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REPORT

EFFECTS OF WATER CRISIS ON BANGALORE REAL ESTATE

GRI CLUB MEMBERS DISCUSS MARKET
IMPACT AND INNOVATIVE SOLUTIONS

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GRI Club

Editor: Isabella Toledo | Designer: Gabriela Carvalho | Image: PQN Studios / Shutterstock

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INTRODUCTION

For more than 25 years, GRI Club's exclusive networking events have been providing unique opportunities for the industry's decision makers to exchange valuable insights and experiences, igniting deal flow and potential using the real estate market.

GRI Club reports provide the key takeaways from these events, including the most valuable insights, the most ardent discussions, and the most intriguing strategies.

This report was compiled following the conversations that took place at the online meeting **Ripple Effect of Bangalore's Water Crisis**, where industry leaders and experts addressed the origin of the crisis, the potential implications for the real estate market, and innovative strategies such as mitigation solutions and contingency plans.

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NAVIGATING BANGALORE'S WATER SCARCITY IMPACT

The critical water crisis in Bangalore emerged as a pressing issue with far-reaching implications for both the local population and various sectors of society, including real estate. The severity of the situation could not be overstated, as the city's rapidly depleting water resources threatened not only daily life but also future growth and development.

As a leading platform dedicated to driving impactful conversations, GRI Club has always prioritised staying informed about pressing issues affecting members and the industry. The water crisis posed significant challenges for real estate development, property values, and investment decisions, making it a topic of urgent concern for stakeholders across the market.

In response to this critical issue, GRI Club India facilitated a dedicated discussion to explore the nuances of Bangalore's water crisis. By bringing together industry experts and stakeholders, the aim was to explore the repercussions of the water shortage on real estate and identify collaborative solutions to address this multifaceted problem.

This exploration sought to aid understanding and navigation of the complexities inherent in Bangalore's water crisis and its impact on the real estate landscape, providing valuable insights and fostering meaningful dialogue among all involved parties.

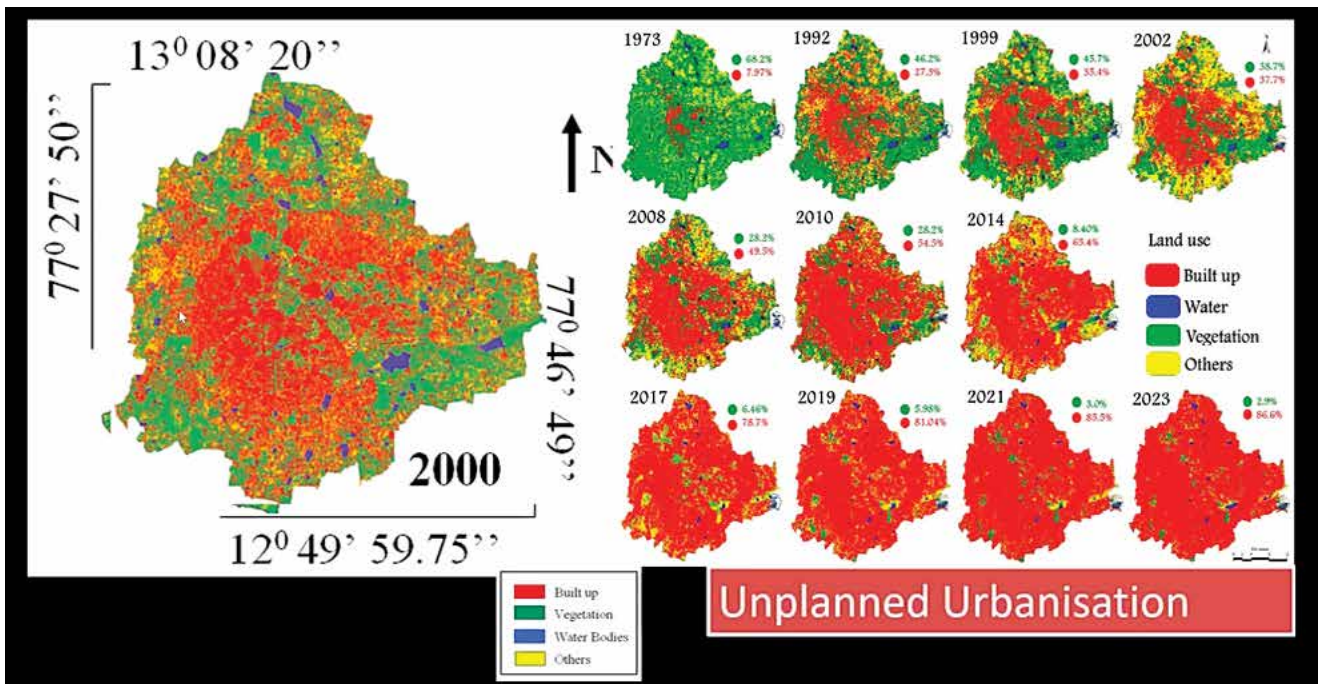
» **Origins of Crisis**

Understanding the origins of Bangalore's water crisis is crucial for grasping its severity and complexity. By examining the historical context and root causes, effective solutions and strategies can be identified to mitigate the impact on the city and its inhabitants.

One significant issue in Bangalore is the absence of water urbanism. The city has transitioned from a porous landscape to a paved one, resulting in inadequate groundwater recharge and a growing groundwater shortage. Currently, 45% of Bangalore's water demand is met by groundwater resources.

The crisis is largely due to unplanned urbanisation, which has led to the loss of porous surfaces such as wetlands and trees, and the degradation of plains. This has resulted in water scarcity and oxygen deficiency in the region. Additionally, erratic rainfall due to climate change exacerbates the problem at the other end of the Cauvery River.

Bangalore's undulating terrain includes three watersheds: KC Valley, Hebbal-Nagavara, and Vrishabhavathi. The city's landscape has dramatically changed from 1973 to 2023. In 1973, the green cover (vegetation) was at 68%. By 1992, industrialization had begun, and by 2000, the ITPT sectors emerged on the outskirts, further altering the landscape. Intensification continued through 2006 and 2009, and by 2023-2024, approximately 86% of the landscape is covered with paved surfaces, including buildings and roads.



Source: Dr. TV Ramachandra, Indian Institute of Science.

Urbanisation has surged from 7.97% in 1973 to 86% in 2023-2024. A study from 2021-2022 shows a 1078% increase in paved surfaces over the past five and a half decades, with an 88% loss of vegetation and 79% loss of water bodies. Predictions indicate that in the next 4-5 years, 98.5% of the landscape could be paved.

The primary issue driving the water crisis is that growth has surpassed the region's carrying capacity. This includes both supporting and assimilative capacities, as evidenced by the increasing levels of pollutants.

Currently, Bangalore has 1.5 million trees for a population of 9.5 million people, translating to one tree for every 7-8 people. Ideally, there should be 7-8 trees per person to balance carbon dioxide emissions, which range from 540 to 980 grams per person per day. One hectare of vegetation absorbs about 6-9 tons of carbon, but the city has only one tree per 7 people.

Over the last five decades, Bangalore has lost 88% of its vegetation. Additionally, 79% of the city's water bodies have been lost from 1973 to 2023, leaving about 203 remaining, with 98% of them encroached upon. 82% of stormwater drains, which connect to the lakes, are encroached or filled with solid waste and debris.

The linkage between vegetation, water bodies, and temperature is evident. The average temperature in Bangalore has increased over the years, correlating with urban growth. Areas with water bodies or vegetation are 2°C cooler than the city centre, demonstrating that these features act as heat sinks.

Lake pollution in Bangalore is also a major issue, contaminating the food chain. Vegetables and fish from polluted lakes like Varthur and Bellandur contain heavy metals, posing health risks. The lakes are polluted by solid and liquid waste, with 98% of water bodies being encroached upon. Invasive weeds in these lakes block sunlight, reducing algae and fish populations, which has further diminished the economic value of the lakes.

Air pollution in Bangalore is exacerbated by weak public transportation, with the transportation sector contributing to 46% of the city's pollution, and inappropriate architectural choices, such as glass facade buildings designed for temperate climates. Glass facade buildings consume significantly more electricity—up to 70,000 units per person per year—compared to normal buildings, leading to a larger carbon footprint and increased emissions, which contribute to global warming and erratic weather patterns.

Taking a broader view of infrastructure and natural resources, it is evident that Bangalore has surpassed its carrying capacity in terms of physical infrastructure, transit-based infrastructure, and water and air quality.

To raise public awareness, a decision support system has been developed, named [Western Ghats Spatial Decision Support System \[WGSDSS\]](#). This portal makes all relevant data publicly accessible, allowing everyone, including decision-makers, to visualise it. The portal includes details about the city's infrastructure, energy consumption, and tree cover, along with the current situation and potential solutions.

Additionally, the [Bangalore Lake Information System](#) provides information about lake water quality and fish populations. These tools empower decision-makers to make informed decisions, aiming to improve the city's environmental and infrastructural challenges.

TAILORED SOLUTIONS

Bangalore is facing an acute water crisis, but viable solutions are within reach. The business sector can adopt and promote various strategies, including rainwater harvesting, wastewater treatment, and mini forest creation.

However, it is crucial to understand that there is no one-size-fits-all solution. Each location has unique challenges and requires tailored developments based on a thorough understanding of the region. Therefore, a comprehensive understanding of the specific needs is necessary to devise an effective action plan.

Learn more about each solution mentioned and how it can help address the water crisis below.

» **Lake Interconnectivity**

Before widespread urbanisation, Bangalore's lakes were highly interconnected, and restoring this interconnectivity will be crucial to minimising flooding and water pollution going forward. Historically, this network of lakes managed the city's water flow, ensuring efficient water storage and groundwater recharge. Re-establishing these connections can help control water levels, reduce the risk of floods, and improve water quality.

55% of the city's water needs are met by the Cauvery River, while 45% comes from groundwater resources. Over the past six decades, deforestation and land degradation in the Cauvery Basin have reduced forest cover by 45%, impacting water retention and groundwater recharge. Additionally, Bangalore has seen an 88% decline in tree cover and a 79% decline in lakes, leading to a significant drop in the groundwater table, exacerbated by commercial over-exploitation.

Data shows certain areas of Bangalore are facing severe groundwater shortages. Historically, water was accessible at 80 to 100 feet, but the loss of lakes has caused the groundwater table to plummet to 1800 feet in some urbanised regions.

Since 2001, the conversion of lakes into residential areas has disrupted the natural system, leading to frequent flooding and droughts. Inadequate drainage infrastructure and encroachment have further aggravated the situation.

Restoring the interconnectivity of Bangalore's lakes involves cleaning and desilting the lakes, re-establishing the natural water channels between them, and preventing further encroachment. Such measures will enhance water retention, support groundwater recharge, and mitigate flooding.

» **Lake Rejuvenation**

A recent study demonstrated the effectiveness of lake rejuvenation when Sarakki Lake was rejuvenated by removing accumulated silt, resulting in the groundwater table rising by 320 feet within a year.

Three years later, Sarakki Lake now holds sufficient water, and the groundwater table remains robust. This increase in moisture content has also lowered regional temperatures by 2-3 degrees compared to the city average.

This model of lake rejuvenation can be successfully replicated across the city. Healthy, well-maintained lakes provide significant economic benefits, offering resources such as fish and fodder. In contrast, polluted lakes can impact local livelihoods that depend on these resources.

Additionally, creating new lakes in suitable areas can further support water management and ecological balance. For example, at the Indian Institute of Science (IISc), a new lake was created, serving as a biofuel research lab for students. This project has even attracted wildlife, demonstrating the ecological benefits of such initiatives.

Lake rejuvenation does not oppose urbanisation but rather complements it by integrating sustainable water management practices into urban development. Restoring and maintaining lakes enhances water security, supports local economies, and improves environmental conditions.

» **Rainwater Harvesting**

Bangalore receives approximately 700 to 850 millimetres of rainfall annually, translating to around 15 thousand million cubic feet (TMC) of water. Given that the city's water demand is 18 TMC, rainwater harvesting could meet about 70% of this requirement. The best approach for achieving this is through lake rejuvenation and the retention of rainwater in these lakes.

Rainwater harvesting is both an effective and economical solution for urban areas. It involves collecting and storing rainwater from rooftops, roads, open spaces, and other surfaces for future use. This practice not only reduces dependency on external water sources but also helps mitigate flooding by controlling runoff.

By treating and reusing wastewater for construction and other activities, the city's water resources can be significantly optimised. Successful examples within the region demonstrate that residents can manage their daily water needs through rainwater harvesting. Scaling up this practice across the city could have a substantial impact.

» **Wastewater Treatment**

An integrated approach involving both rainwater harvesting and wastewater treatment offers promising solutions for water management. Currently, the city utilises 18 TMC of water, generating an equivalent volume of wastewater.

By employing nature-based solutions, such as constructed wetlands and algae ponds, it is possible to treat 16 TMC of this wastewater. Consequently, combining 15 TMC from rainwater harvesting with 16 TMC from wastewater treatment results in a total of 31 TMC, thereby creating a surplus water situation.

Constructed wetlands are engineered systems designed to replicate natural wetlands, utilising wetland vegetation, soils, and microbial processes to treat wastewater by removing organic matter and pathogens.

Algae ponds, or algal treatment systems, leverage photosynthesis and nutrient uptake by using algae to remove contaminants, absorbing nutrients like nitrogen and phosphorus while producing oxygen to aid in organic matter breakdown.

In the Jakkur Lake project, a secondary treatment plant works alongside constructed wetlands to effectively remove nutrients and prevent contamination by nitrates and heavy metals.

These methods enhance biodiversity, create green spaces, and contribute to urban sustainability through natural filtration and absorption processes. Over the past decade, continuous monitoring has confirmed the absence of contaminants in the lake, demonstrating the efficacy of this intervention.

Additionally, these measures could reduce temperatures by 2°C and create biodiversity hotspots, further enhancing the ecological balance and sustainability of the region.

» Artificial Water Solutions

In tackling the water crisis, innovative solutions such as creating artificial water bodies and utilising advanced technologies are proving effective. A notable example is the crystal lagoon in Dubai, a man-made artificial lagoon created using air water technology.

This method extracts water from the humidity in the air, an approach effective in regions with over 50% humidity. Given Bangalore's relative humidity of approximately 68-69%, this technology holds promise for the city.

Real estate developers are exploring the potential of integrating lagoon projects in India, leveraging this four-step filtration process. The initial air filter removes dust particles from the air. Subsequently, the water dust filter eliminates external particles and airborne sediments.

A pre-carbon filter then removes impurities, colour, and odour, followed by an ozone filter, which is 3,000 times more powerful, ensuring disinfection and making the water nearly potable. This technology, if deployed in containers, can produce between 5,000 to 50,000 tons of water per day, offering a substantial solution to water scarcity.

Another innovative solution is the development of cloud water technology. This technology, which extracts water from atmospheric humidity, is particularly effective in areas such as Bangalore, with its sufficiently high levels of humidity.

Globally, lagoon projects have successfully implemented cloud water technology, even in arid regions like the UAE and Saudi Arabia, where water scarcity is a critical issue. These projects have attracted investors who are well-versed in water crisis management and sustainable practices.

However, reliance solely on artificial solutions is not sustainable in the long term. Unplanned urbanisation and the reduction of green spaces have significantly impacted cities like Bangalore, once known as the "Garden City," which now faces extreme summer heat and groundwater depletion. Sustainable urban planning and increased green cover are essential to address these challenges and ensure a stable water supply.

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REAL ESTATE MARKET ADAPTS TO WATER SHORTAGE

The water crisis in Bangalore poses significant challenges, but its impact on the real estate market is still being assessed. Bangalore remains resilient and continues to thrive as the largest commercial office space market in India, but in recent months, heightened awareness of the water crisis has led both developers and consumers to prioritise water availability.

Previously, discussions primarily centred around project quality, pricing, location, and amenities. Now, the availability of piped water has become a critical factor for consumers, influencing developer and investor priorities. While the sales market remains strong, the rental market has seen some pressure, with tenants actively seeking locations with reliable water supply and government interventions to address water shortages.

Consumer sentiment toward home ownership and employment opportunities remains positive, driving demand in Bangalore. While water availability has recently become a significant consideration, economic factors, social infrastructure, and employment connections are still the primary drivers of buyer decisions.

Equally important factors for growth, such as water and air quality, were generally perceived by the public as temporary concerns. However, this perception is changing as the long-term implications of environmental sustainability become clearer. The public and businesses alike are beginning to understand the necessity of addressing these issues to ensure sustainable urban growth.

Additionally, the growth of Bangalore's real estate market is largely driven by the region's economic activities, business operations, and job creation, which attract population influx and shape urbanisation. Despite the water crisis, macroeconomic activities continue to fuel the market's growth. However, ensuring a high quality of life remains a challenge that must be addressed to avoid long-term economic repercussions.

While Bangalore's water crisis is a significant concern, it has not substantially dented the real estate market. Instead, it has spurred a renewed focus on sustainable practices and long-term planning. This shift highlights the growing recognition of the importance of environmental sustainability in ensuring the city's continued growth and resilience.

UNIFIED EFFORTS TO TACKLE THE CRISIS

Bangalore's water crisis is a complex issue that extends beyond the city's borders, requiring both city-level and regional-level solutions. While initiatives like rainwater harvesting and lake rejuvenation by private investors and real estate developers can address part of the problem, collaborative action from various stakeholders, including the state government, municipal corporations, and planning development authorities, is crucial.

The water shortage is not exclusive to Bangalore but affects many parts of South India, exacerbated by poor rainfall and increasing demand. At the regional level, the absence of a comprehensive watershed management plan is a significant gap. A substantial portion of water demand comes from agriculture, and without a regional strategy to manage and conserve water, the supply remains unstable and limited.

Bangalore's growth needs to be balanced with addressing its water demands. As new developments arise, offsetting the increased demand becomes critical. The current expectation for unrestricted water use may need to shift towards a strategy of conservation and sustainable management. This involves recognizing the limitations of supply and implementing policies that encourage water conservation to ensure equitable distribution.

At the city level, issues such as over-concretization and fragmented governance can hinder effective water management. The Bangalore Development Authority's (BDA) master plan, intended for a 2015 target, may no longer be sufficient for current needs. Additionally, governance is managed by multiple jurisdictions overseeing different sections of the city, which can create challenges.

To address these challenges, an integrated governance framework can be beneficial. The Bruhat Bengaluru Mahanagara Palike (BBMP) Restructuring Committee and the Bangalore Climate Action Plan (BCAP) are steps in the right direction, but further efforts should include prioritising the creation of updated, scientifically-backed master plans and establishing authorities to manage watersheds and regional development effectively.

The involvement of the community and business leaders is also important. Organising forums to advocate for sustainable water management can help drive positive change. A sustained effort over the next few years can ensure that water management remains a priority, helping to prevent future crises. Advocacy and continuous engagement can lead to the implementation of necessary regulations and sustainable urbanisation practices.

While the water crisis presents significant challenges, a collaborative approach involving both the public and private sectors can lead to effective and sustainable solutions. By addressing both city-level and regional-level issues and encouraging community involvement, Bangalore can secure a resilient and sustainable future.

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BUILDING THE FUTURE WITH SUSTAINABLE GROWTH

To foster equitable growth across all districts and sub-districts, a cluster-based development model can be adopted. This approach leverages regional strengths by creating specialised economic zones focused on sectors like agriculture, manufacturing, technology, or services.

By distributing growth rather than concentrating it in Bangalore, local youth can find employment and continue in agriculture, which is vital as 65% of the population relies on the sector for their livelihood.

Agro-clusters can be developed in more fertile regions, emphasising modern agricultural techniques, strong agri-businesses fundamentals, and the growth of food processing industries.

For example, the triangular region comprising Thanjavur, Kumbakonam, and Thiruvallur demonstrates the benefits of such a model. There, rural youth travel to towns for industrial work during the week and return to their villages for farming on weekends. This model supports sustainable development and can be replicated across India.

This boosts agricultural productivity and job opportunities, encouraging youth to stay and contribute locally. Additionally, these clusters can adopt sustainable practices to preserve the region's environment, ensuring that development does not come at the expense of natural resources.

Image: Bala Bhat / Shutterstock

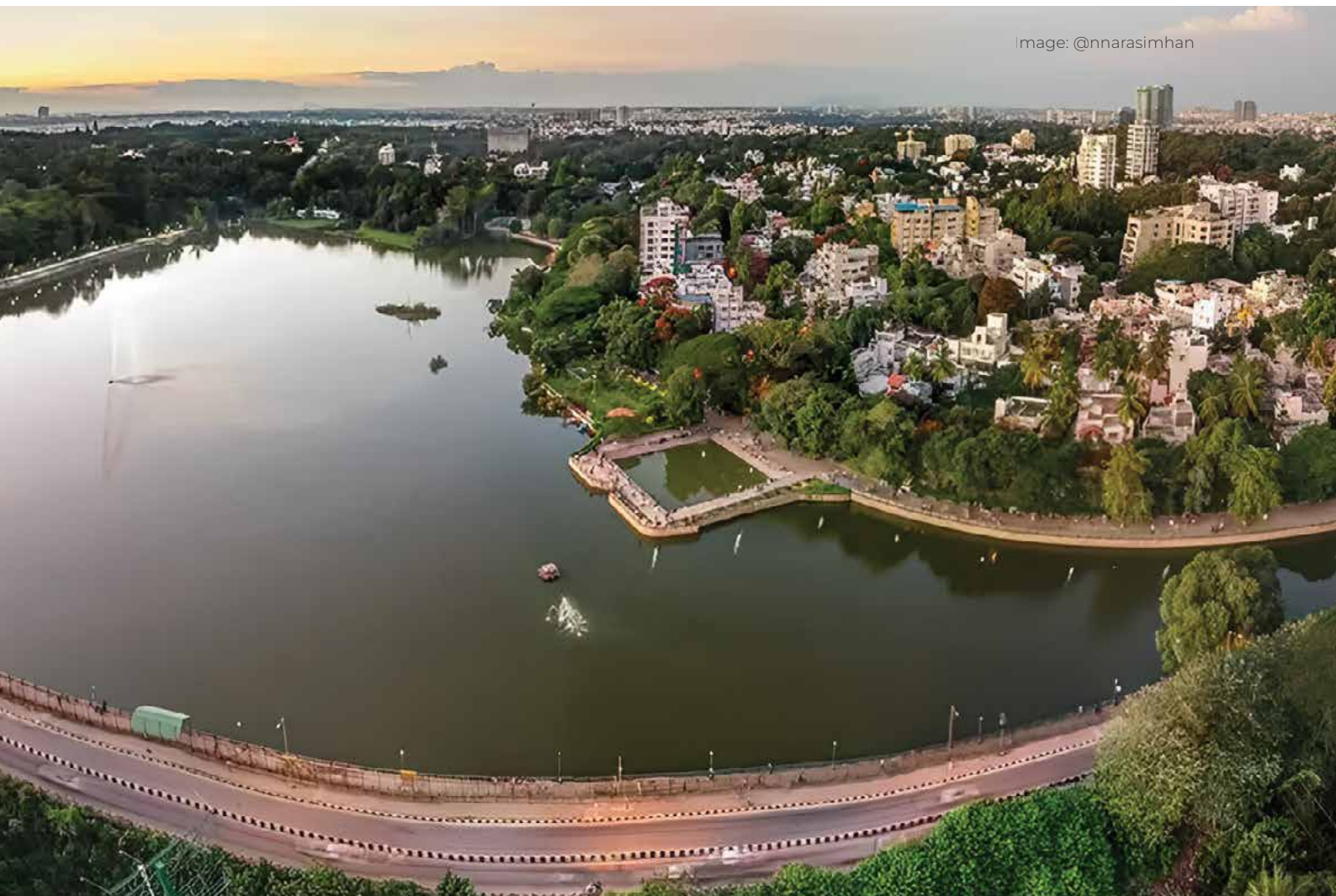


Therefore, the solution needs to encompass the entire system, recognizing that Bangalore's water supply depends on the preservation of the Western Ghats and the Cauvery Basin. Effective management of these regions can mitigate the impacts of climate change and global warming.

A carrying capacity study can alleviate pressure on Bangalore by promoting smart, sustainable growth in surrounding areas. This strategy can enhance the city's ecosystem and quality of life. To build a climate-resilient system, construction activities can shift from using borewell water to treated wastewater, reducing overall water demand.

Corporate social responsibility (CSR) initiatives can play a pivotal role in this transformation. Companies can adopt and rejuvenate local lakes, similar to efforts in Hyderabad, where corporations have revitalised over 25 lakes. Encouraging Bangalore's corporations to engage in such activities can support the city's sustainability goals, creating a better environment for all.

The water crisis is a pressing concern, and continued environmental mismanagement and unplanned urbanisation will only worsen the situation. Immediate intervention can help restore the landscape and ensure water availability for future generations. It is crucial to take this warning seriously and implement comprehensive, sustainable measures to safeguard our water resources and secure a livable future for all.





Founded in 1998 in London, GRI Club currently brings together more than 16,000 senior executives spread across 100+ countries, operating in both real estate and infrastructure markets.

GRI Club's innovative discussion model allows free participation of all executives, encouraging the exchange of experiences and knowledge, networking, and business generation.

GRI Club Members also have access to our exclusive online platform to learn more about other members and their companies, correspond, schedule meetings, and receive unrestricted access to all GRI Club content.

CONTACT



Anureet Kochhar

Head of India, Real Estate

anureet.kochhar@griclub.org



Rodrigo Branchini

Managing Director - APAC

rodrigo.branchini@griclub.org

GRI *Club*



GRI Club India



GRI Club



@griclub.apac



griclub.org