. Its establishment significantly boosted trade and mobility. Today, it stands as a heritage landmark.

1918

1919



1920

1920-1927

1931

MUSI CORRIDOR DEVELOPMENT

Osmania Arts College/University

Osmania University's location in Adikmet in eastern Hyderabad created a new urban node outside the traditional city center, developing surrounding areas like Amberpet, Tarnaka, and Habsiguda. This marked the beginning of Hyderabad's eastward expansion. Faculty housing, student hostels, and related amenities emerged, transforming the area from a relatively rural hinterland into a more urbanized zone.

Osmania General Hospital/ High Court

The development of the Musi River corridor in the early 20th century led to the construction of two of Hyderabad's most iconic landmarks: Osmania General Hospital and the High Court, both completed in 1919. Following the catastrophic Musi flood of 1908, these structures were part of Nizam's efforts to modernize the city. Their strategic placement near the Musi signified the city's new identity, integrating civic infrastructure with flood management while enhancing the public realm along the river corridor.

Dewan Bahadur Ramgopal textile Mills, Tank Bund

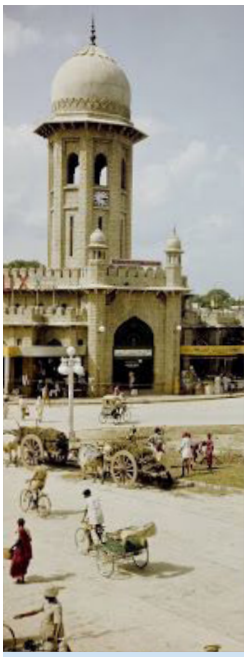
Dewan Bahadur Ramgopal Textile Mills, established in 1920 near Hyderabad's Tank Bund, was one of the earliest major industrial enterprises in the city. It played a crucial role in the local economy. However, its proximity to Hussain Sagar led to industrial waste being discharged into the lake, causing significant water pollution. It is now defunct and in a state of neglect. After shutting down operations in the late 20th century, the mill's land and buildings have largely fallen into disrepair.

Osman Sagar and Himayat Sagar

After the devastating Musi River floods of 1908, the Nizam government undertook major flood control and water supply initiatives, resulting in the construction of Osman Sagar (1920) and Himayat Sagar (1927) reservoirs. Located on the Musi River's tributaries, these reservoirs controlled flooding and became key drinking water sources for Hyderabad.

Town Improvement Trust of Secunderabad

The Town Improvement Trust of Secunderabad, established in 1931, was responsible for planning and managing the urban development of Secunderabad, a key military and civilian area. The Trust played a crucial role in modernizing Secunderabad, addressing issues related to urban sprawl, and laying the groundwork for future development.



1935

1948

1947
INDEPENDENT
INDIA

1948-1956

1956

1965

Mozamjahi Market

Mozamjahi Market, built in 1935 during the reign of the last Nizam, is one of Hyderabad's iconic landmarks. was designed to serve as a well-organized commercial hub for fruits, vegetables, and other goods, addressing the growing need for a central marketplace while improving the city's urban landscape. The market's strategic location and architectural grandeur made it a key commercial and social hub for the city.

Annexation of Hyderabad State

Following India's independence in 1947, the Nizam of Hyderabad opted to remain independent rather than join India or Pakistan. This increased tensions and unrest, prompting the Indian government to initiate Operation Polo in September 1948. Indian military forces marched into Hyderabad, clashing with the Razakars, a paramilitary group supporting the Nizam's independence. The operation resulted in Hyderabad's integration into the Indian Union, but not without violence, leading to significant casualties.

Hyderabad State

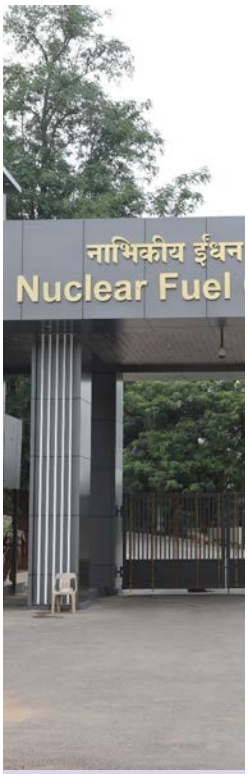
From 1948 to 1956, Hyderabad State underwent significant political and social transformation. Following the military annexation of Hyderabad in 1948, the state was integrated into the Indian Union. This period saw the consolidation of power under Nizam's administration and the implementation of various reforms to modernize governance, education, and infrastructure. The region also experienced economic growth, driven by agricultural advancements and the establishment of industries.

Capital of Andhra Pradesh State

In 1956, with the formation of the newly reorganized state of Andhra Pradesh, Hyderabad was designated as its capital. This followed the States Reorganisation Act, which merged the Telugu-speaking regions of the former Hyderabad State with Andhra State. With its established infrastructure and cultural significance, Hyderabad became the administrative and political center of the new state, playing a pivotal role in its governance and growth until the bifurcation of Andhra Pradesh in 2014.

ECIL industry, Cherlapalli

As a public sector enterprise, ECIL specializes in manufacturing electronic equipment and systems, attracting skilled labor, and fostering technological innovation. The influx of ancillary industries and workforce transformed Cherlapalli and nearby areas into vibrant industrial clusters.



1971

1974

1975

1976

1980

Nuclear Fuel Complex

Areas like Malkajgiri and Kanchanbagh witnessed rapid urbanization as a result. The NFC contributed to Hyderabad's industrial landscape and enhanced the city's status as a center for technological and scientific advancement, transforming its urban fabric.

University of Hyderabad

Established in 1974, the University of Hyderabad significantly influenced the city's morphology by fostering educational and residential development in its vicinity. Located on a sprawling campus in Gachibowli, the university attracted students, faculty, and researchers from across the nation and abroad, driving demographic changes and urban growth in the surrounding areas.

HUDA - Hyderabad Urban Developemt Authority

Established in 1975, the Hyderabad Urban Development Authority (HUDA) played a crucial role in shaping the city's morphology through structured urban planning and development. HUDA was tasked with regulating land use, promoting housing projects, and enhancing infrastructure, facilitating organized growth in Hyderabad and its surrounding areas. The authority's planning initiatives led to developing key residential and commercial zones, such as Banjara Hills and Jubilee Hills. By introducing zoning regulations and infrastructure projects, HUDA helped manage urban sprawl and transition from a historically compact city to a more dispersed metropolitan area, laying the foundation for future urban expansion.

Urban Land Ceiling Act

Commissioner of Land Administration enforces the Urban Land Ceiling Act of 1976 limiting urban plot size to 4,000 sq ft (370 m2) and outlawing land sale along the Musi River. The main reason they wish to enforce this Act, according to the Secretary to the Chief Commissioner of Land Administration, is so that farmers do not sell the land and hurt air quality due to the loss of green area.

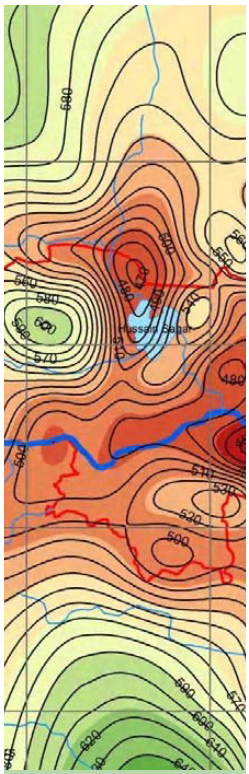
Hussain Sagar Lake Reclaimation and Necklace Road

The development of Necklace Road around the Hussain Sagar Lake in the 1980s was a pivotal moment in shaping the central part of Hyderabad. The road, designed as a recreational zone, helped beautify the lake's surroundings and connected major areas like Secunderabad, Tank Bund, and Sanjeevaiah Park.

1981

Heritage Conservation Committee - a list of built and natural heritage

The Heritage Conservation Committee under HUDA was formed by the state government in 1981 to retain architectural, historical, and social value of buildings. Almost 70% of heritage buildings are in private hands. Heritage structures include buildings, monuments, rock structures, etc.



late 1980s

Free electricity scheme for borewell digging by NTR Govt.

The NTR government's free electricity scheme for borewell digging, initiated in the late 1980s, significantly impacted groundwater depletion in Hyderabad. By providing subsidized electricity, the scheme incentivized the widespread drilling of borewells, leading to a dramatic increase in groundwater extraction for agricultural and domestic purposes.

1986

Ban of wet cultivation in city premises

In 1986, the Andhra Pradesh Government banned wet cultivation on city premises, and the power (electricity) supply to the farmers for irrigation was cut off.

1989

Singur Dam

Located on the Manjira River, Singur Dam was built in 1989 to provide a secure drinking water supply to Hyderabad and surrounding areas. The dam helped alleviate Hyderabad's growing water demands by supplying the city around 15 TMC (thousand million cubic feet) of water. In addition to drinking water, Singur Dam is also used for irrigation and supports aquaculture. The project became vital in ensuring Hyderabad's water security as the city's population surged. It reduced its reliance on traditional water bodies, and allowing urban expansion into areas previously constrained by water scarcity.

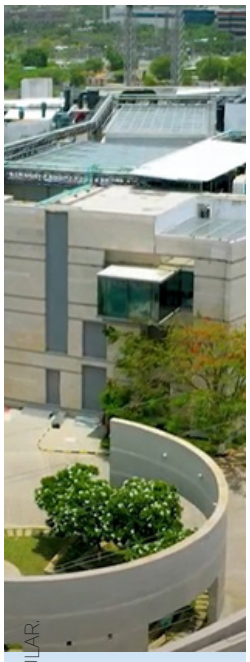
1995

Town survey declaring Musi river bed lands from agricultural to commercial

Until 1995, a land tax was collected (Rs. 480 per acre/year) considering all the land on the Musi bed as agricultural land. But after 1995, the Town Survey declared the land as Commercial land and asked the farmers to pay a commercial tax on that land. There is no legal procedure with the Town Survey regarding the transfer of ownership rights or title of the land.

1990s

2000- WORLD LAKE CONFERENCE BY HUDA

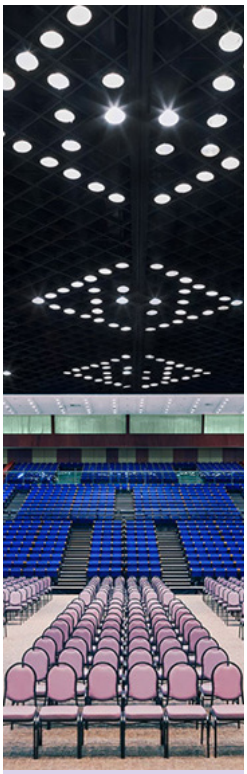


WORD 'LAKE' BECAME POPULAR.

2000s

2003

2004



2006

Hitech City and IT Corridor

The development of HITEC City (Hyderabad Information Technology and Engineering Consultancy City) began in the late 1990s to make Hyderabad a global IT hub. The creation of HITEC City in Madhapur and its extension into Gachibowli transformed Hyderabad into one of India's top destinations for information technology, outsourcing, and software services.

Genome Valley

Genome Valley has positioned Hyderabad as a leader in life sciences, biotechnology, and pharmaceuticals. It houses many national and international companies engaged in R&D and manufacturing. The project has attracted significant investment in biotech and pharmaceuticals, contributing to the city's economic growth and transforming the northern outskirts of Hyderabad into a leading global bioscience hub.

MMTS - Multi Modal Trasnport System

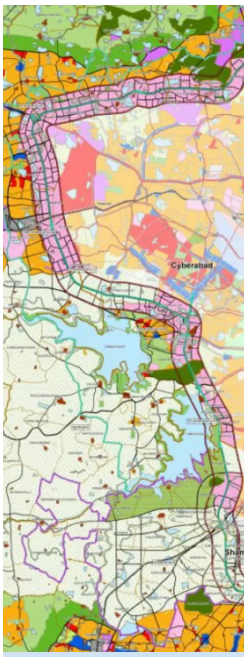
The Hyderabad Multi-Modal Transport System (MMTS), launched in 2003, significantly improved connectivity between Hyderabad, Secunderabad, and surrounding suburbs, reducing road traffic and fostering transit-oriented development. It enhanced accessibility to peripheral areas, leading to urban expansion, especially in regions like Lingampally, Falaknuma, and HiTech City. The improved mobility prompted residential and commercial development around stations, transforming formerly underdeveloped areas into bustling zones.

Krishna Drinking Water Supply Board

This large-scale project was initiated in 2004 to divert water from the Krishna River, located about 120 km from Hyderabad, to meet the city's increasing drinking water needs. The project was implemented in phases, with a network of pumping stations, pipelines, and treatment plants delivering over 16 TMC of water per year. The Krishna Drinking Water Project played a critical role in reducing Hyderabad's dependency on local water bodies like Osman Sagar and Himayat Sagar, which had begun to suffer from overuse and pollution, ensuring a more reliable and sustainable water supply for the growing city.

International Convention Centre

The convention center has had a major impact on business tourism, attracting multinational corporations and global conferences, further cementing Hyderabad's reputation as a global business destination.



2008

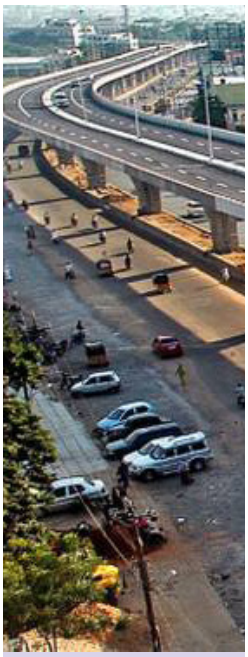
HUDA became HMDA expanding metropolitan boundaries

The expansion facilitated integrated urban development, better infrastructure planning, and regulation of real estate growth across a larger metropolitan area. HMDA's policies encouraged development in peripheral zones, promoting decentralization and reducing pressure on the city center, thus transforming Hyderabad's urban morphology into a polycentric, sprawling metropolis.

2008

Rajiv Gandhi International Airport

The opening of the Rajiv Gandhi International Airport in 2008 was a landmark in Hyderabad's global connectivity. It replaced the Begumpet Airport and is now one of India's busiest airports. The airport catalyzed the development of the surrounding areas, transforming them into commercial and industrial hubs.



2009

Inner Ring Road and PV Narasimha Rao express way

The PV Narasimha Rao Expressway (also known as the Hyderabad Elevated Expressway), built in 2009, connects the Hyderabad city center with the Rajiv Gandhi International Airport, reducing travel time significantly. Along with the Inner Ring Road, the expressway improved connectivity between the central and southern parts of the city, reducing traffic congestion and improving access to the airport.

2014

Telangana State Formation

The bifurcation led to increased migration from rural areas, resulting in rapid urbanization and the expansion of residential and commercial spaces in suburban areas like Gachibowli and Kukatpally.

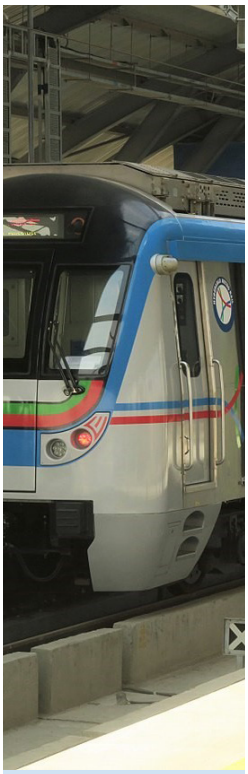
mid 2000s -2016

Outer Ring Road proposal and inauguration

Launched in the mid-2000s and completed in phases by 2016, the ORR is a 158-kilometer expressway encircling the Hyderabad Metropolitan Region. It has facilitated urban expansion into the city's periphery, unlocking vast land for real estate, industrial, and IT development, particularly in areas like Gachibowli, Hi-Tech City, and Shamshabad. It also improved access to the Rajiv Gandhi International Airport and the Genome Valley biotech cluster.

mid 2010s

2016



2017

Now

Strategic Road Development Plan - SRDP

Launched in the mid-2010s, the SRDP aims to ease traffic congestion in critical areas of the city by constructing flyovers, underpasses, grade separators, and junction improvements. The SRDP is a city-wide project focusing on easing traffic bottlenecks at high-traffic zones such as Ameerpet, Panjagutta, and LB Nagar. Key projects under SRDP include the Durgam Cheruvu Cable Bridge and numerous flyovers in and around Hi-Tech City.

Mission Bhagiratha

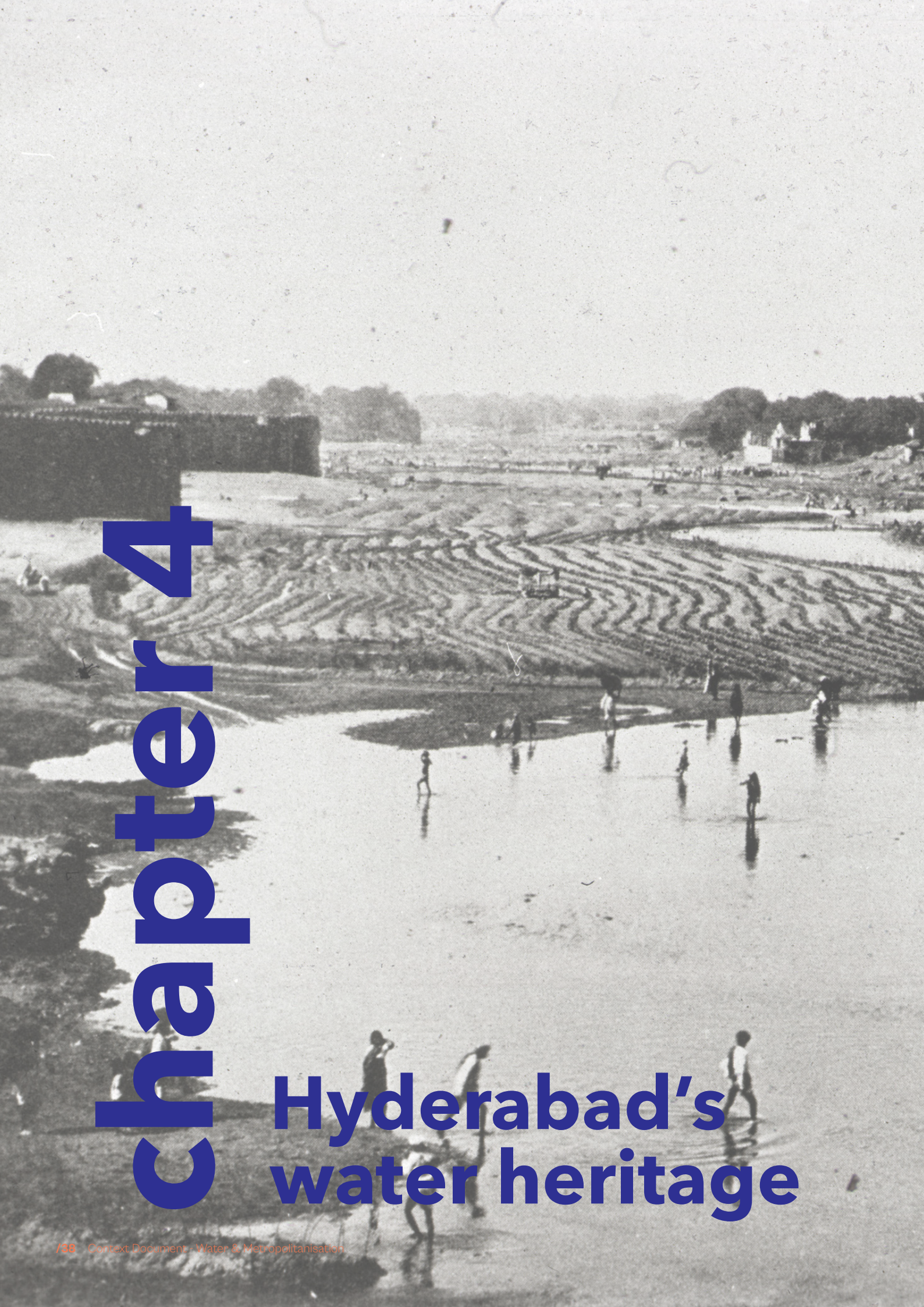
The Telangana government launched this massive drinking water supply project to provide clean and safe drinking water to all households across the state, including the Hyderabad Metropolitan Region. The project aims to ensure sustainable water supply through a network of reservoirs and pipelines from the Godavari and Krishna rivers.

Hyderabad Metro Rail

The Hyderabad Metro Rail project, one of the world's largest public-private partnership metro systems, was launched in 2017. The metro has three lines: Red (Miyapur-LB Nagar), Blue (Nagole-Raidurg), and Green (Jubilee Bus Station-MGBS), with further extensions planned. The metro significantly enhanced urban mobility, reducing travel time across the city, especially in congested areas like Ameerpet, Begumpet, and Hi-Tech City. It has reshaped commuting patterns and led to new commercial zones around metro stations, boosting retail and real estate development.

Water & Metropolitanisation

The Telangana government is launching a large-scale initiative to rejuvenate the Musi river ecosystem. The government in collaboration with Les Ateliers is holding the international urban planning workshop "Water and metropolitanisation" from 25 Novto 06 Dec in Hyderabad.



chapter 4

Hyderabad's water heritage

Fig 15: Musi River (1887)
Source: Getty Museum collection, Lala Deen Dayal

4.1 Water systems - Natural, man-made, and intangible

The Deccan has a dry climate and does not possess snow-fed rivers to irrigate its lands. Historically, it has depended on ground water and the yearly monsoon. And hence, water in Hyderabad serves as a vital, dynamic, and interconnected network, essential for both ecological balance and urban development. The water system in Hyderabad can be broadly categorized into two types: riverine system and lake system. The riverine system consists of the Musi River and the large reservoirs that feed it: Osman Sagar and Himayat Sagar in the west and Hussain Sagar in the heart of the city. The lake system is more granular, characterized by small and medium tanks that provided a decentralized network of water supply and food production. The riverine system was responsible for holding large quantities of water and transporting it outside the city while the lake system fed it by draining stormwater from the city.

But this network is much complex than it appears. It can also be understood through three distinct categories: natural water bodies and ecological heritage; manmade water infrastructure heritage; and intangible water heritage. Each category reveals a unique aspect of how water shapes the identity and functionality of the city.

Natural Water Bodies and Ecological Heritage

Hyderabad is rich in natural water bodies, including rivers, lakes, and wetlands that form an intricate surface water network. The Musi River, which flows through the city from west to east, is the primary river, historically serving as a significant ecological element in the region. However, being a non-perrennial river, rarely it served the city as a reliable drinking water source. The city is also home to several lakes, formed due to the natural terrain and catchments providing recreational spaces and playing a crucial role in biodiversity conservation.

The ecological heritage of these water bodies includes wetlands that support diverse flora and fauna, helping maintain the city's ecological balance. These natural water systems are integral to the urban landscape, influencing local climate, groundwater recharge, and urban biodiversity. However, rapid urbanization and pollution threaten their health, necessitating sustainable management practices.

Manmade Water Infrastructure Heritage

Hyderabad's history is marked by impressive manmade water infrastructure that has evolved over centuries. For retention of monsoon rainwater, an extensive network of ponds, tanks, and canals were constructed over time across the kingdom by the Qutb Shahis or the Nizams. Notable examples include the Hussain Sagar or Mir Alam tank, which showcase the ingenuity of early water management systems.

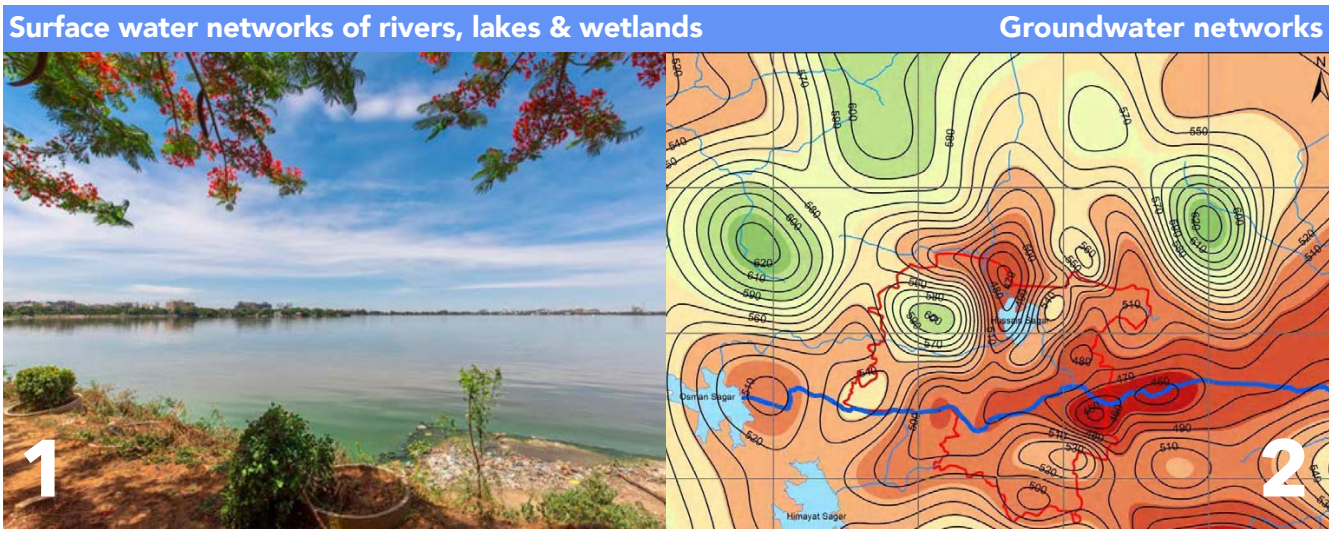
Additionally, inverted water architecture, such as stepwells, is an essential feature of Hyderabad's water heritage, highlighting the traditional methods of water conservation. For accessing groundwater during dry seasons through aquifiers, several stepwells were built throughout the region for irrigation as well as domestic use. However, the recent developments saw a significant decline in these structures either through encroachment after filling up the stepwells, or them being turned into garbage dumping sites. On a positive note, the recent governments have started to revive these structures and acknowledge their importance in water conservation.

Intangible Water Heritage

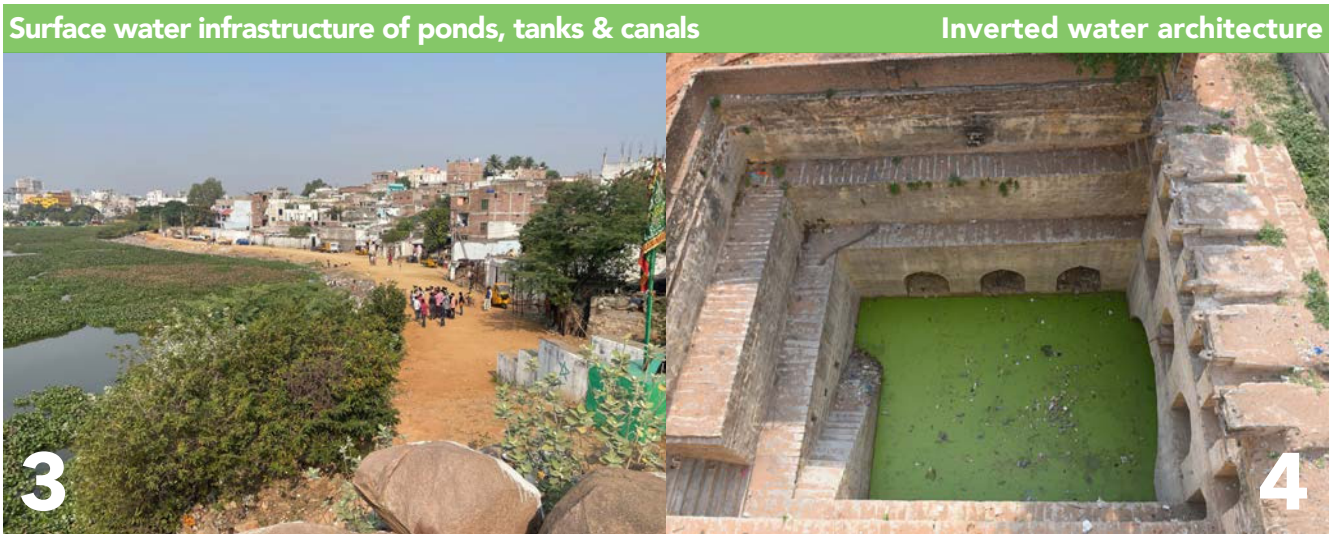
Intangible water heritage encompasses the cultural, spiritual, and digital aspects of water in Hyderabad. Water holds significant cultural and spiritual importance in the region, often associated with festivals, rituals, and community gatherings. Also, each of these tank bunds, across Telangana and Hyderabad, have a small temple on the sluice, known as the Katta Maisamma, literally meaning 'Goddess of the Bund', which are revered to keep the bund intact and the water plenty. Local traditions celebrate the water bodies and the goddess, fostering a sense of community and belonging among residents.

In recent years, digital innovation has emerged as a vital component of urban water governance. Smart technologies are being integrated into water management systems, enhancing efficiency and transparency. Digital platforms facilitate community participation, allowing citizens to engage in water conservation efforts, report issues, and access information about water quality and availability.

Understanding water in Hyderabad as a dynamic and interconnected network highlights its multifaceted role in the city's development and identity. By acknowledging the significance of natural and manmade water bodies alongside cultural and digital heritage, stakeholders can implement sustainable practices that ensure the longevity and health of Hyderabad's water resources. This interconnectedness is essential for preserving ecological balance and enhancing the quality of life for the city's residents.



Natural *water bodies and ecological heritage*



Manmade *water infrastructural heritage*

Intangible *water heritage (spiritual, cultural and digital)*

Fig 16: The natural, man-made, and intangible water heritage of the metropolis

4.2 The Musi River

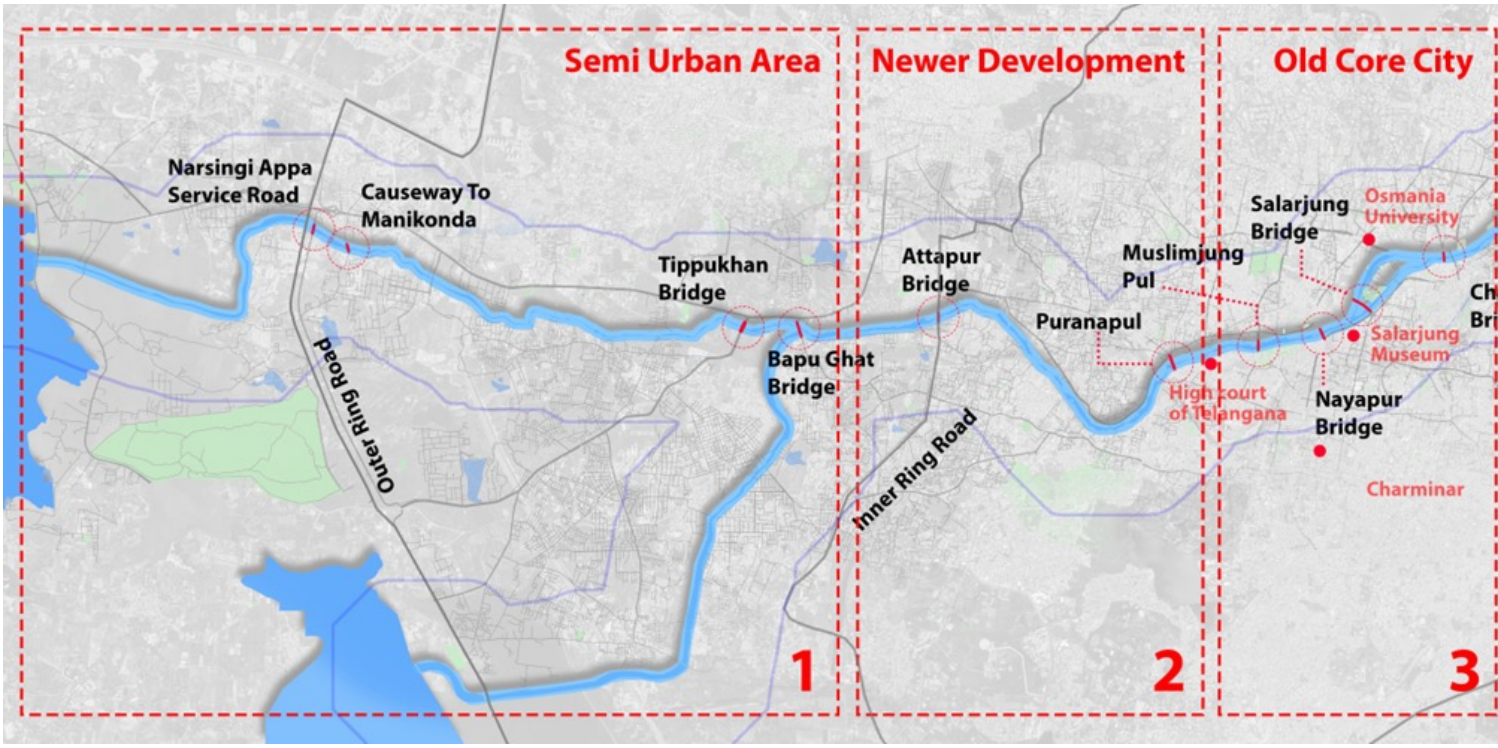
The River Musi, quietly flowing through Hyderabad, holds immense historical and cultural significance. Despite its deep connection to the city's origins, the Musi often receives less attention than it deserves from the city's admirers. Understanding its journey and impact requires deeper exploration.

A tributary of the River Krishna, the Musi has its source in the Anantagiri Hills, near Vikarabad, in the Rangareddy district, about 90 kilometers west of Hyderabad. Along with its twin tributary, the Easa (or Esa), the Musi flows southeast to eventually merge with the Krishna near Wazirabad in the Nalgonda district. Locally, the Musi is often compared to rivers like the Thames and Seine, as it flows through Hyderabad, physically dividing the old city from the new. The two tributaries, Musa and Esa, converge at the Tipu Khan Bridge near the iconic Golconda Fort.

Historically, the Musi River was known as the Muchukunda River. One of its tributaries played a role in the formation of Hussain Sagar, a large artificial lake built in 1562 to control flooding and provide water for irrigation and drinking. Later, significant water infrastructure developments continued with the construction of Osman Sagar in 1922 and Himayat Sagar in 1925. Both reservoirs were created to manage the Musi's waters and help mitigate the flood risks that the river posed to Hyderabad.

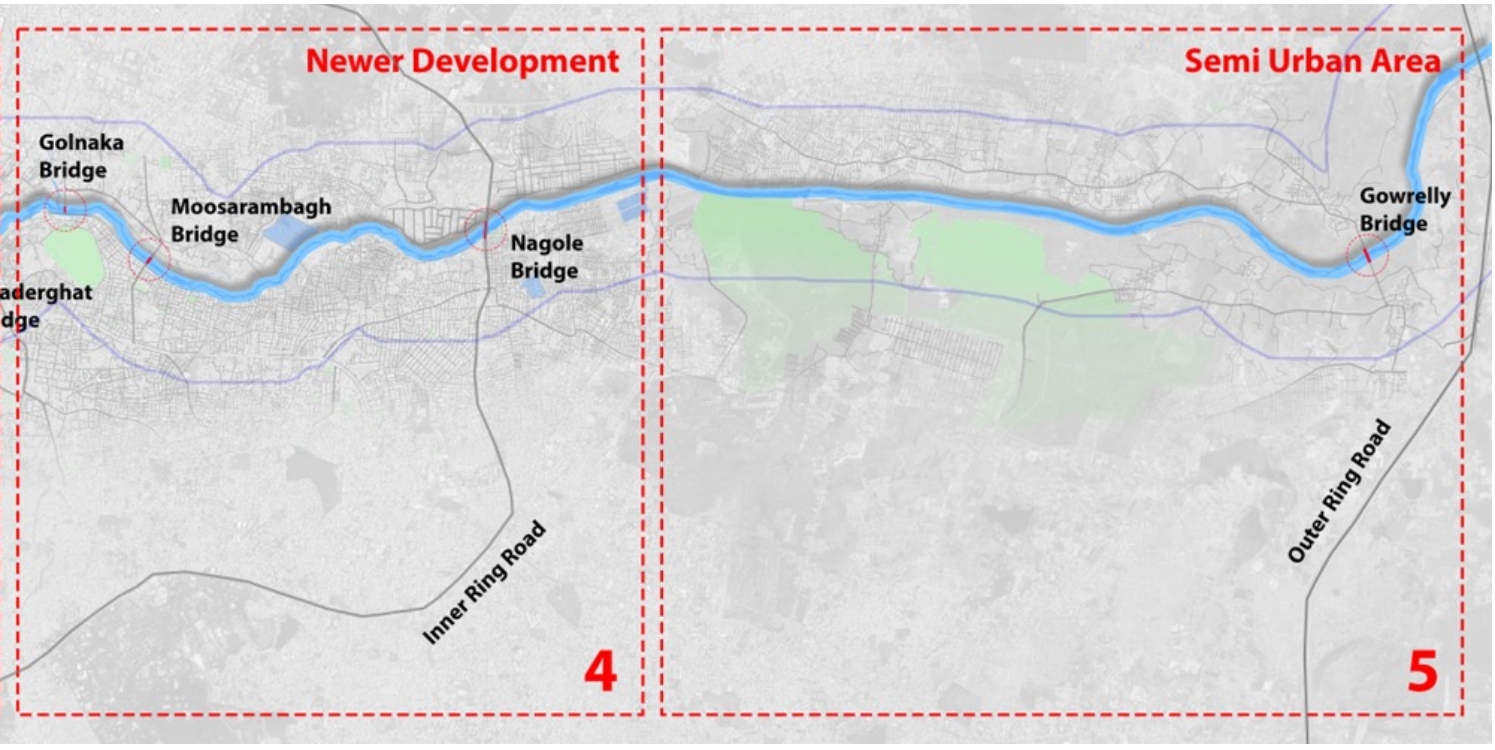
The Musi is largely dry in its upstream regions, except for the four months of the monsoon season, during which it receives heavy rainfall. While seasonal rains replenish the river, its role as a flowing body of water in urban Hyderabad is more complex. Domestic, hospital, and industrial wastewater from Hyderabad and Secunderabad flows into the Musi, transforming it into a perennial river within the city. This wastewater, much of which comes from urban drains, is used for agricultural purposes. In the case of Washermen communities, the washing is often supplemented by water pumped directly from the river or wells along its banks.

The Musi River continues to play a crucial role. However, its degradation due to unregulated waste dumping and industrial discharge has impacted both the river's ecosystem and the health of the communities relying on it.



Map 18: The River's Path Through Hyderabad - 55 km of Musi through Hyderabad City
Source: MRDCL, Government of Telangana

Map 17: Musi river as a tributary to the Krishna river; and location of Hyderabad on the banks of Musi with the Krishna river basin highlighted
Source: Kennan Peppar



MGBS to Uppal (10 Km)

Uppal to ORR-East (13 Km)

Fig 17: Musi at Afzalganj Bridge (source: Rahul Palagani)

Fig 18: Musi at Afzalganj with Dhobi ghat (source: Rahul Palagani)

Fig 19: Musi at Karwan (source: Nithya Khendry)

Fig 20: Musi near Osmania hospital (source: Nithya Khendry)

Fig 21: Musi and Puranapul bridge (source: Nithya Khendry)

Fig 22: Musi near Attapur bridge (source: Nithya Khendry)

Fig 23: Musi banks at Afzalgunj (source: Nithya Khendry)

Fig 24: Musi near Nagole (source: Nithya Khendry)

4.3 Network of Water bodies

Water in the Deccan is deeply connected to its unique topography, particularly in Hyderabad. The region is characterized by rolling hills, dotted with ancient igneous rock formations that are over 2.5 billion years old. These rocks act as natural water reservoirs, supporting rich ecosystems that include reptiles, birds, mammals, and various plant species. The higher elevations of the Deccan feature large granite formations, which gradually diminish in size as the terrain descends into valleys where fine soil allows natural stormwater streams to collect, creating lakes that sustain local agriculture.

Hyderabad's landscape undergoes dramatic seasonal changes. During the monsoon, the area becomes lush and green, but in summer, it turns dry and dusty. The city's water patterns are heavily influenced by the ridges and valleys within its metropolitan area. The northern ridges divide the city between the Godavari and Krishna river basins (refer Map-17), affecting water flow in the northern regions, while ridges to the west and south influence the water systems south of the Musi River. These ridges range from 600 to 700 meters in elevation, while the valleys, primarily in the northwest and eastern regions of the metropolitan area, sit at 350 to 500 meters above sea level.

Hyderabad is located at the confluence of a vast network of stormwater channels formed by thousands of interconnected lakes, all draining into the Musi River. This intricate system allowed the city to manage its water needs through a decentralized network, which helped prevent flooding during the monsoon. When one lake filled with rainwater, the excess would flow into the next through a surface-level connection, eventually leading to the Musi River, which carried the water out of the city safely.

"It has been demonstrated that these tanks are not isolated entities, but often found in clusters forming part of a hydrologically integrated system known as a 'cascade'"(Panabokke, 2002, Bandara 2010).

Historically, these lakes and tanks, known locally as kuntas and cheruvus, were part of an integrated hydrological system called a "cascade." This system, developed as early as the 4th and 5th centuries AD, stored, conveyed, and utilized water from seasonal rivulets, benefiting the entire ecosystem rather than just providing irrigation for crops. Unlike modern systems that focus on direct water supply to crops, this ancient system prioritized the overall water requirements of the environment. Over time, rulers like the Qutb Shahi and Asaf Jahi dynasties, as well as local chiefs and farmers, enhanced this network for both irrigation and revenue generation. The Deccan's undulating topography provided an ideal setting for these innovative structures, which ensured a reliable supply of drinking water, groundwater recharge, and irrigation.

Starting in the 12th century, the Kakatiya rulers began developing small tanks with earthen dams, which evolved over time under the Qutb Shahi, Mughal, and Asaf Jahi dynasties into a more sophisticated water management system. Stone masonry dams replaced earthen ones, allowing for greater water retention and supporting larger settlements. In addition, subterranean aqueducts were constructed to provide stormwater connections between distant lakes. Large reservoirs, such as Osman Sagar and Himayat Sagar, were built to regulate flooding along the Musi River, which had its banks raised to protect the city.

These advancements, combined with the stormwater network, supported Hyderabad's growth and fostered local communities. The lakes not only served as irrigation sources but also played cultural roles, supporting pastoralist communities like the Banjaras, recreational fishing, and religious festivals such as Bonalu. They also became significant elements in Hindu and Muslim funeral customs.

However, the last three decades have seen the disintegration of Hyderabad's lakes, leading to seasonal flooding, traffic congestion, and property damage. This breakdown of the water management system is evident both at the metropolitan and neighborhood levels. The unchecked urbanization and pollution have led to a loss of many traditional water bodies, resulting in increased flood risks and a decline in the quality of life for the city's residents. Restoring this historic water network is essential for the city's resilience against future climatic and urban challenges.

Fig 25: Alarming water quality at Hussain Sagar
(source: The Hindu)

Fig 26: Saroornagar lake overflows onto roads
(source: Deccan Chronicle)

Fig 27: Environmentally degraded lake at Manikonda
(source: X account of Dr. Sudhir Kumar MD)

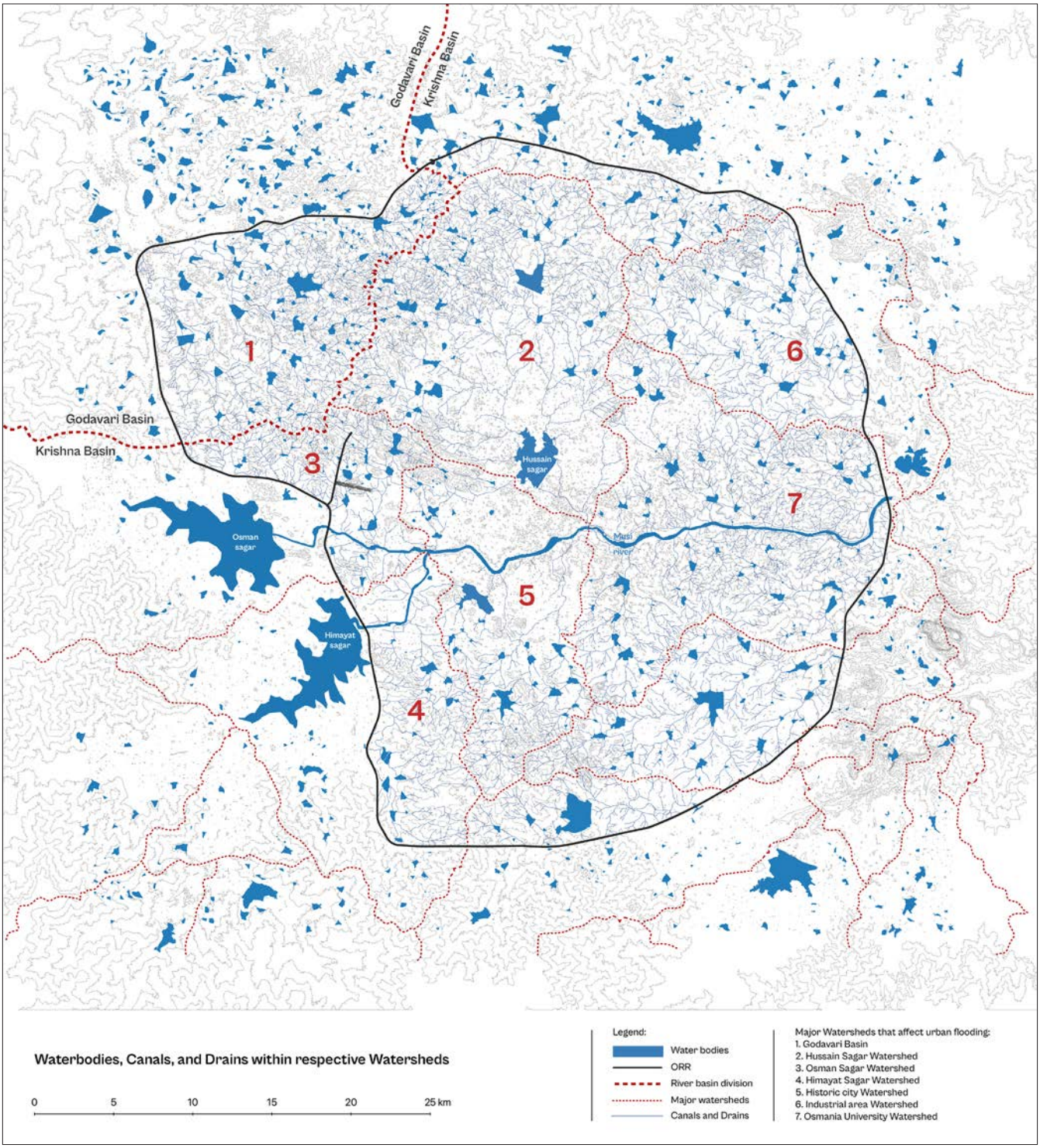
Fig 28: Mir Alam tank with close knit communities
(source: The Hindu)

Fig 29: Polluted Hameed Khan kunta
(source: The Hindu)

Fig 30: Cleaning of polluted Shah Hatim talab in progress
(source: X account of Khairatabad Zonal Commissioner)

Fig 31: Road flooded after Osmansagar and Himayatsagar reservoir gates were opened (source: The Siasat Daily)

Fig 32: Open stormwater drain between the Fathenagar STP and Rain Garden in Begumpet (source: The New Indian Express)



Map 19: Map of Hyderabad with Waterbodies, Canals, and Drains on contoured terrain within respected Watersheds
Source: Data gathered from NIUM and Open City Urban Data Portal; Created by Les Ateliers team

4.4 Cross-section of a tank

The nomenclature associated with water bodies such as tanks and lakes is varied and reflects their distinct characteristics and purposes.

Tanks in Telangana, often manmade, are primarily designed for the storage of water. Their functionality includes the regulated release of water to manage drainage systems or to meet agricultural needs. These structures play a vital role in ensuring the effective distribution and utilization of water resources, particularly in regions where water scarcity is a concern.

In contrast, **kuntas**–as seen in localities like Nallakunta in Hyderabad–refer to smaller, isolated percolation tanks. These are typically designed to collect and store rainwater, allowing for groundwater recharge and serving as important ecological and hydrological features within the landscape.

On the other hand, **cheruvus**, a term for lakes in Telugu, are more naturally aligned with the contours of the terrain. They often occupy depressions or valleys, reflecting the natural topography of the area. Unlike tanks and kuntas, cheruvus are generally larger and may serve various ecological functions, such as supporting biodiversity and providing habitats for aquatic life.

Together, these terms highlight the diversity of water bodies in the region, each serving unique purposes and contributing to the local environment and culture.

Cross-section of a tank:

The cross-section of a tank/lake typically reveals various functional zones, each playing a vital role in the tank/lake's ecology and water management.

- **Littoral Zone:** This is the shallowest area along the tank/lake's edge, where sunlight penetrates to the lakebed, supporting a high density of aquatic plants and wildlife. It's crucial for the lake's biodiversity, providing habitat and breeding grounds for fish, insects, and amphibians. Plants in the littoral zone also help stabilize sediments and improve water quality.
- **Shallow Part:** Beyond the littoral zone lies the slightly deeper areas that still receive sunlight but support fewer rooted plants. This zone aids in filtering sediments and provides food and shelter for aquatic species. It acts as a transitional area between the littoral zone and deeper water sections, helping maintain the lake's ecological balance.
- **Full Tank Level (FTL):** The Full Tank Level marks the lake's maximum capacity when it is fully filled. It is determined to prevent flooding while allowing maximum water storage. Structures within the lake's boundary are often regulated up to this level.
- **Bund Area:** The bund is an embankment built along the lake to contain its water and prevent overflow. Constructed typically from soil, stone, or concrete, the bund creates a clear demarcation of the lake's boundary and prevents water from spilling into surrounding areas. It also supports plants that can reduce erosion and contribute to the lake's ecosystem.
- **Surplus Weirs:** These structures release excess water from the lake when it exceeds the Full Tank Level, especially during the monsoon. Surplus weirs, or spillways, prevent flooding and maintain a stable water level. They direct overflow to nearby rivers, tanks, or drainage systems, protecting both the lake and surrounding areas.
- **Sluice Gates:** Sluice gates control water outflow from the lake to irrigate surrounding lands or maintain water levels in downstream areas. These gates are manually or mechanically operated, allowing controlled water release. They are essential in managing water supply for agricultural or urban use.
- **Biodiversity:** The buffer zone surrounds the lake consists of vegetation like grasses, shrubs, and trees that act as a natural barrier, reducing pollution by filtering runoff before it enters the lake. This zone prevents soil erosion and sedimentation, stabilizes banks, and serves as a crucial habitat for terrestrial habitat. Thumma chettu, Acacia tree, is often found at its edge.
- **Katta Maisamma:** In many lakes across Telangana and Hyderabad, Katta Maisamma is a small shrine located on the sluice gate or bund, dedicated to the Goddess of the Bund. Local communities revere Katta Maisamma, performing rituals to honor the goddess and seek protection for the lake. This shrine underscores the cultural significance of lakes in Hyderabad, reflecting a blend of spiritual belief and environmental stewardship.

This cross-sectional layout of a tank/lake demonstrates the interplay between ecological zones and structural components designed for environmental sustainability, water management, and cultural reverence.

An illustrated case of flood-prevention methods in Hussain Sagar:

On July 12, the water levels of Hussain Sagar rose to 513.44 meters above sea level, just above its Full Tank Level (FTL) of 513.41 meters, due to heavy rainfall. If the downpour had continued, downstream areas like Domalguda and Ashok Nagar would have faced severe flooding. However, thanks to a slightly elevated bund and well-designed ancient overflow channels, Hussain Sagar has effectively prevented flooding in the city.

Unlike other lakes in the region, which often threaten nearby areas during the monsoon season, the Hussain Sagar has proven resilient. The lake has established escape routes for excess water, including channels running from the Viceroy Hotel and beneath the Greater Hyderabad Municipal Corporation (GHMC) office, ultimately directing flow to the Musi River.

During the Qutb Shahi era, reservoirs incorporated surplus weirs and sluices for effective overflow management. These features allow for controlled water release, which has been critical for flood prevention. Historically, canals associated with Hussain Sagar were functional, enabling the regulated release of excess water during storms.

The Greater Hyderabad Municipal Corporation closely monitored water levels, updating the Revenue and Irrigation departments to ensure timely action. Fortunately, no flooding occurred from the Hussain Sagar. Even during the torrential rains of 2020, when the city faced widespread flooding, the Hussain Sagar did not overflow. In contrast, other water bodies like Balapur Lake caused destructive floods. The management of water levels at Hussain Sagar highlights the importance of historical water management practices in mitigating urban flood risks.

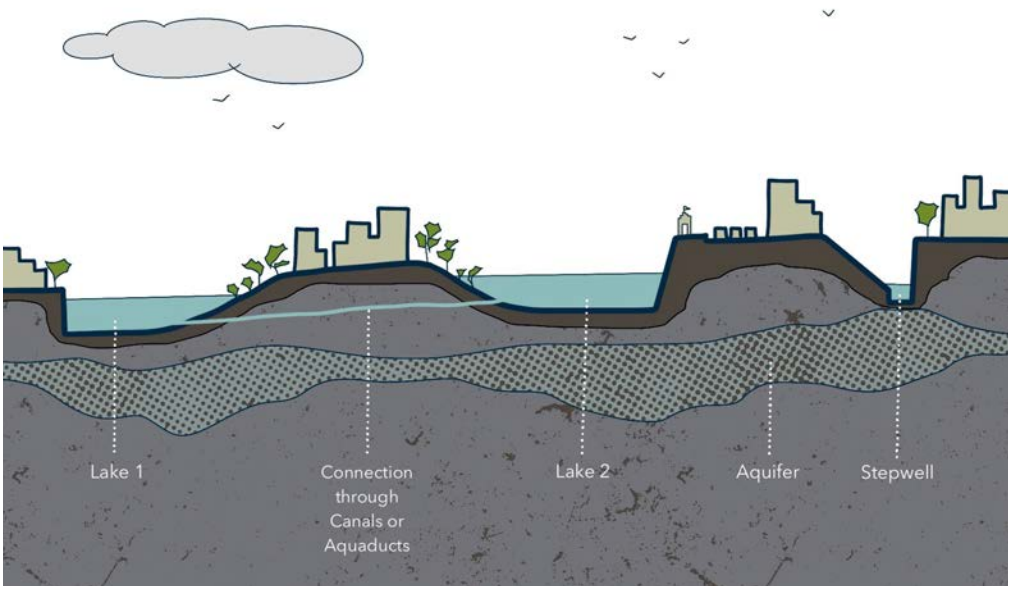


Fig 33: Conceptual sketch of the cascading network of lakes

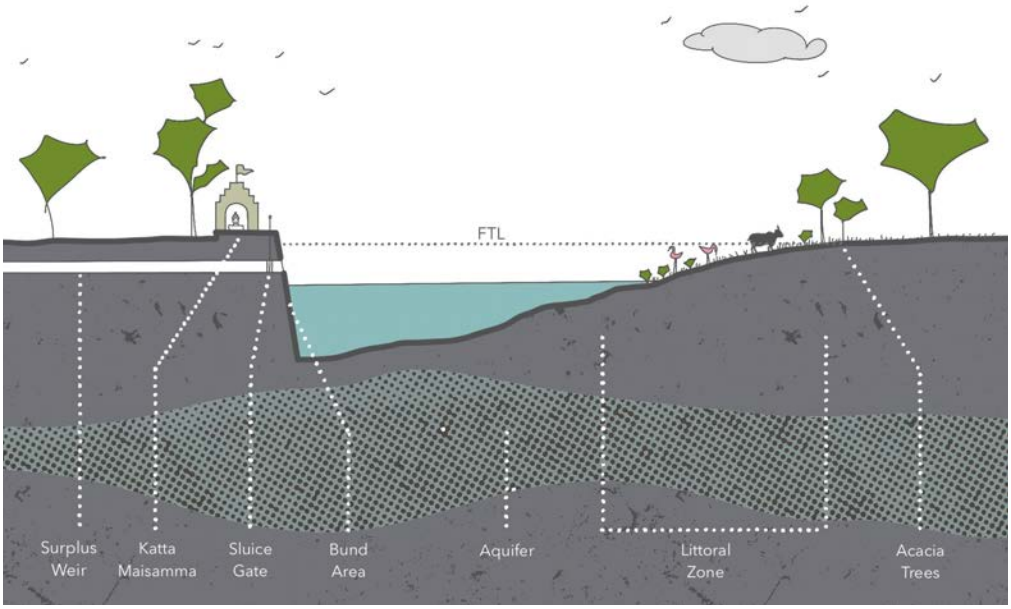


Fig 34: Conceptual cross-section of a lake

4.5 Hyderabad's ground water

Hyderabad's groundwater situation is at a critical point. Historically, Hyderabad relied on an intricate system of traditional water management practices, including wells, stepwells, and tanks, designed to capture and store monsoon rainfall for domestic and agricultural needs. This system effectively sustained Hyderabad's groundwater, allowing the city to flourish in an arid region. However, rapid urbanization and industrial growth have led to a significant decline in groundwater levels in recent decades. Once at an average depth of around 6 meters below ground level (BGL), groundwater levels in Hyderabad have now dropped to 12-15 meters, and in some densely populated or industrialized areas, levels have plummeted to over 20 meters BGL.

Hyderabad's geology, part of the Pre-Cambrian peninsular shield, is primarily composed of ancient Archaean crystalline rocks like granites, intruded by dolerite dykes. This rocky terrain exhibits structural features such as fractures, joints, faults, and fissures, which influence groundwater retention. Unlike porous soils, these hard rock formations store water only in their fractures and weathered zones, making natural groundwater recharge both challenging and slow.

Groundwater in Hyderabad exists under two conditions: phreatic (unconfined) in the weathered zone, where water fills large, shallow dug wells, and semi-confined or confined in deeper fractured zones, which are accessed through borewells. Up until the 1970s, large-diameter dug wells were sufficient to meet domestic and agricultural needs. Today, however, the demand for water has shifted to deep borewells, typically ranging from 100 to 300 meters in depth, to access groundwater in the fractured rock layers.

Rapid urban growth has drastically altered Hyderabad's land-use patterns, replacing natural and agricultural land with built-up areas. This development has not only diminished natural recharge zones but also impacted groundwater quality. Impermeable concrete surfaces prevent rainwater from penetrating the soil, reducing recharge rates to under 10% of pre-urbanization levels, as estimated by the Central Ground Water Board (CGWB). Furthermore, Hyderabad's inadequate sewerage and waste treatment facilities have led to the direct discharge of untreated domestic sewage and industrial effluents into the city's nalas (open drains) and streams. This has contaminated the groundwater, with high levels of pollutants such as fluoride, nitrates, and heavy metals now commonly detected in the aquifers.

Hyderabad, once self-sustained through local water resources like the Musi River and numerous lakes, has increasingly relied on external water sources since the 1960s to meet its growing demands. Local water sources like Hussain Sagar, Durgam Cheruvu, and Osman Sagar now contribute only a fraction of the city's requirements, primarily due to pollution and overuse. Hyderabad has turned to "imported" water from distant reservoirs like the Singur (in Medak district) and Nagarjuna Sagar (Krishna River), with water now traveling up to 120 kilometers to reach the city. The Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB) projects a growing gap between water demand and supply as the population continues to rise, emphasizing the urgency of sustainable water management.

Hyderabad is experiencing a severe groundwater crisis. The CGWB reports that approximately 50% of the city's groundwater resources are critically over-exploited. This means that the city's rate of groundwater extraction far exceeds the rate of natural recharge.

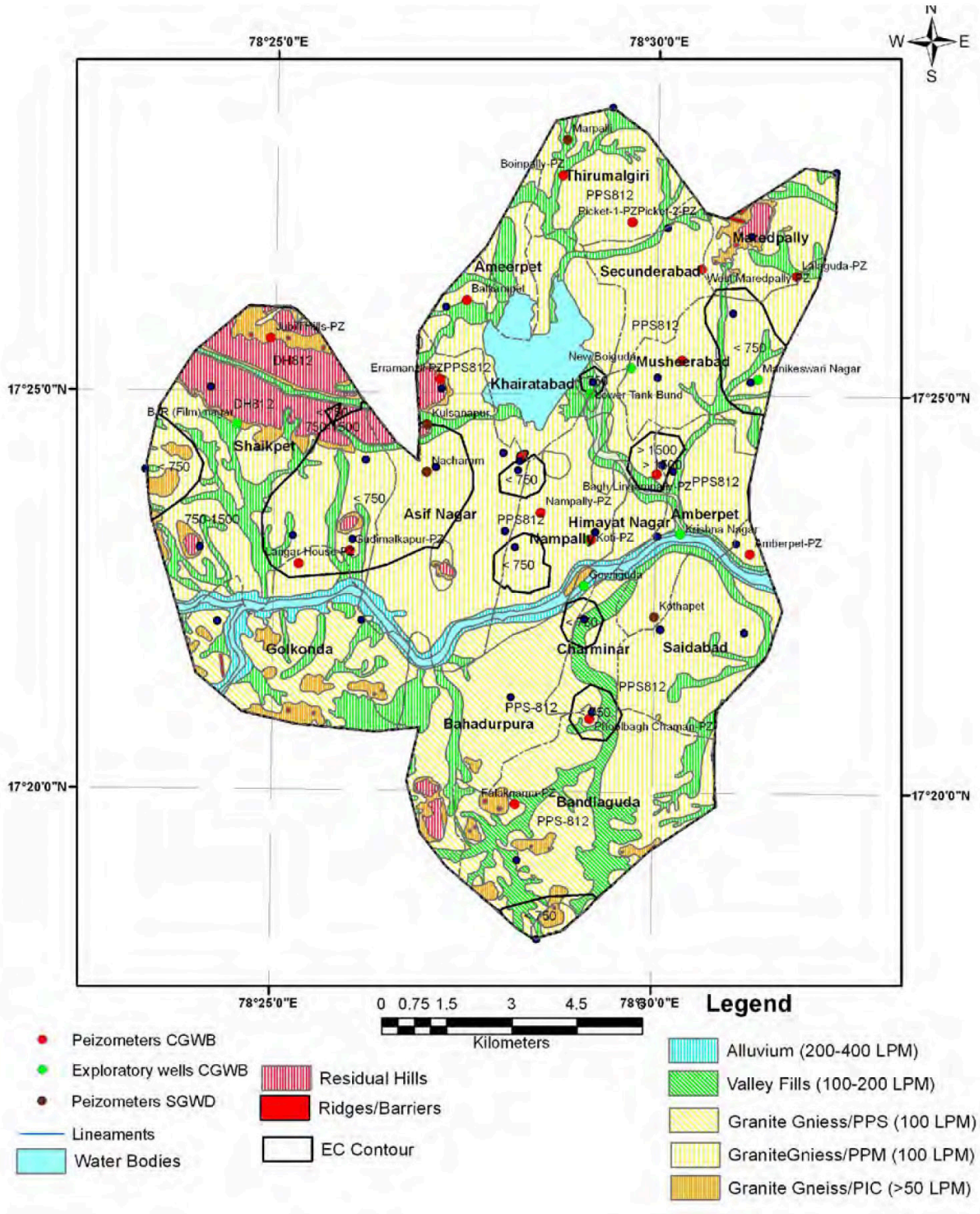
In central Hyderabad, pre-monsoon depths vary from about 6 meters (e.g., Erra Manzil) to 17 meters (e.g., Nampally), with post-monsoon levels ranging from as shallow as 1.4 meters (e.g., Alwal) to around 9 meters (e.g., West Maredpalli). In Secunderabad, pre-monsoon depths can go from 7 meters (Bolarum) to as deep as 23 meters (West Maredpalli), and post-monsoon depths typically range between 2.4 to 9.5 meters.

On the city's outskirts, pre-monsoon water levels are shallower, ranging from roughly 2 meters (Ahmedguda) to 8 meters (Patancheru), and improve slightly after the monsoon. In densely populated areas such as Boinpalli, Kothapet, and Sanath Nagar, groundwater levels can exceed 20 meters due to high demand.

Urban areas with high groundwater use, including Miyapur, Kukatpalli, and Dilsukhnagar, often see shallow hand pumps drying up. Near water bodies like Lower Tank Bund, Kapra, and Safilguda, groundwater is generally more accessible. Moderate depths (5-7 meters) are observed around the city's semi-urban and peripheral zones.

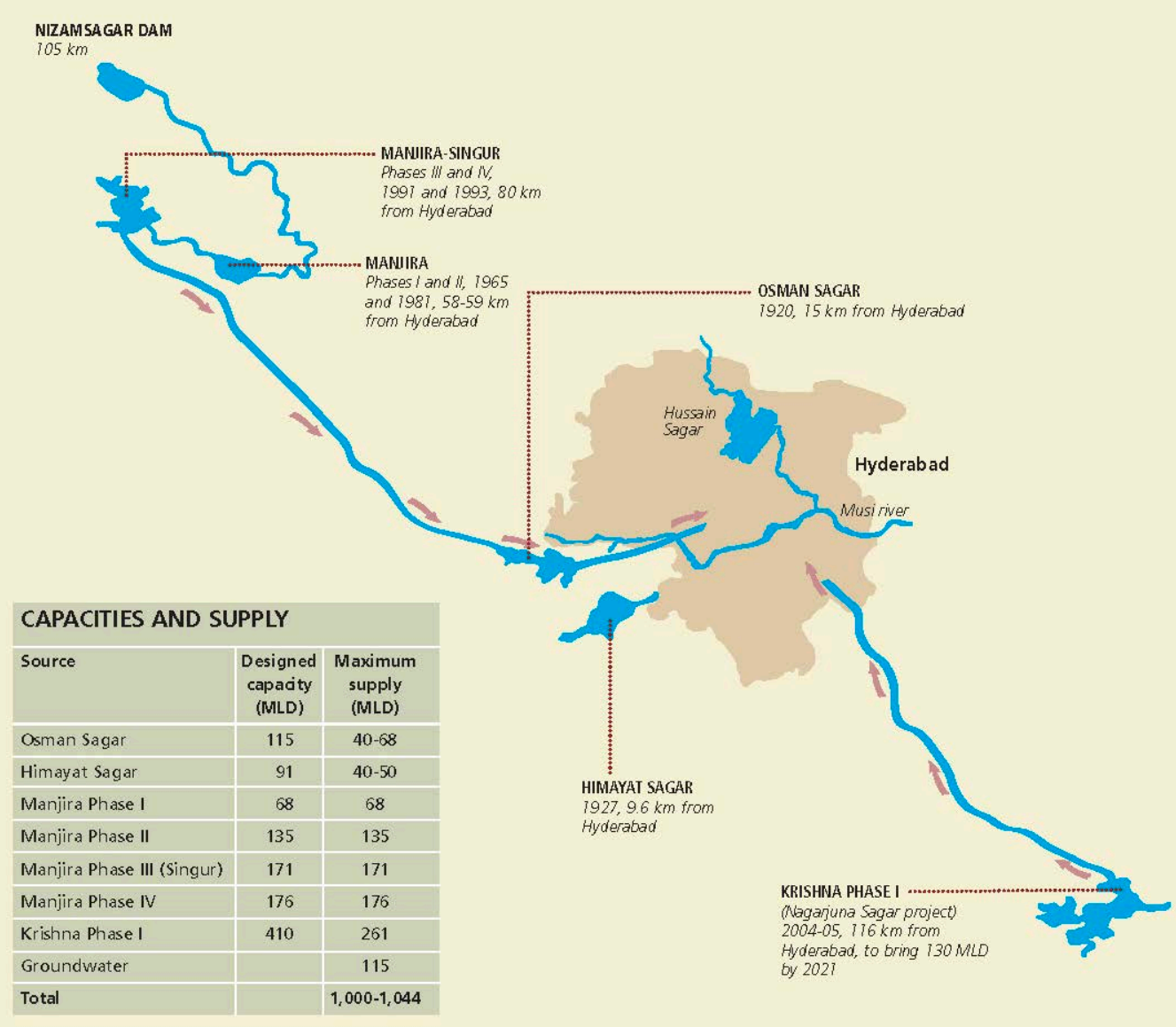
Over time, many areas like Kothapet, Moulali, Kukatpalli, and Jubilee Hills have experienced declining groundwater levels. However, following increased rainfall since 2008, groundwater levels have risen across much of Hyderabad, though places like Khairatabad, Humayun Nagar, and Nampally have seen little change. To combat this crisis, the Greater Hyderabad Municipal Corporation (GHMC)

has mandated rainwater harvesting structures in new buildings, and the government is restoring historic tanks and lakes to enhance groundwater recharge. These efforts, however, remain small compared to the scale of the problem. Experts recommend further restrictions on borewell usage, enhanced rainwater harvesting systems, and stricter regulation of pollutants.has mandated rainwater harvesting structures in new buildings, and the government is restoring historic tanks and lakes to enhance groundwater recharge. These efforts, however, remain small compared to the scale of the problem. Experts recommend further restrictions on borewell usage, enhanced rainwater harvesting systems, and stricter regulation of pollutants.



Map 20: Hydrogeology Map of Hyderabad

Source: Figure 6 in https://www.cgwb.gov.in/old_website/District_Profile/Telangana/Hyderabad.pdf



CAPACITIES AND SUPPLY

Source	Designed capacity (MLD)	Maximum supply (MLD)
Osman Sagar	115	40-68
Himayat Sagar	91	40-50
Manjira Phase I	68	68
Manjira Phase II	135	135
Manjira Phase III (Singur)	171	171
Manjira Phase IV	176	176
Krishna Phase I	410	261
Groundwater		115
Total		**1,000-1,044**

Map 21: Hyderabad's water resources
source: Anon 2006, Hyderabad City Development Plan, JNNURM and Ramachandraiah Chigurupati and Vedakumar Manikonda 2007, Hyderabad's water issues and the Musi river: Need for integrated solutions, paper presented at the International Water Conference, Berlin, September 12-14

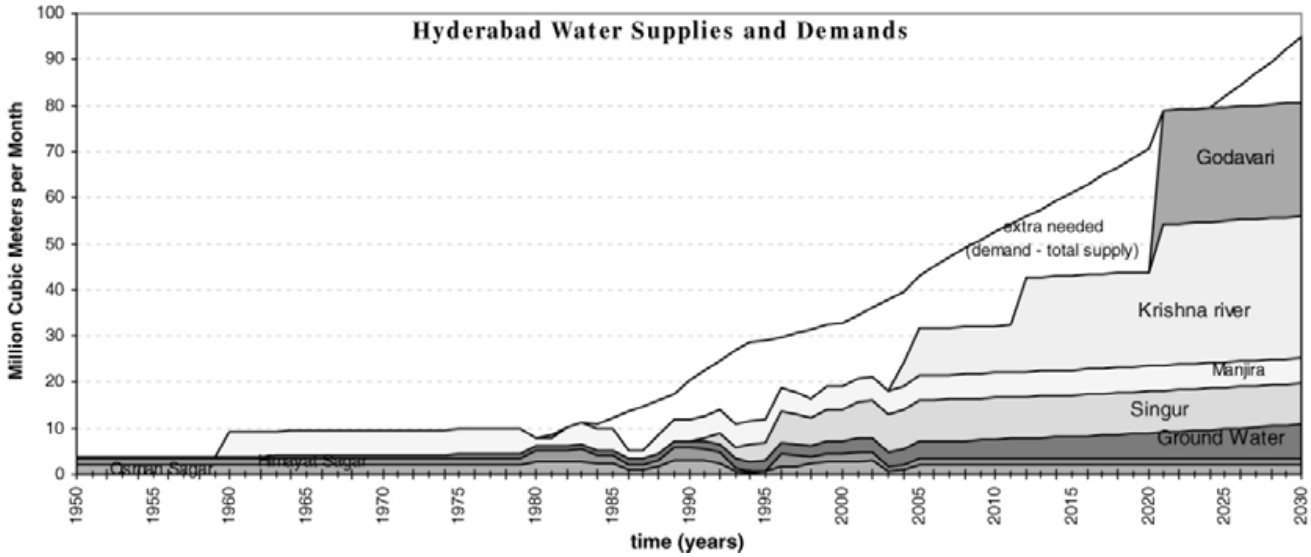


Fig 35: Statistics graph - Demand of water supply to Hyderabad city
Source: https://www.researchgate.net/figure/Water-delivery-rates-from-the-different-water-sources-for-urban-water-supply-in-Hyderabad_fig1_268979978

4.6 Step-wells, and other water conservation systems

The stepwells of Hyderabad, known as baolis, are remarkable architectural and cultural treasures designed for water conservation in the city's arid landscape. Constructed primarily during the Qutb Shahi period (16th-17th centuries), these structures reflect a blend of Indo-Islamic architectural styles, characterized by elegant arches, steps, and carved details. Built into the earth and often multi-tiered, stepwells provided access to groundwater throughout the year. By connecting with underground aquifers, they ensured a stable water supply even in dry seasons and were used to irrigate crops and provide drinking water.

Architecturally, stepwells in Hyderabad varied in size and design, from simple single-tier structures to grand multi-level wells that could reach depths of several stories. They were typically constructed with sandstone or granite and featured descending staircases with wide landings that allowed people to access water even as levels fluctuated. Notable examples, like the stepwell at Naganna Kunta near Golconda, demonstrate the sophisticated engineering involved, with deep, precisely carved chambers that keep water cool and reduce evaporation. Their design allowed for efficient collection and conservation of rainwater, and these wells connected to aquifers, naturally filtering water through layers of stone and earth.

These stepwells were essential in Hyderabad's historic water conservation system. In addition to storing rainwater, they acted as overflow structures during monsoons, capturing excess runoff and preventing floods. Connected to other water systems like lakes and tanks, the stepwells helped recharge groundwater by channeling surplus rainwater into aquifers. This cascading system of tanks and wells created a flood-resistant network that supported sustainable water management and was an early model of urban resilience.

Stepwells in Hyderabad served as gathering spaces and held immense cultural significance, especially for women. These wells were hubs for socializing, relaxation, and community activities, offering women a space to gather daily while collecting water. As water collectors, women played a central role in the maintenance and communal care of stepwells, which fostered a sense of shared responsibility toward water conservation. This social aspect made stepwells an integral part of Hyderabad's community structure, where rituals, festivals, and small ceremonies took place.

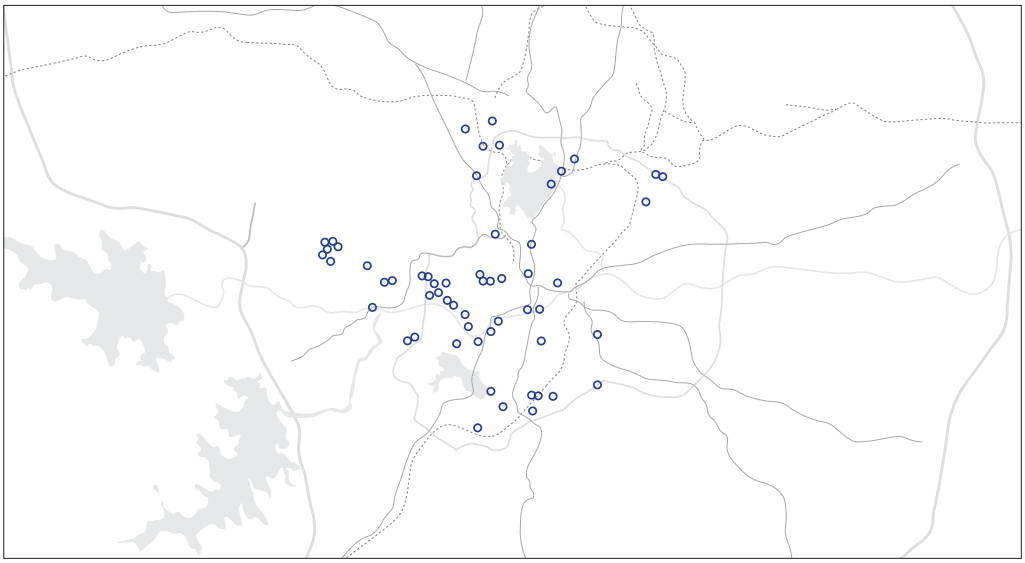
Over time, Hyderabad's stepwells have suffered from neglect, urban encroachment, and pollution. Many were filled with debris or repurposed as dumping sites, erasing their once-central role in the city's water management. As Hyderabad expanded, modern water infrastructure reduced the need for traditional wells, leading to their abandonment. Fortunately, recent conservation efforts have begun to recognize the importance of these structures. Local organizations and government bodies are restoring stepwells, such as the Bansilalpet Baoli, to revive them as heritage sites and potential water sources.

By reclaiming stepwells, Hyderabad aims to merge historical water wisdom with modern needs, reconnecting the city with its past while addressing contemporary water scarcity. These revived stepwells not only conserve water but also re-establish their cultural and social significance, creating shared spaces for public engagement and appreciation of Hyderabad's unique water heritage.

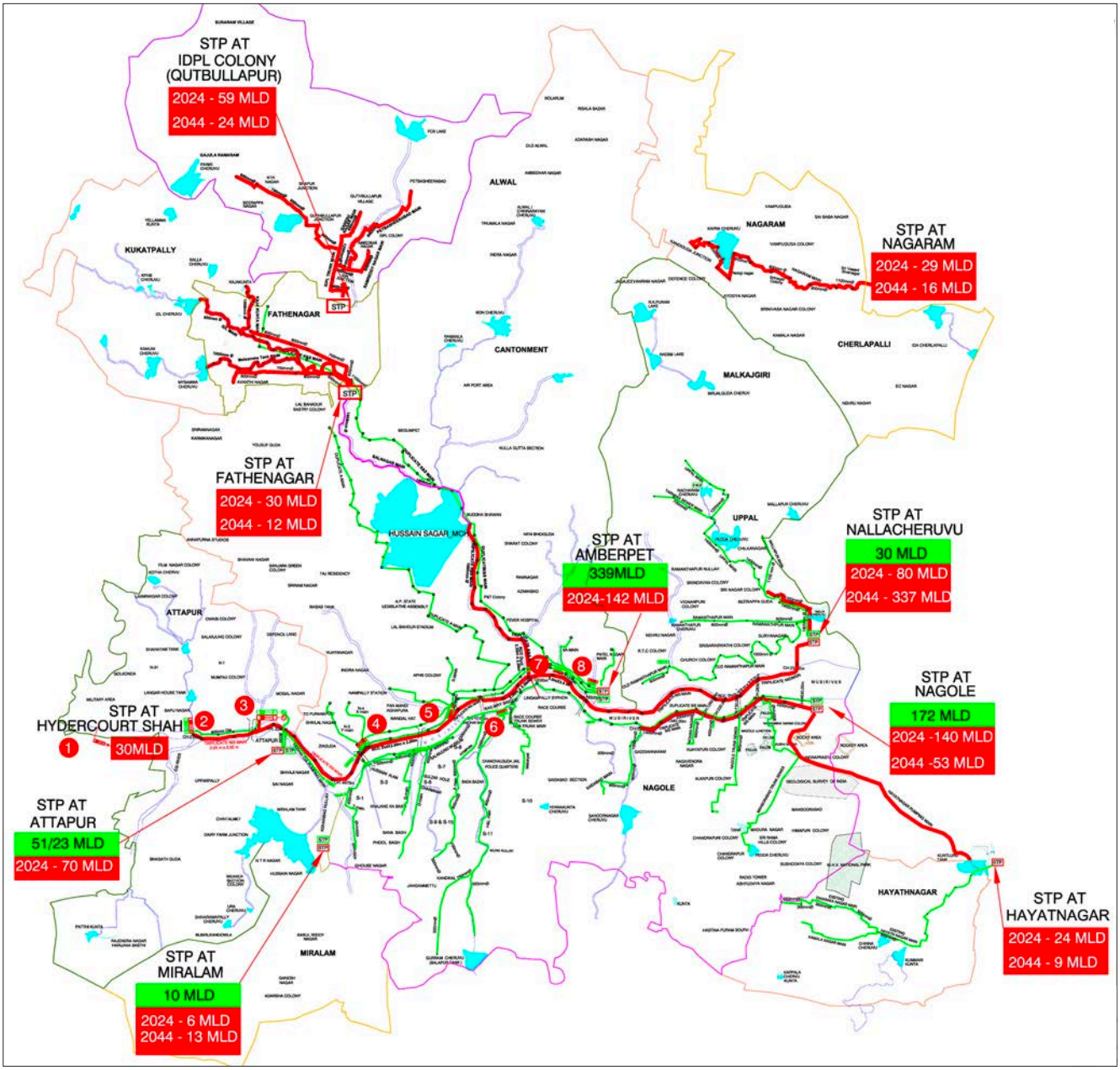
In addition to tanks and step-wells, Hyderabad also relied on other water conservation structures like kunds (small tanks) and aqueducts to channel and store water. The Kakatiya and Qutb Shahi rulers constructed underground channels and aqueducts that transferred water across distances to lakes and reservoirs. The Karez system, found in Bidar and emulated in parts of Hyderabad, involved subterranean channels that collected and transported groundwater to surface reservoirs.

In essence, Hyderabad's traditional water conservation systems demonstrate the city's adaptive strategies to its challenging climate, providing a sustainable model for future water management.

Fig 36: Bansilalpet Stepwell
Source: Question of Cities



Map 22:
Stepwells of Hyderabad
Source: Forgotten Stepwells of Telangana, Hyderabad Urban Forum, 2024



Map 23: STPs of Hyderabad with current and proposed capacities
Source: HMWSSB

4.7 The underground city - Sewage management networks

Hyderabad's underground water and sewage management system is a complex network designed to address stormwater, wastewater, and sewage. For sewage management, Hyderabad has a network of sewer lines linked to Sewage Treatment Plants (STPs) spread across the city, which treat wastewater before releasing it back into water bodies or using it for non-potable purposes. Some major STPs include those at Amberpet, Nagole, and Attapur, helping reduce water contamination from untreated sewage.

Hyderabad's sewage treatment infrastructure is undergoing significant expansion, with the Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB) spearheading efforts to achieve 100% sewage treatment. Currently, the city generates around 1,650 million liters per day (MLD) of sewage, but only about 772 MLD (46.8%) is treated by the existing 25 sewage treatment plants (STPs) in the Greater Hyderabad Municipal Corporation (GHMC) area. Untreated sewage has thus been a major issue, with nearly 53% of wastewater flowing untreated into water bodies like the Musi River, causing environmental concerns.

To address this, the Telangana government has allocated ₹3,866.21 crore to establish 31 new STPs under a comprehensive sewage management plan. These new plants will add a treatment capacity of 1,260 MLD, effectively increasing the city's sewage treatment capability to 100% of its daily output. The project is divided into three packages:

1. Package I includes eight STPs with a combined capacity of 402.5 MLD, covering northern Hyderabad, such as the Uppal and Kapra areas.
2. Package II consists of six STPs, totaling 480.5 MLD, focusing on the southern areas around Rajendranagar and LB Nagar.
3. Package III, with 17 STPs and a 376.5 MLD capacity, targets the Hussainsagar catchment in areas like Kukatpally and Serilingampally.

One of the country's largest STPs, with a capacity of 320 MLD, is located in Nagole and uses advanced Sequential Batch Reactor (SBR) technology, which is both power-efficient and cost-effective. The hybrid annuity model (HAM) employed for this expansion involves 40% funding from the state and the remainder from private contractors, who will also manage the plants for 15 years.

Projections indicate that by 2036, Hyderabad's sewage output may reach 2,814 MLD, and an estimated 3,715 MLD by 2051, necessitating additional infrastructure. To meet this demand, a long-term plan recommends constructing an additional 31 STPs outside the GHMC area.

The initiative also includes upgrades to the city's sewer networks, with the addition of lateral, branch, and trunk mains to efficiently transport sewage to treatment facilities. By building this extensive STP network, Hyderabad aims not only to prevent pollution of local lakes and rivers but also to reuse treated water for non-potable applications.

Fig 37: Untreated effluents from the common effluent treatment plant, Patancheru, drains into the iskavagu which discharges into the Manjira
Source: Pradeep Saha, Excreta Matters, The Deccan Hyderabad

4.8 Irrigation and livelihoods around Musi River

The Musi River has historically served as an essential resource for agriculture and livelihoods around Hyderabad. Dating back to the Qutb Shahi period, the river supported both agriculture and communities like washermen (dhobis), whose lives depended on its waters. Over the years, the use of Musi's resources has evolved, with distinct seasonal cropping patterns, taxation mechanisms, and recent real estate pressures transforming its socio-economic landscape.

The dhobi community, or washermen, depended heavily on the Musi River, as it provided water for laundry services, which were in high demand from urban households and businesses. The riverbanks became informal workspaces where the dhobi community would wash, dry, and press clothes, supporting their livelihood while simultaneously integrating into Hyderabad's economy.

Wastewater Agriculture and Crop Diversity

The practice of wastewater agriculture along Hyderabad's Musi River provides livelihoods to a broad spectrum of people from different backgrounds, including those from lower-middle-class groups, low-income urban residents, and migrants. The socio-economic diversity shapes how each group interacts with wastewater agriculture, engaging in various activities such as fodder cultivation, vegetable farming, and livestock rearing.

Agricultural activities along the Musi are largely sustained by wastewater, as it is often the only available water source. The primary crop grown in this area is para grass, which covers approximately 65% of the cultivated land and is sold as fodder. Other grasses, such as tunga and garika, are also common. Banana and coconut occupy much of the remaining farmland, while small sections are dedicated to high-value leafy vegetables. Although vegetables only account for 1% of the land, they generate more income per unit area than bananas and coconut. Additionally, small plots are used for fruit trees like guava, mango, papaya, and lemon, as well as flowers such as jasmine and crosandra, mostly for household use.

Cultural Significance and Role of Caste in Land Ownership

Land ownership in these urban farming zones along the Musi is predominantly held by members of the Kachi caste, traditionally known for cultivating fodder grass. Many of these families were given land in the 17th century in recognition of their service to local rulers, and the titles have rarely been updated, even across generations. Disputes over land division are settled within the Kachi community association, preserving their traditional role in the area's agriculture. They often rent portions of their land to members of the Yadav caste, who raise dairy livestock. This arrangement creates a symbiotic relationship where the Yadavs use the fodder to feed buffaloes, whose milk fetches a high price due to its fat content, supporting both renter and owner families.

Fodder Grass Market

The fodder grass market, located near Kachiguda, is crucial for the local economy. Approximately 50% of the fodder produced is sold in this informal market, while the remaining portion is used by the farmers for their livestock. The demand for fodder in Hyderabad prompted a recent commitment from the home minister to donate 2,000 square yards for expanding the market, demonstrating its economic and social importance in the urban farming community.

Historic "Ek Phasal Patta" System

The "Ek Phasal Patta," or one-crop permit, is an agricultural practice that allows riverbank communities to cultivate a single seasonal crop when the Musi recedes in summer. Farmers grow pulses, leafy vegetables, and grains suited to the varying water availability. However, this system grants temporary land access without ownership rights, restricting the farmers' economic security in the long term.

Institutional and Legal Environment

The regulatory framework around urban farming on Musi land is complex. Government departments like the Municipal Corporation of Hyderabad and the Commissioner of Land Administration enforce land-use restrictions, including the Urban Land Ceiling Act of 1976, which limits plot sizes and prohibits land sales along the river. While the Hyderabad Urban Development Agency (HUDA) master plan has suggested promoting urban agriculture in peripheral and non-development zones, local institutions still lack recognition of its economic and environmental benefits.

Urban Farmers' Association and Advocacy

The Bhagya Nagar Kisan Sangh (BNKS), an association of urban farmers, advocates for these communities' rights. It was formed as a response to government restrictions on farming along the Musi and provides legal support and a forum for information exchange. This group has

resisted initiatives like covering the river with a canal and transforming its banks into parks, which would limit farming access. BNKS represents a crucial advocacy platform, pushing for official recognition of urban agriculture's positive impact on livelihoods and aiming for policy reforms that support sustainable urban farming.

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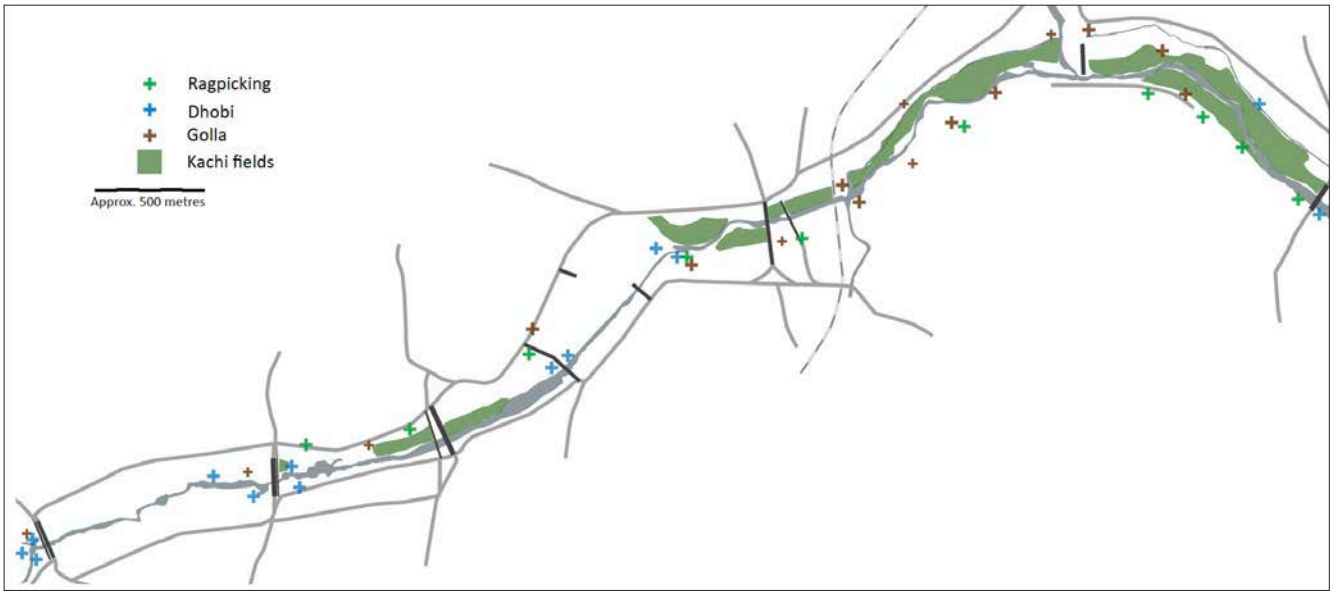
Challenges and the Way Forward

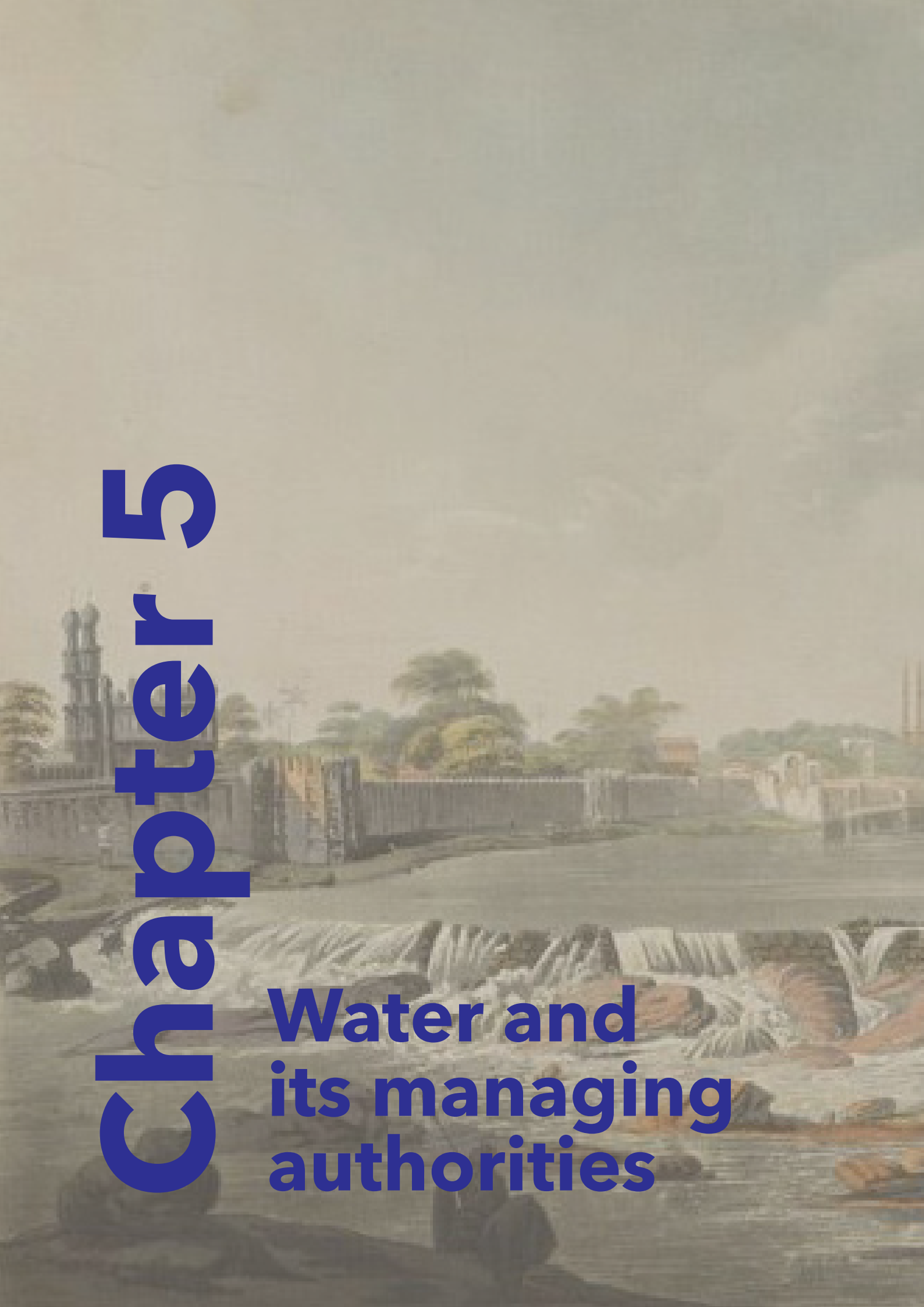
Despite the community's dependence on Musi for agriculture, challenges persist. Pollution from untreated sewage makes wastewater agriculture risky, especially with crops like leafy vegetables, which pose health risks if consumed without proper washing. Meanwhile, urban development pressures have reclassified some of this land as commercial, increasing tax burdens on farmers. The value of riverbed land has become a contentious issue, as land values are rising, and compensation rates for government projects often don't match current market valuations.

Urban agriculture along the Musi River is a historically rich practice integral to Hyderabad's socio-economic fabric. However, the future of these communities depends on balancing urban development with sustainable farming and pollution control, ensuring that traditional practices and livelihoods can adapt and thrive in a rapidly modernizing city.

Map 24: Irrigated areas in and downstream of Hyderabad city
Source: Stakeholder Views, Financing and Policy Implications for Reuse of Wastewater for Irrigation: A Case from Hyderabad, India 2015



Map 25: River labour mapped between Puranapul bridge on the left to Moosarambagh Road bridge on the right
Source: Loïc De Béthun, Perceptions on urban space in developing cities: the case of Hyderabad's river Musi, 2010-11



Chapter 5

Water and its managing authorities

Fig 38: North east view of Hydrabad (1799)
Source: British Library, Painting by Major General Sir Thomas Anburey and Francis Tukes, London

5.1 Administrative boundaries of the Hyderabad metropolitan region

Municipal Administration and Urban Development (MA&UD) Department of Telangana is entrusted with the responsibility of urban sector management. All Urban Development Authorities, Urban Local Bodies, and Municipal Corporations, and Municipalities in Telangana state are administered and monitored by MA&UD for better civic administration and sustainable urban development. It is the department that co-ordinates with the necessary Central Government Bodies of India for getting GoI grants (Govt. of India Grant) and external funding for taking up various developmental activities / projects in urban areas. It also co-ordinates with the Finance Department for raising required loans for taking up various projects by each department that works under its administration.

The Hyderabad metropolitan area's administrative boundaries and responsibilities are managed by several key organizations, including the Greater Hyderabad Municipal Corporation (GHMC), and Hyderabad Metropolitan Development Authority (HMDA). These entities collectively address the needs of Hyderabad's urban expansion, infrastructure, water management, and development. Primarily, these administrative boundaries fall under two categories:

- Local revenue authorities that are responsible for civic administration and tax collection: GHMC (Greater Hyderabad Municipal Corporation) and other Municipal Corporations.
    - **GHMC (Greater Hyderabad Municipal Corporation):** Greater Hyderabad Municipal Corporation is a civic administrative body which looks after the administration of the Hyderabad city which is the capital city of Telangana State. It has been constituted in the year 2007 by merging surrounding 12 municipalities into the Municipal Corporation of Hyderabad which was formed in the year 1955. At present GHMC limits extend to 650 Sq. Km with 6 zones with 30 circles which is further divided into 150 wards. GHMC manages urban planning, building and maintenance of public infrastructure, municipal schools, street lighting, health and sanitation, waste management, and basic water supply.
- Town planning agencies that respond to the city's growth and need for infrastructure: HUDA (Hyderabad Urban Development Authority), HADA (Hyderabad Airport Development Authority), CDA (Cyberabad Development Authority), QQSUDA (Quli Qutub Shah Urban Development Authority) and HMDA (Hyderabad Metropolitan Development Authority).
    - **HMDA (Hyderabad Metropolitan Development Authority):** HMDA is responsible for broader metropolitan planning, covering approximately 7,257 square kilometers, including (7) Districts, (70) Mandals, 1032 Villages including Greater Hyderabad Municipal Corporation (GHMC) consisting of 175 Villages and 40 Municipalities / Nagar Panchayats. HMDA was set up for the purpose of planning, co-ordination, supervising, promoting and securing the planned development of the Hyderabad Metropolitan Region. It oversees large-scale urban projects, zoning regulations, environmental management, and long-term infrastructure planning. It coordinates the development activities of the municipal corporations, municipalities and other local authorities, the Hyderabad Metropolitan Water Supply & Sewerage Board, the Telangana Transmission Corporation, the Telangana Industrial Infrastructure Corporation, the Telangana State Road Transport Corporation, and other such bodies. The HMDA includes HUDA, HADA, QQSUDA and CDA.

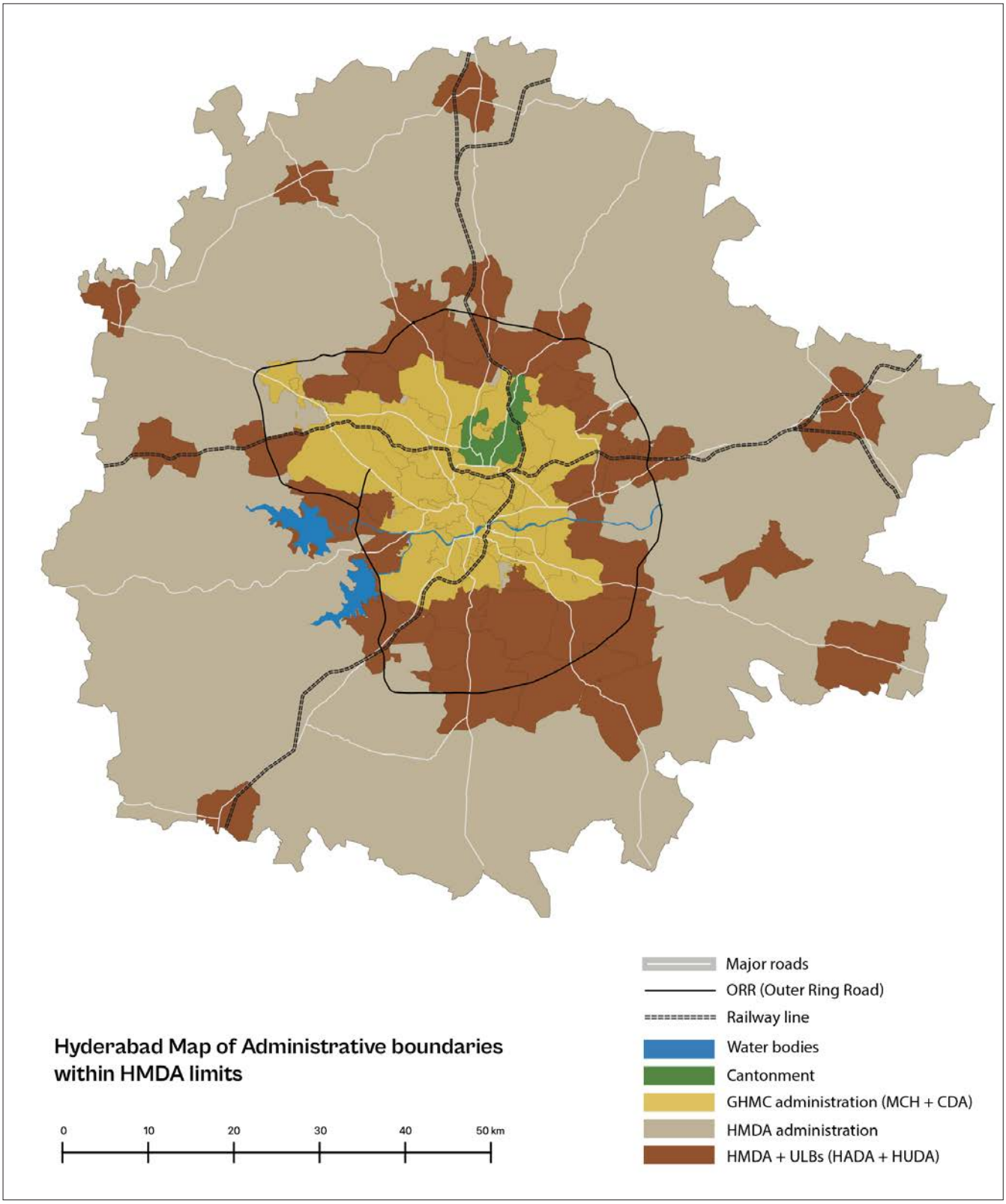
Fig 39: Organogram of Urban Institutional Structure of Telangana State and Hyderabad Metropolitan region
source: Govt. of Telangana

5.2 The managing authorities of the water supply chain

Water governance and management in Hyderabad involve a coordinated network of state and city-level agencies, each handling different aspects of water distribution, sewage treatment, conservation, and urban development.

1. **GHMC (Greater Hyderabad Municipal Corporation):** While GHMC's core mandate is civic administration, it also plays a role in stormwater management, maintenance of small water bodies, and rainwater harvesting initiatives in the city. GHMC is also responsible for ensuring effective drainage systems to prevent urban flooding.
2. **HMDA (Hyderabad Metropolitan Development Authority):** HMDA oversees long-term planning, including water resource management and conservation initiatives for the entire metropolitan region. It regulates land use around lakes and ensures compliance with environmental regulations. HMDA also proposes and implements policies related to sustainable urban growth and water conservation in collaboration with other agencies.
3. **HMWSSB (Hyderabad Metropolitan Water Supply and Sewerage Board):** The primary agency responsible for Hyderabad's water supply and wastewater management, HMWSSB manages water sourcing, treatment, and distribution across the metropolitan area. The board is also responsible for constructing, operating, and maintaining sewage treatment plants and pipelines to ensure safe wastewater disposal and treatment. Recently, HMWSSB has undertaken projects to expand sewage treatment capacity and reduce dependency on groundwater.
4. **HMWBC (Hyderabad Metropolitan Water Board Commission):** This body primarily focuses on regulating water distribution and quality. It oversees water pricing, supply allocation, and policies related to sustainable use and equitable distribution among urban and peri-urban areas.
5. **BPPA (Buddha Purnima Project Authority):** BPPA oversees projects around Hussain Sagar Lake, with a focus on lake conservation, water quality improvement, and the creation of recreational zones. This body works on reducing pollution levels in the lake and preserving it as a significant water source and recreational area.
6. **MRDCL (Musi Riverfront Development Corporation Limited):** MRDCL is primarily responsible for the revitalization, conservation, and development of the Musi River in Hyderabad, Telangana, including managing the riverfront area by undertaking projects like infrastructure development, and environmental restoration, aiming to transform the river into a vibrant public space while also addressing issues like pollution and encroachment along the riverbanks.
7. **NIUM (National Institute of Urban Management):** NIUM plays an advisory role, offering training and support for urban water management strategies. It conducts studies and provides recommendations on efficient water use, conservation practices, and urban planning, supporting various government departments to implement improved water governance frameworks.
8. **CDMA (Commissioner and Directorate of Municipal Administration):** CDMA assists in policy implementation across various municipal bodies within Telangana. It coordinates urban water management policies, offers guidance on urban water supply systems, and enforces water-related regulations across municipalities, including Hyderabad.
9. **HYDRAA (Hyderabad Disaster Response and Asset Protection Agency):** HYDRAA is an integrated body created by the government of Telangana and began operations in 2020, to protect critical assets from natural and man-made disasters. It is crucial for disaster management in Telangana core urban region (TCUR) during floods, fires, and industrial accidents. It has added a new Framework to protect lakes, parks, Nalas, and canals within GHMC limits in July 2024.

Each of these bodies plays a unique role in maintaining, managing, and supplying water in Hyderabad. The interconnected efforts of these agencies help ensure the city's urban resilience and the sustainability of water resources amidst Hyderabad's rapid urbanization and growing population.

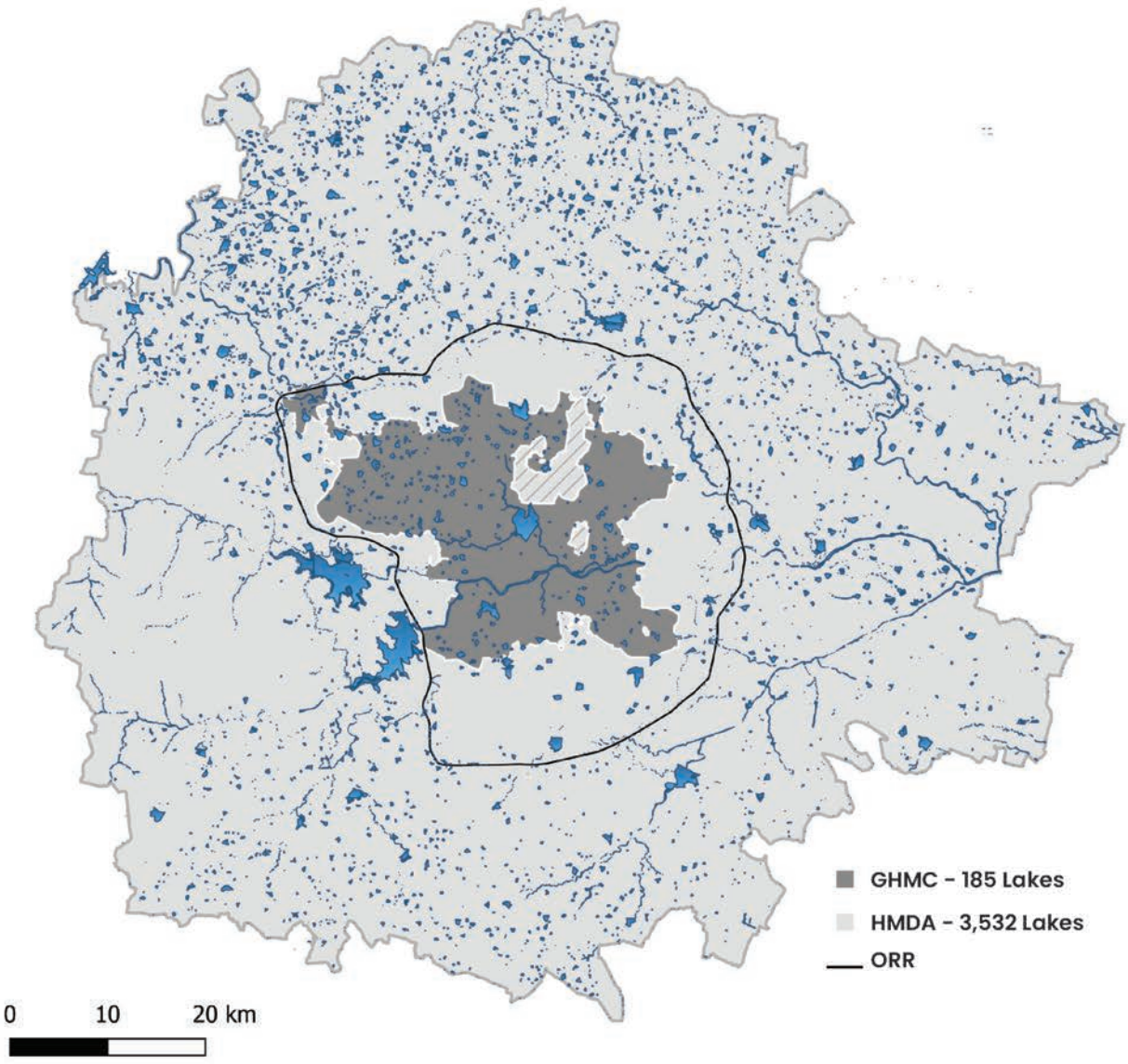


Map 26: Administrative boundaries of Hyderabad
source: Data gathered from NIUM based on the data available on the Master Plan; Created by Les Ateliers team

HMDA has about **3,532 man-made lakes, of which 185 lakes are within GHMC.** The lakes, originally constructed for water supply, are interconnected, ultimately flowing into Musi river, and play an important role in flood risk management in Hyderabad. Improved management of these lakes is important for:

- management of flood risk in the city;
- improving urban livability, potential to capture land value and improving quality of life through clean and odor-free lakes
- addressing potential health impacts due to water contamination and
- as a source of water supply and other economic activities
- important for the water quality in Musi river

Lakes in HMDA and GHMC



Map 27: Water bodies within the HMDA limits of Hyderabad metropolitan region
source: Lake Protection Committee, MA&UD Telangana

5.3 Hyderabad's drinking water

Hyderabad's drinking water primarily comes from the Krishna, Godavari, and Manjira Rivers, along with supplemental sources from other reservoirs. Here's a breakdown of these key sources:

1. **Krishna River:** One of the most significant water sources, Hyderabad began drawing water from the Krishna River under the Krishna Drinking Water Supply Project, initiated in the 2000s. The Krishna Phase I, II, and III projects supply water to Hyderabad, with each phase adding capacity to meet growing demand. The water is pumped from reservoirs connected to the river, such as Nagarjuna Sagar and Srisailam, and treated before being distributed to Hyderabad.
2. **Manjira River and Reservoirs:** Before the Krishna project, the Manjira River was the primary source of drinking water for Hyderabad. Water is stored in Singareni, Nizam Sagar, and Manjira Barrage reservoirs and then supplied to the city. While Manjira is still a significant source, its capacity has become insufficient due to rapid urbanization and population growth.
3. **Supplemental Sources**: To further support the city's water needs, the Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB) has tapped other sources like the Godavari River through the Yellampally Reservoir. The Osman Sagar and Himayat Sagar lakes, initially developed for flood control on the Musi River, also provide some water to Hyderabad, though in smaller quantities today due to pollution and reduced water levels.

Together, these sources aim to meet the city's water demand, which has grown significantly. However, given the rapid population increase, Hyderabad is continually expanding its supply network and planning additional projects to ensure reliable access to drinking water.

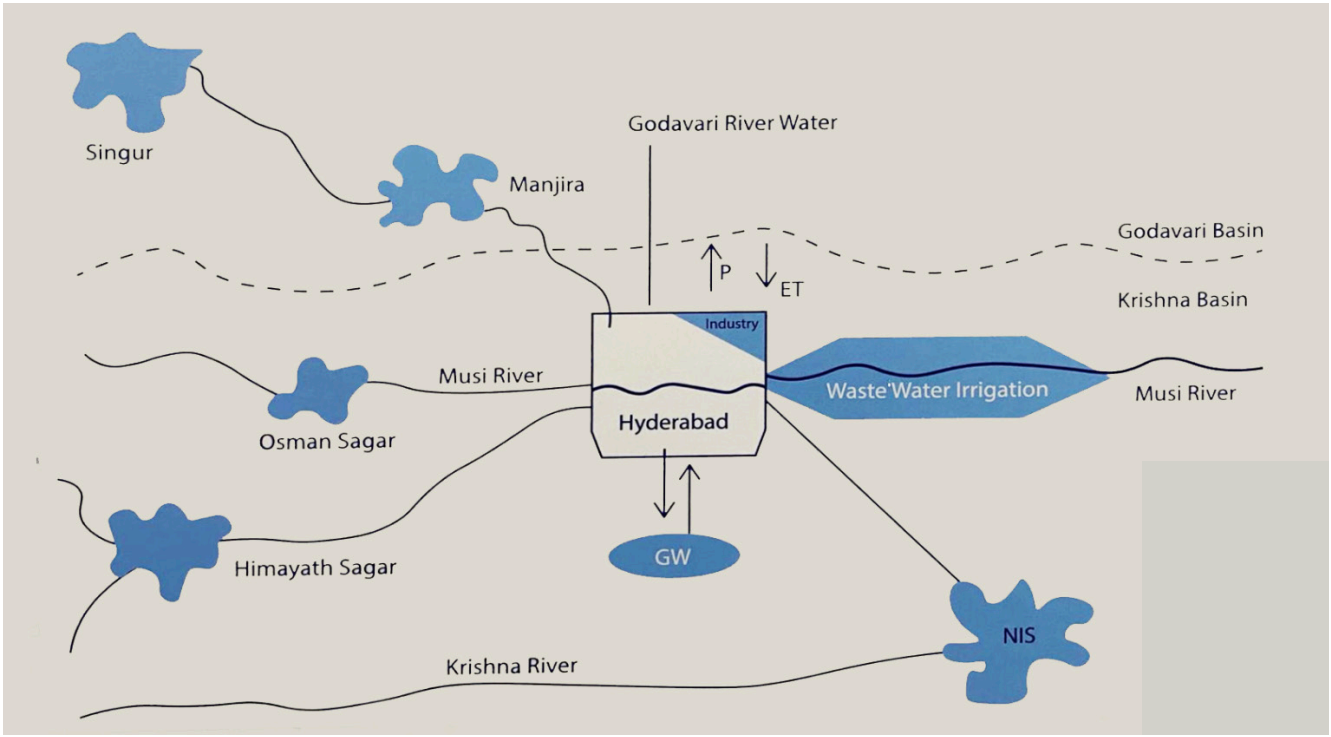


Fig 40: Hyderabad's drinking water sources
Source: SACI waters

5.4 Role of RWAs (Residential Welfare Associations)

Resident Welfare Associations (RWAs) in Hyderabad play a critical role in urban governance, acting as intermediaries between residents and municipal authorities. Under the leadership of Dr. V.B.J. Chelikani Rao, President of the United Federation of Resident Welfare Associations (UFERWAS), RWAs have expanded their influence beyond traditional functions, engaging in city planning, public health initiatives, and social welfare activities.

RWAs across Hyderabad are involved in maintaining civic amenities, resolving local issues, and representing residents' concerns on issues like property taxes, water supply, and sanitation. RWAs like UFERWAS have organized themselves as formal federations, uniting multiple local associations to coordinate efforts across different neighborhoods, such as information-sharing on municipal services and advocating for transparency in urban governance

During the COVID-19 pandemic, UFERWAS and other RWAs in Hyderabad took on a prominent role by coordinating with health authorities to manage testing, isolation facilities, and patient counseling. By collaborating with the Telangana government, RWAs established community testing centers, worked with primary health centers (PHCs), and helped monitor home isolation cases, particularly in high-density areas like Malkajgiri and Kukatpally. The RWAs' community-led approach significantly supported the overstretched health infrastructure during this crisis

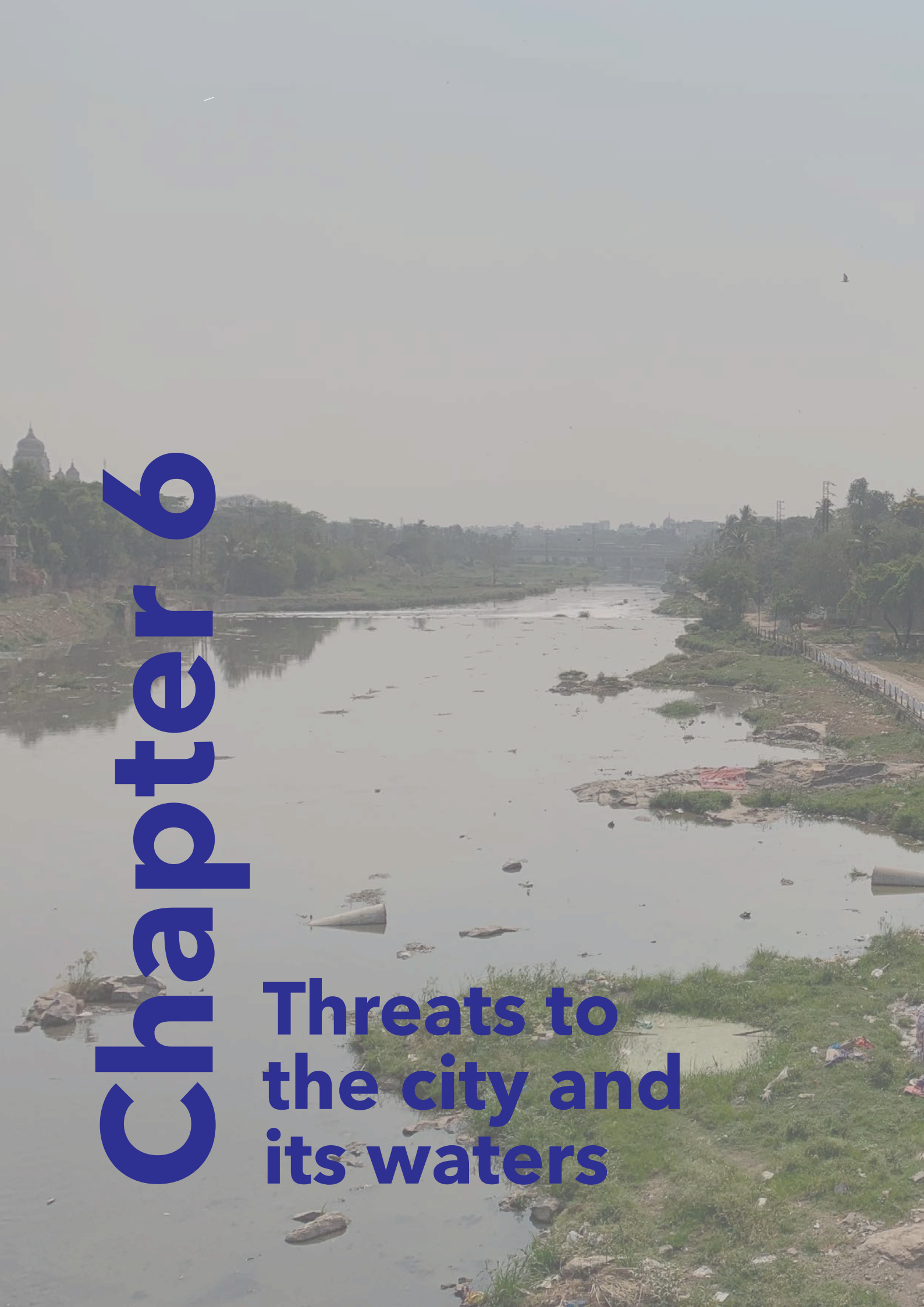
Also, during the pandemic, RWAs worked alongside UFERWAS to address water supply shortages by organizing additional water tanker services in coordination with GHMC. RWAs in localities such as Gachibowli and Kukatpally have been proactive in maintaining functional rainwater harvesting systems and have implemented smart water meters to monitor community consumption, setting an example of efficient resource management.

RWAs collaborate with bodies like the Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB) and GHMC to address local water issues. They advocate for regular water supply, report issues like water contamination or disruptions, and push for improvements in water infrastructure in areas facing chronic shortages. In some cases, they lobby for additional water tankers during peak demand seasons.

They also promote the installation of rainwater harvesting systems in residential complexes. By capturing rainwater from rooftops and other surfaces, they help replenish groundwater levels and reduce dependence on municipal water supplies. The Greater Hyderabad Municipal Corporation (GHMC) mandates rainwater harvesting structures for new constructions, and RWAs often oversee compliance within their communities, ensuring effective implementation and maintenance. Additionally, RWAs in water-stressed areas organize efforts to dig borewell recharge pits and recharge wells, which help direct rainwater into the ground.

Many RWAs conduct periodic water audits to monitor water usage, identify leakages, and repair faulty pipelines in residential complexes. By minimizing water wastage, RWAs manage to reduce overall consumption. This approach also involves installing water meters to track usage per household, encouraging residents to conserve water.

Through these efforts, RWAs in Hyderabad demonstrate a community-centered approach to water conservation, reducing strain on municipal water supplies and enhancing resilience against water scarcity. As Hyderabad grows, RWAs are increasingly recognized by government entities as vital stakeholders in urban governance, reflecting a shift towards greater community self-management and local decision-making. They make the governance reach the last mile, hence, often referred as the fourth tier of government after the union, state, and municipal authorities.



Chapter 6

Threats to the city and its waters

Fig 41: River bank of Musi with Dobhi ghats and shrine
Source: Rahul Palagani

6.1 Rapid urbanisation

The city's population mushroomed over three decades, and its urban footprint rapidly expanded into the metropolitan area. Since Hyderabad's water network is inextricably linked to topography, the way land was developed had a direct impact on its hydrological network. Indiscriminate building cut off surface-level storm water connections and destroyed subterranean aqueducts fracturing the network and diminishing its flood control capacity. Lakes were encroached and built upon, reducing the number of lakes in the metropolitan region from approximately four thousand to a few hundred. The city today is also dealing with acute water pollution and its impacts on the health of its residents and natural ecosystems. Hyderabad is a hilly city with a distinct pattern of development, which means flooding and water pollution do not affect all areas of the city equally. Areas with higher elevations are less susceptible to flooding and have premium land values and high-end development. Low lying areas on the other hand are populated with dense informal settlements that live in close proximity to lakes and storm water streams. This makes them highly susceptible to flooding and to disease outbreaks caused by polluted and stagnant water.

Today, Hyderabad faces three major water-related concerns that have been threatening the city's growth, its river, its water resources, and surrounding ecology: floodings, water pollution, and ecological damage. And the key causes are rapid urbanisation and encroachments.

Rapid Urbanisation:

Hyderabad's metropolitan area is spread over 7,257 sqkm (2,802 sq mi) and has a population of 10 million (World Population Review 2018). Growth in the city's population in the last few decades has been a product of its expanding administrative boundaries and waves of migration sparked by growth in the information technology and pharmaceutical sectors. Comparatively, the rates of global population increase during the same time periods have been far slower, highlighting Hyderabad's abnormal pace of growth. Between 1960-80 and 1980-90, the global population growth rate held steady at around 1.8% while the city's population grew at approximately 3.5% every year. Between 1990-2020, the global rate dropped to 1-1.5% while the city's growth rate soared to around 5.5%.

To keep up with Hyderabad's metropolitan expansion, the city extended its administrative boundaries to include surrounding districts and villages which further contributed to the increase in its population. The lack of planning and a reliance on the market to provide housing and amenities to a growing population of workers driven by the IT sector has been devastating to the city's ecology. With the city making virtually no efforts to protect its lakes, stormwater channels, or ecological commons, developers have capitalized on every square foot of potential real estate without any regard for the city's expansive water network.

Fig 42: Hyderabad Metropolitan in 2000
Source: Google Earth

Fig 43: Hyderabad Metropolitan in 2020
Source: Google Earth

An illustrated case of Mir Alam tank:

An illustrated case study of the Mir Alam Meso Catchment area exemplifies the challenges faced by traditional water bodies under the pressure of rapid urbanisation.

Historically, Hyderabad's cascading lakes and tanks, like those in the Mir Alam area, played a crucial role in water conservation, flood control, and groundwater recharge. Built during the 19th century, Mir Alam Tank alone covered 1.7 square kilometers and, along with other interconnected tanks, helped manage stormwater through a natural cascade system that gradually directed overflow to downstream tanks.

This network of small reservoirs and drainage channels sustained agriculture, supported groundwater recharge, and buffered the city against droughts and floods. However, post-independence policy changes transferred control from community ownership to the state, disrupting traditional maintenance practices and allowing encroachment and neglect to degrade these systems.

Rapid urbanization without adequate planning has resulted in extensive encroachment of lakebeds and feeder channels. With Hyderabad's expansion, real estate development around Mir Alam and similar water systems ignored traditional norms, leading to sediment buildup, polluted inflows, and reduced storage capacity. Satellite imagery indicates that the Mir Alam cascade, once comprising 21 water bodies, has lost almost two-thirds of its lakes over the last few decades, shrinking from 21 lakes in 1978 to just 8 by 2012 (refer Fig. 44 and 45). This loss has decreased groundwater recharge and increased flood risks, as interconnected tanks that once prevented flash floods are now disconnected by urban infrastructure.

The Mir Alam catchment represents an ancient water management strategy that combined environmental resilience with cultural values. This cascading tank system, originally intended to reuse each drop of rainwater before it reached the sea, supported community needs, agriculture, and livestock. Maintenance of the water bodies was a community effort focused on sustainability, equity, and ecosystem health. However, the shift to urban priorities has sidelined these community values, diminishing the cultural heritage associated with Hyderabad's water commons.

Attempts to restore Mir Alam Tank and its surrounding lakes have been made, but challenges remain due to fragmented management and insufficient understanding of the interconnected cascade system. Limited initiatives, such as desilting and reinforcing embankments, have shown some success, but holistic, long-term strategies are needed to preserve the remaining water bodies and restore functionality. Efforts to involve the community in conservation and to address encroachment, pollution, and unregulated development are essential for sustainable water management in Hyderabad.

In summary, Hyderabad's transformation has disrupted traditional water networks, resulting in environmental degradation, loss of heritage, and increased vulnerability to floods. Without coordinated policies that recognize and protect these systems, Hyderabad's water security and ecological stability will continue to face significant risks.

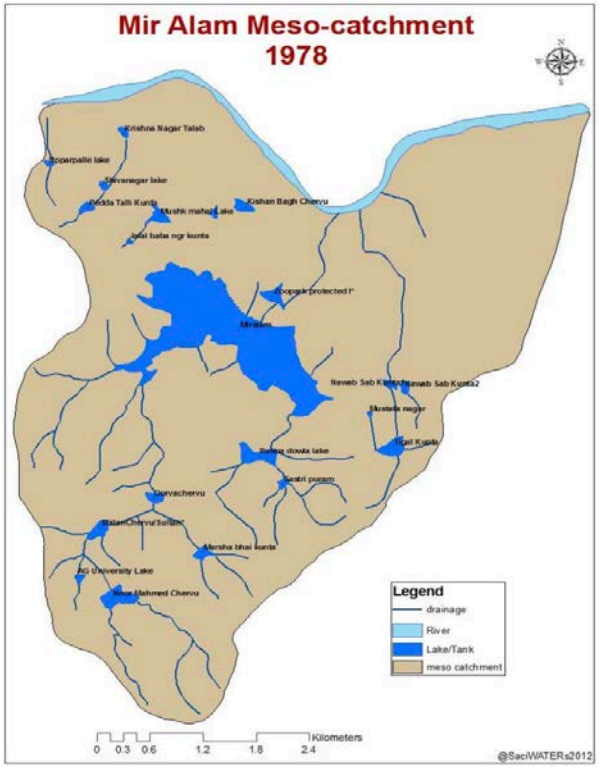


Fig 44: Tank and drainage order of Mir Alam Meso-catchment (1978)
Source: SACI waters, 2012

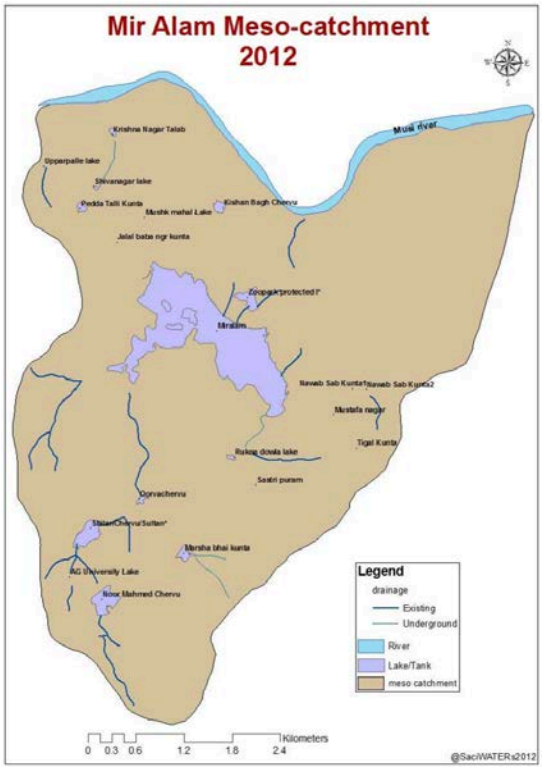


Fig 45: Tank and drainage order of Mir Alam Meso-catchment (2012)
Source: SACI waters, 2012

6.2 Encroachments

An analysis by HMDA reveals a staggering potential of between 3,600 to 4,000 lakes that once thrived within the metropolitan area of Hyderabad. This figure, frequently cited by urban planners and water conservation experts, starkly contrasts with the reality today, where the number of lakes has plummeted to anywhere between 79 and a few hundred. This significant decline underscores the scale of ecological destruction inflicted upon the city's vital water bodies, which have historically played a crucial role in maintaining the region's hydrology and biodiversity.

One of the most illustrative case studies of this encroachment crisis is Fox Sagar, also known as Jeedimetla Cheruvu. Once a picturesque picnic spot for locals in the Kompally-Quthbullapur areas, Fox Sagar has become a victim of rampant illegal encroachments, with a staggering total of 1,014 illegal structures. It ranks as the third most encroached lake in Hyderabad, highlighting the widespread disregard for environmental regulations and the urgent need for effective governance.

Fox Sagar is not an isolated case; within the Greater Hyderabad Municipal Corporation (GHMC) limits, 134 lakes have been officially declared encroached upon, leading to a shocking total of 14,061 encroachments around these water bodies. The government report submitted by the Telangana Irrigation Department to the National Green Tribunal (NGT) on November 22, 2022, revealed that a significant 85% of the total encroachments are concentrated around just 30 water bodies, while the remaining 15% are scattered across 104 lakes.

The extent of this encroachment crisis is further exemplified by the situation at Mysamma Cheruvu in Kukatpally, where over 1,500 illegal structures have been identified within the Full Tank Level (FTL) zone, an area where any form of development is strictly prohibited. The FTL refers to the maximum water level of a lake, beyond which construction poses a risk to the water body's integrity and ecosystem. Furthermore, a designated buffer zone surrounding the FTL aims to safeguard these lakes from further encroachment. However, the stark reality is that there are currently 8,718 encroachment structures within FTLs and an additional 5,343 structures in the buffer zones of the 134 identified lakes.

The problem extends beyond individual lakes to entire neighborhoods, with notable cases such as Milan Tank in Bahadurpura, Fox Sagar in Jeedimetla, and the Large Tank in Saroor Nagar. These once vibrant water bodies are now mere shadows of their former selves, surrounded by sprawling residential developments. Particularly alarming is the complete transformation of the 30 acres of Salkam Cheruvu in Bandlaguda and 25 acres of Banjara Kunta in Shaikpet into residential colonies, obliterating their ecological functions.

The implications of these encroachments are dire. The loss of lakes threatens not only local biodiversity, including migratory and indigenous bird species but also exacerbates urban flooding and diminishes the city's natural resilience to climate change. The unchecked encroachment has rendered these water bodies unable to fulfill their ecological roles, such as stormwater management and groundwater recharge, ultimately impacting the lives of the residents who depend on these resources.

Restoring Hyderabad's lakes and combating encroachment require a concerted effort from government authorities, civil society, and local communities. Strategies such as enforcing stricter regulations against illegal construction, promoting awareness campaigns about the importance of lakes, and engaging local stakeholders in conservation efforts are critical. By revitalizing these water bodies, Hyderabad can reclaim its ecological heritage and enhance its urban resilience in the face of ongoing environmental challenges.

Fig 46: Google earth pictures of Surram Cheruvu from 2014 (top) and 2024 (bottom) showing how the lake was encroached over the years. Source: Siasat.com

6.3 Floodings

Hyderabad has a long history of riverine flooding, but in the past three decades, the deterioration of its lake system has led to an increase in flash flooding across the city. One of the most devastating events in the city's history occurred in 1908, when heavy rains over two days overwhelmed local tanks and the Musi River, resulting in catastrophic damage. In response, the city implemented flood control measures, including the construction of two large reservoirs on its western edge to regulate the flow of the Musi River, along with raising the riverbanks to provide additional protection.

For many years, these measures effectively mitigated flooding risks. However, beginning in the 1990s, Hyderabad began experiencing a series of increasingly severe floods, including those in 1994, 2000, 2009, 2016, and most recently, 2020. The 2020 floods were particularly catastrophic, causing estimated damages of ₹5,000 crores and resulting in 50 fatalities across the state. The most severe impacts were felt in Hyderabad, where the breakdown of the lake network compromised the city's riverine flood control systems, rendering them ineffective in managing the volume of rainwater.

Several factors contribute to this escalating vulnerability to flooding. The city's lake network, once integral to flood regulation, has been increasingly encroached upon by developers and land grabbers. Many lakes have been drained, filled, or built upon, significantly reducing their capacity to manage stormwater. This degradation has been compounded by the proliferation of informal settlements along the riverbanks and, in some extreme cases, even in the riverbeds. These encroachments disrupt critical stormwater connections, which are essential for regulating urban flooding.

A poignant case study illustrating these issues is Moosa Nagar, an area that has been flooded twice in just two years since 2020. Resident Imran Taj describes the distressing experience of having to pack his most treasured belongings whenever the government opens the gates of Osman Sagar and Himayat Sagar to allow water to flow into the Musi River during heavy rains. "They inform us an hour in advance, so what can we even take? Our houses are filled with garbage and muck for days after," he laments. In 2020 and again in 2022, Moosa Nagar faced severe flooding, with homes submerged under more than a foot of water as water from the reservoirs was released into the Musi River.

A major contributing factor to the flooding in areas like Moosa Nagar is the construction of homes within the Full Tank Level (FTL) of lakes and on the Musi River's riverbed. Similar situations can be observed in neighborhoods such as Nadeem Colony, which has been built in the FTL of the historic Shah Hatim Talab in the Golconda Fort area.

Additionally, informal settlements, often located in low-lying areas, are characterized by high population densities and inadequate drainage infrastructure, making them particularly susceptible to flooding. Each major flood event in Hyderabad has disproportionately affected these vulnerable communities, highlighting the urgent need for improved urban planning and flood management strategies. As climate change intensifies weather patterns, the city's existing infrastructure struggles to cope, necessitating a comprehensive reevaluation of both the lake systems and flood control measures to safeguard Hyderabad's residents from future disasters.

Fig 47: Flood at Musarambagh in Hyderabad, 2020
Source: M Somasekhar, Scroll.in

Fig 48: Flood at Puranapul and Karwan, 2022
Source: Anand Dharmana, Telangana Today

6.4 Water pollution

Hyderabad's water network faces a multifaceted crisis, exacerbated by deteriorating infrastructure, shrinking lakes, and a dramatic increase in pollution over the past three decades. This crisis has far-reaching implications for public health, environmental sustainability, and community engagement.

The primary sources of pollution include hazardous discharges from chemical and pharmaceutical companies, domestic sewage, and solid waste. As a result, the health of both riverine and lake systems has been compromised, leading to outbreaks of waterborne diseases and significant disruption of aquatic ecosystems. The interconnected nature of Hyderabad's water network heightens its vulnerability, as contaminants introduced at one point can rapidly spread downstream, affecting a broad swath of the ecosystem and the communities that rely on it.

The impact of water pollution is not just an environmental concern; it also dampens public interest in recreational activities around the city's lakes. Although the government has made efforts to activate these areas with jogging tracks and playgrounds, their usage remains disappointingly low due to poor water quality. The lack of engagement underscores a deeper issue—Hyderabad's lakes score alarmingly low on key metrics indicative of water health, specifically Biochemical Oxygen Demand (BOD) and Dissolved Oxygen (DO) levels.

According to the National Oceanic and Atmospheric Administration (NOAA), BOD levels in water bodies should not exceed 3 mg/L, while DO levels must not fall below 2 mg/L. However, data from the Telangana State Pollution Control Board (TSPCB) reveal the dire state of Hussain Sagar, one of the oldest lakes in Hyderabad. Built in the mid-16th century, Hussain Sagar was once a vital source of drinking water and irrigation. Yet, in 2021, its BOD levels ranged between 25-116 mg/L, and its DO levels plummeted between 2.9 and 0.5 mg/L. A DO level below 2 mg/L classifies the water as "dead," while levels below 0.5 mg/L indicate that it is effectively sewage.

Another critical case study is Fox Sagar Lake, which illustrates the ongoing degradation of Hyderabad's water bodies. Originally constructed for irrigation and water supply, Fox Sagar has suffered immensely due to encroachments and untreated sewage inflow. Over the years, the lake has lost significant surface area, with the surrounding landscape increasingly dominated by informal settlements and commercial developments. Reports indicate that Fox Sagar's water quality has severely deteriorated, with BOD levels recorded as high as 40 mg/L, far exceeding acceptable limits, and DO levels dropping to dangerous lows of around 1.5 mg/L. Such conditions render the lake unable to support aquatic life and pose serious health risks to nearby residents.

The degradation of Fox Sagar is emblematic of the larger issues facing Hyderabad's lakes. As lakes become less viable, the quality of life diminishes, and the potential for public spaces to foster community engagement erodes. The connection between the residents and their natural surroundings is fraying, resulting in a loss of environmental stewardship.

Moreover, the consequences of pollution are compounded by the absence of robust waste management systems and regulatory enforcement, allowing industries and households alike to discharge contaminants without accountability. The situation calls for immediate intervention, including stricter regulations on industrial discharges, enhanced waste management practices, and the restoration of natural filtration systems.

To combat this ongoing crisis, the city must prioritize the rehabilitation of its water bodies. Initiatives could include community clean-up drives, investment in modern sewage treatment facilities, and the establishment of monitoring systems to ensure compliance with environmental standards. By addressing the root causes of water pollution and restoring the health of Hyderabad's lakes and rivers, the city can revitalize its water network, protect public health, and re-engage its residents in appreciating the natural beauty and ecological importance of these vital resources.

Fig 49: An inlet drain of a waterbody carrying significant pollution load in form of both contaminated water and solid waste, 2019
Source: WRI India, 2020

6.5 Ecological concerns

A convergence of water pollution, deforestation, and rock mining has precipitated unprecedented ecological damage in and around Hyderabad. Less than three decades ago, the city's lakes were not only sources of potable water for local neighborhoods but also supported water-intensive agriculture and provided recreational activities like fishing and swimming. These water bodies were critical for sustaining vibrant aquatic ecosystems, which boasted hundreds of species of plants, birds, fish, and reptiles.

Take, for instance, Ameenpur Lake, constructed in the 16th century, which was once a sanctuary for migratory birds such as flamingos, painted storks, and Australian ibises. Recognizing its ecological significance, the central government designated it a biodiversity heritage site. However, despite this recognition, encroachments have decimated the lake, shrinking it from 300 acres to a mere 93 acres over the last two decades. Other significant reservoirs, such as Osman Sagar and Narsapur, are similarly witnessing a decline in migratory bird populations, driven by stagnant water, residential encroachments, and sand mining along the lakebanks.

This decline isn't limited to rare migratory species; even indigenous birds like sparrows and mynahs, once ubiquitous in Hyderabad, have experienced drastic reductions. Their numbers have dwindled to the point where they are now featured in the aviary exhibit at the city zoo. Field investigations around historic lakes such as Durgam Cheruvu, Langar Houz, and Banjara Lake have revealed the detrimental impacts of human intervention in these natural hydrological systems. For example, physical barriers meant to prevent garbage from entering Durgam Cheruvu have inadvertently disrupted the movement of aquatic life, further exacerbating the ecological crisis.

In addition to the degradation of water bodies, the city's unique geological features are under siege. The Deccan plateau is characterized by gentle rolling hills dotted with igneous rock formations, some of which date back as far as 2.5 billion years. These rocks not only capture and retain water but also serve as habitats for diverse ecosystems, including a rich variety of reptiles, insects, mammals, birds, and plant life. However, large-scale rock mining operations have been undertaken to facilitate road construction and residential developments, contributing significantly to the decline of flora and fauna in the metropolitan region. This mining activity has not only robbed the city of its iconic geological identity but has also altered the natural flow of stormwater, leading to increased flooding and erosion.

A compelling case study highlighting these issues is the impact of rock mining in the surrounding areas of the Hyderabad Metropolitan Region (HMR). The area around Shamirpet has become a hotspot for illegal rock mining, which has significantly reduced the land's ecological value. Once lush with greenery and diverse wildlife, the landscape is now marred by deep quarries and disrupted habitats. Local farmers have reported dwindling crop yields due to changes in local hydrology caused by the removal of rock formations that previously held water. Moreover, the disruption of natural habitats has led to a decline in local species, including various reptiles and insects that played essential roles in the ecosystem.

The ongoing degradation of Hyderabad's lakes and rocky terrains underscores the urgent need for a comprehensive approach to environmental conservation. Strategies should include stricter enforcement of regulations against illegal mining, restoration of degraded water bodies, and community engagement in conservation efforts. By recognizing the interconnectedness of these ecological assets and implementing sustainable practices, Hyderabad can begin to restore its natural heritage and protect the delicate balance of its ecosystems.

Fig 50: Sea of Sewage, 2020
Source: The Hindu

Chapter 7

Musi riverfront development project

Fig 51: Musi River and Heritage at its edges
sources: MRDCL

The Telangana government's Musi Riverfront Development Project is a transformative, large-scale initiative focused on revitalizing the Musi River, an iconic yet heavily polluted river running through Hyderabad. Spearheaded by the Telangana government and estimated to cost around Rs 1.5 lakh crore, this project aims to convert the Musi River into an eco-friendly, aesthetically pleasing space comparable to the redevelopments of the Thames in London. Beyond merely beautifying the riverfront, the project intends to address long-standing environmental issues, bolster urban infrastructure, and create a recreational space that serves both Hyderabad's citizens and tourists.

Project Vision and Objectives:

The overarching goal of the Musi Riverfront Development Project is to rejuvenate the Musi River by transforming it into a vibrant and sustainable ecosystem that also doubles as a recreational and cultural hub. This vision reflects the Telangana government's commitment to sustainable urban development and economic growth, as Hyderabad's urban population continues to rise. The government aims to make the Musi River the focal point of Hyderabad's new identity, targeting it as a unique cultural and economic landmark within the city.

Among the main objectives of the project are:

Pollution Control and Water Purification: The Musi River suffers from severe pollution, stemming from untreated wastewater and industrial runoff. A significant portion of the project's budget is allocated to advanced water treatment systems aimed at removing contaminants and ensuring that clean water flows through the Musi. The goal is for this rejuvenation to prevent flooding in surrounding areas, improve public health, and restore biodiversity to the river.

Infrastructure Development: The project includes the development of robust infrastructure around the river. Plans for traffic decongestion through the construction of East and West corridors are underway, which will not only facilitate easier movement across Hyderabad but also enable improved access to the riverfront. Additionally, recreational, wellness, educational, and commercial zones along the river will make the area a gathering space.

Tourism and Recreation: A key aspect of the project is making the riverfront a tourism hotspot. This includes constructing landmarks such as a giant Ferris wheel similar to the London Eye, the world's largest Mahatma Gandhi statue, and theme parks that reflect local culture and heritage. The government envisions these additions as enhancing Hyderabad's appeal as an international city, attracting visitors and boosting the local economy

Recent Developments and Timeline:

The project has made significant strides in recent years, with the Telangana government establishing the Musi Riverfront Development Corporation Limited (MRDCL) as the implementing authority. Initial steps have included extensive surveys, where over 10,600 households were identified within the river's buffer zones. These surveys are instrumental in planning the layout of the riverfront and ensuring that all affected residents receive proper compensation and relocation support

Starting in the end of 2024, the first phase of construction will commence in the Bapu Ghat area, a strategic location chosen for its significance and accessibility. This phase includes constructing channels to divert water from the Mallannasagar Reservoir to Gandipet, ensuring a consistent flow of clean water along the river's course. The comprehensive plan, developed by a consortium of international firms like Meinhardt, RIOS, and SOM, provides a roadmap for the aesthetic and functional transformation of the riverfront. The government is optimistic about completing major sections within two years, despite financial challenges

Financial Strategy and Funding Models:

Given the scale of the project, funding is a critical aspect, especially since Telangana is currently grappling with a high level of state debt. The government is actively exploring various funding models, including Public-Private Partnerships (PPP) and the Hybrid Annuity Model (HAM). These approaches allow for private investment in public infrastructure projects, reducing the state's immediate financial burden. By attracting private partners, the government also aims to bring in expertise and efficiency to ensure that the riverfront meets international standards

Stakeholders Involved

The Musi Riverfront Development Project involves a wide range of stakeholders, each playing a crucial role in its execution:

Government Agencies: Led by the Musi Riverfront Development Corporation Limited (MRDCL), various state departments are engaged in planning, regulatory compliance, and public engagement. The Hyderabad Disaster Response and Asset Protection Agency (HYDRAA) is another key player tasked with protecting the assets around the riverfront, including urban green spaces, playgrounds, and roads.

International Consortium: A consortium of international firms has been appointed to design the project. These firms bring expertise in sustainable urban design, engineering, and environmental rehabilitation, ensuring that the riverfront aligns with global best practices.

Local Communities: Residents and businesses near the Musi are central to the project's social aspect. Families living within the river's buffer zone, identified for potential displacement, will be relocated and compensated under Telangana's double-bedroom housing scheme. The government is working to minimize disruptions, ensuring that children in affected families can continue their education uninterrupted by placing them in nearby schools and Anganwadi centers

Business Sector: Local businesses stand to benefit from increased foot traffic and commercial activities along the redeveloped riverfront. The government is also engaging the business community, which will benefit from a Sultan Bazar-style shopping center on the riverbank. This center is expected to serve as a bustling marketplace that will contribute to the local economy and offer a unique experience to visitors.

Social and Environmental Impact

The Musi Riverfront Project is envisioned to bring about long-lasting social and environmental benefits. By purifying the river, the project will significantly reduce waterborne diseases and create a healthier urban environment. Additionally, green spaces along the river will serve as "urban lungs," improving air quality and offering residents a place to relax amidst nature.

Socially, the project aims to provide better living conditions for displaced families, offering them improved housing and support in education and healthcare. This focus on sustainable and inclusive growth reflects the Telangana government's goal of setting a benchmark in urban riverfront projects in India. Plans for the riverfront also include eco-friendly zones, allowing people to engage with nature responsibly while preserving the ecosystem. The government hopes that the Musi Riverfront will set an example for other cities grappling with river pollution and unmanaged urban growth.

Challenges and Future Outlook

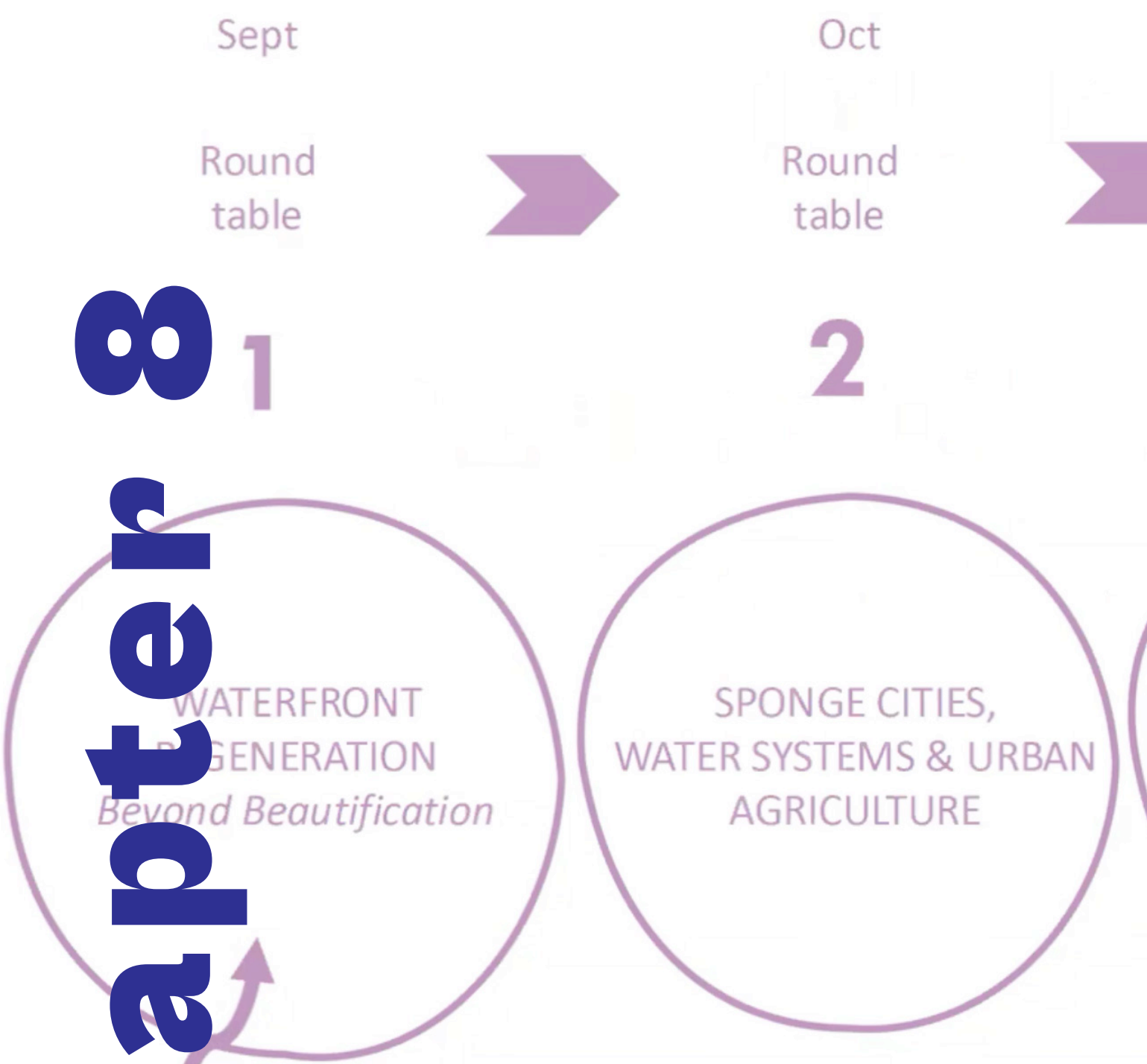
Despite the positive vision, the Musi Riverfront Project faces multiple challenges, including:

Financial Constraints: With Telangana's reported debt of over Rs 7.5 lakh crore, funding such a large project without straining the state's budget requires creative solutions. Reliance on PPP and HAM models shows a proactive approach, but securing private investment for a project of this nature in a developing region may prove challenging.

Public Resistance: Given that thousands of families reside near the river, resistance to relocation may arise. The government's commitment to fair compensation and double-bedroom housing is designed to mitigate this, but strong public engagement and transparent communication will be critical to achieving smooth cooperation

Environmental Concerns: While the project aims to enhance the Musi's ecological health, there are risks associated with large-scale construction, such as disrupting local biodiversity and altering the river's natural flow. Mitigating these impacts will require careful planning and adherence to environmental regulations.

The Musi Riverfront Development Project reflects a broader trend in Indian urban planning: the integration of ecological restoration with economic revitalization. If successful, this project could transform Hyderabad's riverfront into a global tourist destination and a model for sustainable urban river development in India. The Musi, once Hyderabad's lifeline and a hub of cultural life, could once again become a cherished public space, drawing residents and visitors alike to its revitalized shores.



Chapter 8

Overview of preparatory round tables

Fig 52: Round tables of the Hyderabad workshop, 2024
Les Ateliers

8.1 Round table - 1 Waterfront regeneration: Beyond Beautification

Waterfront regeneration: Beyond Beautification

16 September 2024

with the participation of

Poojari Gouthami,
Joint Director of the Musi Riverfront Development Corporation Limited

Niki Shah,
Urban Designer, HCP Design, Planning and Management

Swati Janu,
Architect, Social Design Collaborative.

This year the State of Telangana launched an international competition for the revitalisation of Hyderabad's Musi River Corridor, an ambitious riverfront beautification project that seeks to transform the river into "one of the most innovative restorations in urban landscape contours anywhere in the world".

- What can we learn from Indian and international experiences, so as to ensure the project's also restoring the health of the entire ecosystem of the river catchment in a holistic way?
- Can we improve the resilience of the city by embracing natural systems and establishing living shorelines?
- How can the riverfront be developed in a way such that no one is excluded and all social groups can benefit from it?

Rewatch the roundtable:

https://youtu.be/nUBlvNwCedY

Fig 53: First round table of the Hyderabad workshop, 16 Sept, 2024 - Waterfront regeneration: Beyond Beautification
Les Ateliers

8.2 Round table - 2 Sponge Cities and water ecosystems

Sponge Cities and water ecosystems

10 October 2024

with the participation of

Kongjian Yu,
Landscape architect and urbanist, Founder and Principal Designer of Turenscape, Inventor of Sponge City concept

Kalpana Ramesh,
Water conservationist known as the "water warrior", Founder of the Rainwater Project

Ripin Kalra,
Urban Risk and Resilience expert, Technical director of ICF, and Senior Fellow, University of Westminster

Ramveer "Pondman" Tanwar,
Environmentalist, Founder of #SayEarth.

This second round table will focus on the techniques and challenges of nature based solutions in the context of Hyderabad's rapid urbanisation and ongoing urban regeneration projects. We will explore the immense potential of the city's tanks and their littoral zones to simultaneously contribute to groundwater recharge, flood defence, biodiversity conservation as well as recreational opportunities. A panel of local and international experts will bring diverse perspectives to discuss the multifunctional appeal of managing stormwater locally as close to its source as possible and the urgent need to limit soil sealing, preserve ecosystems and reuse wastewater. We will also explore urban agriculture as one of the key strategies to build water resilience while also providing direct socio-economic benefits such as job creation and food security.

- How can we institutionalise nature-based solutions and principles into urban planning policies and frameworks in the Indian context?;
- How valuable are community involvement and engagement in the success of such practices and operations?
- What role can urban farming play in preserving nature in Hyderabad's metropolitan region?
- Can the restoration of the stepwells extend beyond aesthetics to serve the community's domestic and irrigation needs, as well as a means to evaluate groundwater quality?

Rewatch the roundtable:

https://youtu.be/mFBx60h4sBY

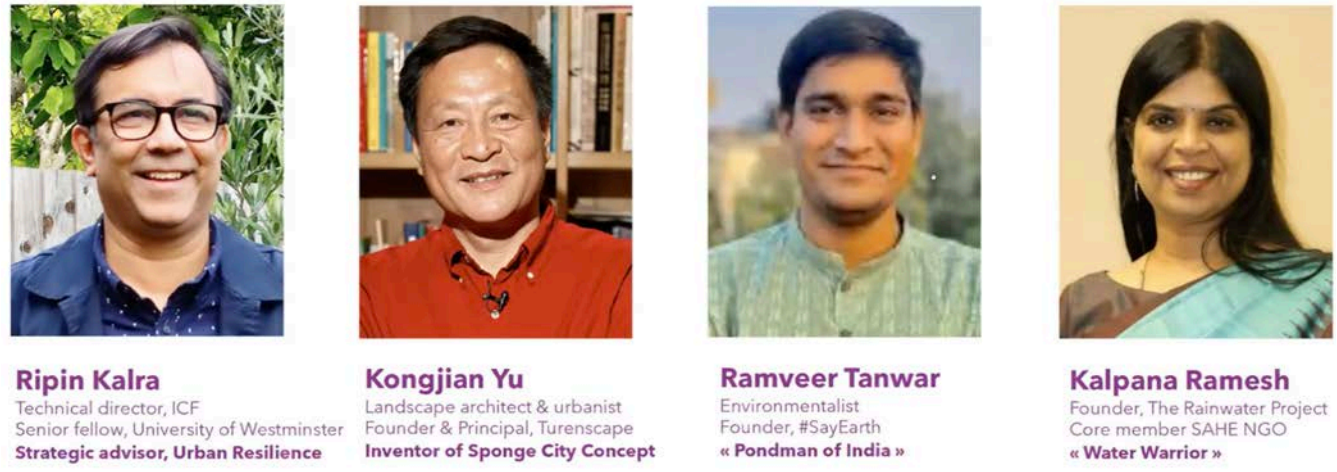


Fig 54: Second round table of the Hyderabad workshop, 10 Oct, 2024 - Sponge cities and Water ecosystems
Les Ateliers

8.3 Round table - 3 Communities and water networks

Communities and water networks

14 November 2024

with the participation of

Dr. Snehalatha Mekala,
Associate Professor, Administrative Staff College of India (ASCI)

Dr. Marie-Hélène Zerah,
Research Director with the French National Research Institute for Sustainable Development (IRD)

Dr. Anant Maringanti,
Founder and Director of Hyderabad Urban Lab (HUL)

This roundtable focuses on communities and their profound relationship with water, and by extension, access to local amenities and services. Water availability and management have shaped the city and the lives of communities. Hyderabad's urban morphology has been defined by its topography and water networks, be it the local scale of stepwells, tanks, ponds and channels, or the larger scale of lakes and the river Musi. The city's mobility structure closely follows this logic as is evidenced by the soft mobility network at the neighbourhood scale and the arterial roads and flyovers at the metropolitan scale.

As we steadily witness the erosion of social ties with the disappearance of local water bodies, the preservation of the local scale becomes paramount for both community resilience and water resilience.

- How can the neighbourhood scale be safeguarded and maintained to improve community access to services?
- How might maintaining only metropolitan-scale lakes harm local neighbourhoods?
- How can we avoid this loss?
- How can communities connect to the metropolitan scale through shared governance, for example, via residential welfare associations?

Rewatch the roundtable:

https://youtu.be/bwn-cPCSkOk?si=5lcz_cP2z8vJEDpR

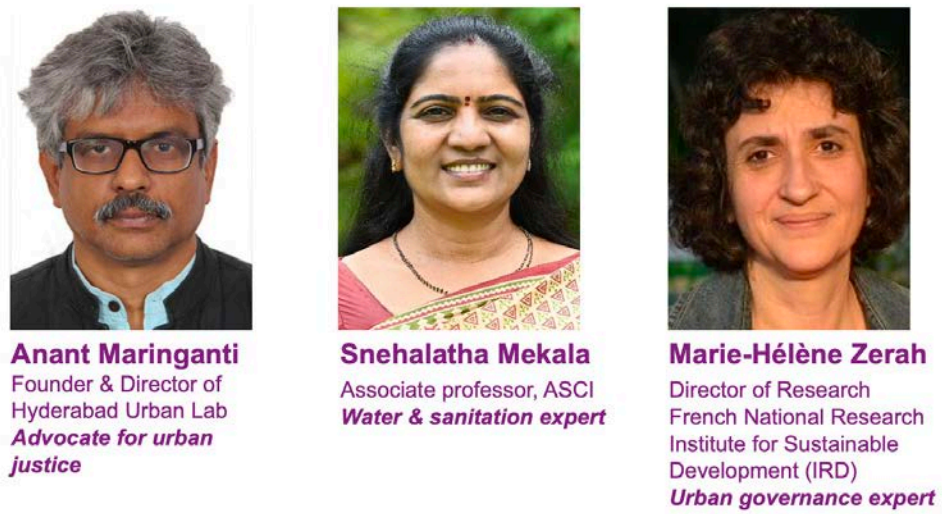
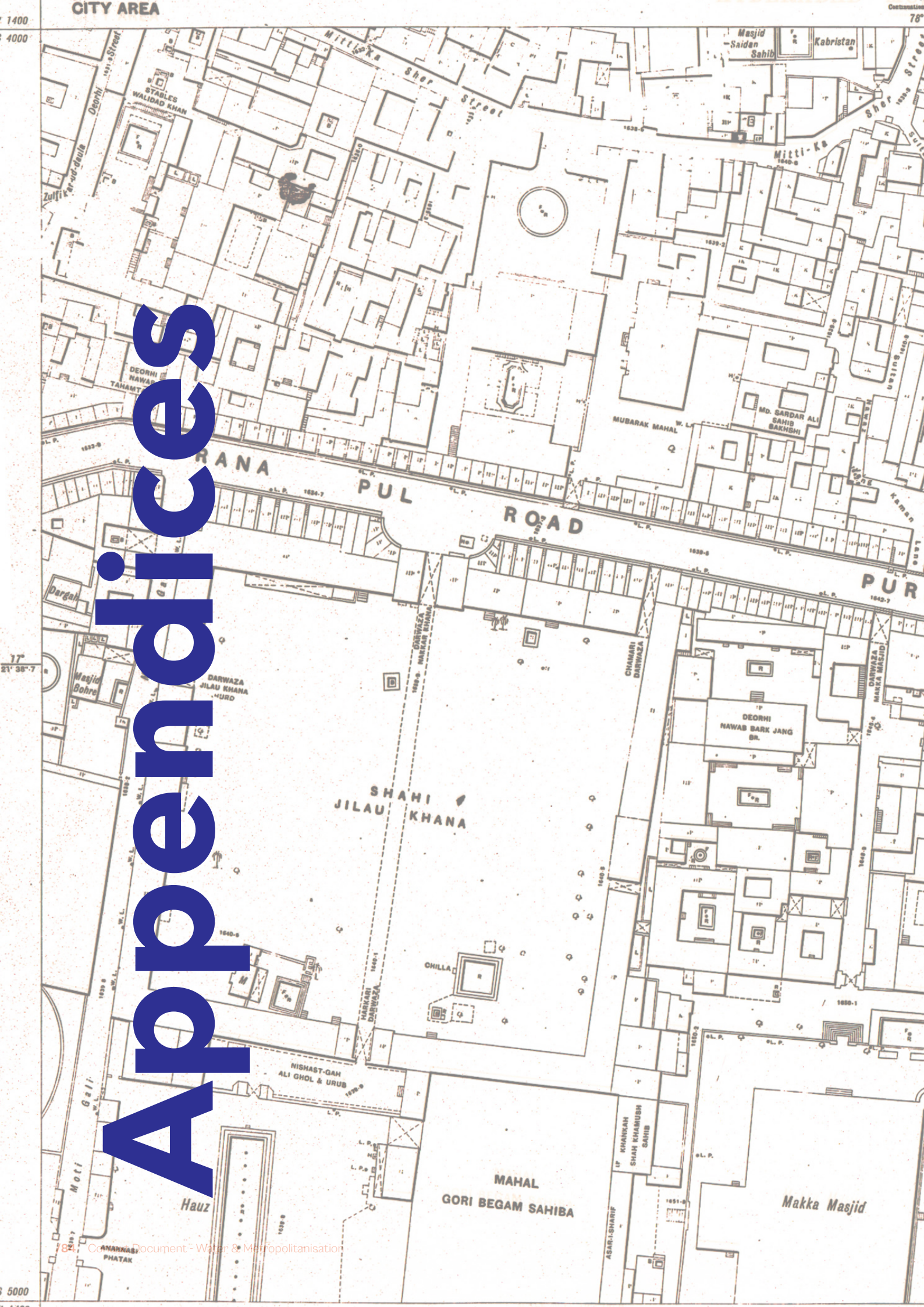


Fig 55: Third round table of the Hyderabad workshop, 14 Nov, 2024 - Communities and water networks
Les Ateliers



Appendices

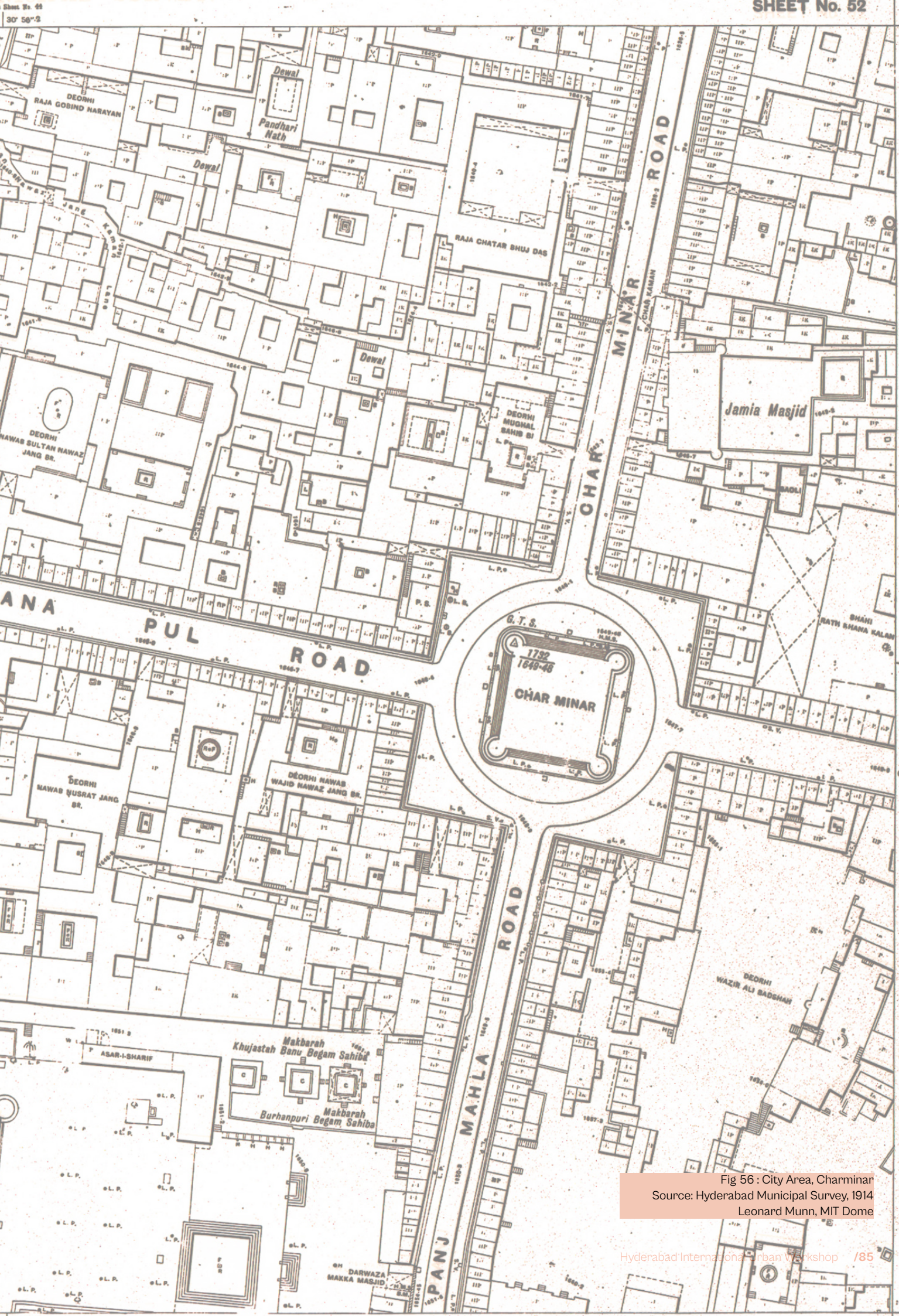


Fig 56 : City Area, Charminar
Source: Hyderabad Municipal Survey, 1914
Leonard Munn, MIT Dome

Further resources:

1. Hyderabad Municipal Survey, 1912-15 lead by Leonard Munn - Archives available at MIT Dome - https://dome.mit.edu/discover?scope=%2F&query=hyderabad+Municipal+Survey&submit=Go&filtertype_0=author&filter_relational_operator_0=equals&filter_0=Munn%2C+Leonard&rpp=10
2. Master Plans available on the HMDA website - https://www.hmda.gov.in/planning-2/
3. Map showing Water Stagnation Areas in GHMC - https://www.ghmc.gov.in/Monsoon_Action/WATER%20STAGNATIONS_3.pdf
4. To explore more about Water supply services, Source and storages, Govt. schemes, Water levels in Resrvoirs, etc., - Access the official website of HMWSSB - https://www.hyderabadwater.gov.in/en/
5. Mapped data on Terrain, Slumscapes, Transit and Poverty etc. available on the website of Hyderabad Urban Lab - https://hydlab.co.in/maps/
6. Understanding Hyderabad City: Differences Between MCH, GHMC, HUDA, and HMDA. Hyderabad. http://hyderabad-india-online.com/2012/05/mch-ghmc-huda-hmda/
7. Archival photographs of Hyderabad city - https://dome.mit.edu/discover?scope=%2F&query=Hyderabad&submit=Go&filtertype_0=title&filter_relational_operator_0=contains&filter_0=&rpp=10
8. Readings available at the Digital Repository of The Deccan Archives - https://www.thedeccanarchive.com/repository/d836f5da-3d2d-4b2d-af4f-de871fe360fd
9. Mapped data of Hyderabad on varied categories - https://data.opencity.in/organization/greater-hyderabad-municipal-corporation
10. Telangana Water Resources Information System on Hydrological data, Terrain, and Administrative boundaries - https://bhuvan-app1.nrsc.gov.in/twris/geoportal/twris.php
11. The Forgotten Stepwells of Telangana (2024) - a book curated by Architect Yeshwant Ramamurthy; Research and Documentation supported by Hyderabad Design Forum. The book will be available for reference during the Workshop.

Glossary of terms:

FTL: Full Tank Level. It is measured in meters and is the vertical distance between the lowest elevation on the lakebed to the top of the maximum water level the lake can hold. Changes in FTL are often used to determine whether a lake is being encroached or tampered with. However, as experts working in the field pointed out, lakes can be encroached while still maintaining its FTL. Encroachments on the periphery of lakes can reduce its volumetric water holding capacity while maintaining the same vertical distance used to measure the lake's FTL.

MWS: Maximum Water Spread. It is measured in square meters and is the total area that a lake occupies when it is upto its maximum volume capacity. when MWS Is used in conjunction with FTL, it can provide a more complete method to track encroachments on lakes.

Inlet: Inlets are any water channels, natural or man-made that feed the lake. Given Hyderabad's rolling topography, each lake has a number of inlets.

Outlet: Outlets are channels leaving the lake and traveling downstream. Lakes in Hyderabad most commonly have two types of outlets: one that provide water for agriculture and the other, that enable storm water connections with other downstream lakes.

Catchment Area: An area from which water drains into a particular lake or river. Hyderabad has a gentle, rolling topography which can result in very large catchment areas. Development inside the catchment area of a lake can have a big impact on the lakes sustenance and the quality of its water.

Bund: The quality and material of the bund can vary by its age and water holding capacity. Smaller and older lakes nave snallow bunas made of earun and rocks. Larger lakes and reservoirs use stone masonry win lime or cement plaster tor their dunas. Bunas witn stone masonry are tall and rodust ana allow lor very large quantues or water to de storea, for example: usman sagar, Mimayat Sagar and Mir Alam Tank. Historically, settlements around small tanks extracted water from them manually wile arger reservoirs had nallahs and pipeline connections lo carry potable water to surrounding settlements.

Agricultural Sluice: An agricultural sluice is a mechanical system operated by a wheel which when turned, opens a duct in the bund to allow water to be released to agricultural fields downstream from the lake. Agri sluices are also used to quickly drain water in the event of a flood.

Excess Weir or Surplus Weir: Excess weirs are located on or adjacent to bunds. They are at a fixed elevation which is set according to the Full lank Level of the lake. Once the lake reaches that level. Water begins draining out of the excess weir and moves on to the next downstream lake. The excess weir is important for maintaining the lake's water holding capacity and its connections to other downstream lakes.

Lake Banks: Most lakes in Hyderabad were non-perennial. Their banks naturally had a gentle topography that allowed them to expand and contract with the season. Since lakes did not have a defined boundary, their banks became interesting thresholds that were constantly changing. They supported water intensive agriculture and enabled a rich biodiversity.

Cemeteries: Water is an important element for ablution in funeral rituals for Hindus, Muslims and tribal communitles that inhabit in Hyderabad. Cemeteries were built along storm water streams, rivers or near lake banks because of the easy access to water. However, they also needed to be strategically located so as to not flood during the monsoon season when the lake would swell up. Therefore, the location of cemeteries can be used as markers to track the original expanse of encroached lakes or rediscover lakes that no longer exist.

Religious Structures: Lakes in Hyderabad often have a temple, mosque, shrine or tomb that signify the importance of water in religious and cultural practices. The most common of which are Katta Maisamma temples that are built on the bund. Katta means bund and maisamma means goddess, hence "goddess of the bund. Hindus believe the goddess protects the bund, safeguarding the source of water and keeping settlements sate from flooding. Katta Maisamma Temples are also an important element of the annual Bonalu festival that honors the goddess, Mahakali. The festival ends with the Ghatam - a copper pot decorated in the form of the goddess being submerged into water, accompanied by the beating of drums. Mosques and tombs from the Qutb Shahi and Asat Jahi era are also located near lakes like the Masjid-e-Qutb Shahi at Durgam Cheruvu or the Saidani Ma tomb near Hussain sagar.

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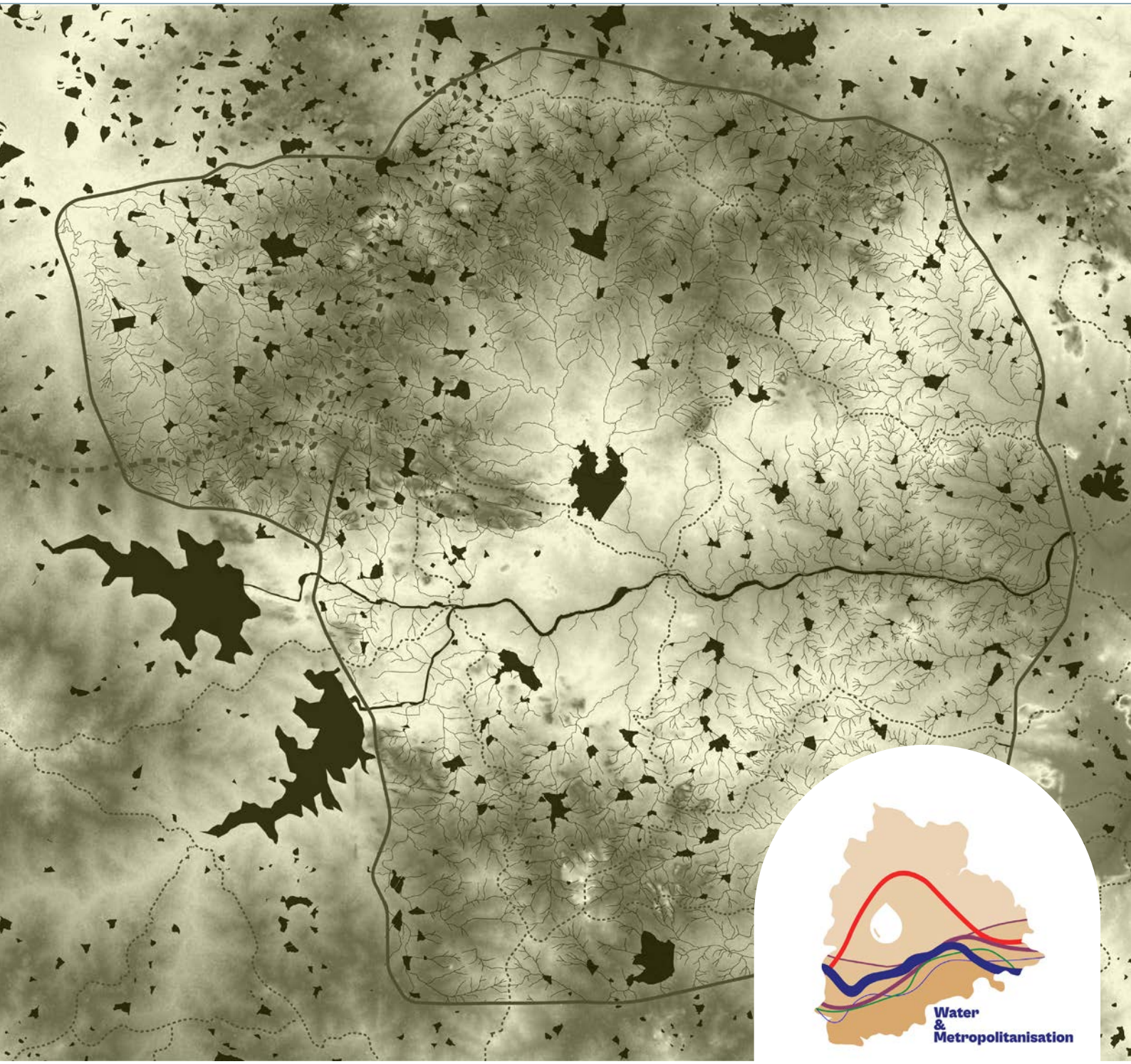
Water
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Metropolitanisation