CONTEMPORARY SOCIAL SCIENCES

PEER REVIEWED, INDEXED & REFEREED QUARTERLY INTERNATIONAL JOURNAL

ISSN 0302-9298

https://www.jndmeerut.org

[Vol. 33, No. 4 (October-December), 2024]

https://doi.org/10.62047/CSS.2024.12.31.122

# Managing Water for Sustainable Cities in Kerala: Challenges and the Way Forward

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**Abstract**

*While Water crisis has become a universal phenomenon of the global risk society, the contemporary institutions are being crafted not only to mitigate the challenges, but also evolve strategies to find local solutions to global hydraulic issues. In the backdrop of sustainable goals SDG 6 and SDG 11, this article examines the Water management challenges to Urbanization by analyzing the contemporary cases of Water issues in cities. The article articulates how the Kerala society is not only navigating with the Water management challenges but also develop policies to effectively deal with the current and future Water needs of Urbanization.*

**Keywords**

Urbanization, Flash floods, Water scarcity, Water policy, SDG 6 AND SDG 11, People's participation.

Research Foundation International, New Delhi
(Affiliated to UNO)
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# Managing Water for Sustainable Cities in Kerala: Challenges and the Way Forward

## 1. Introduction

Water mirrors society (Dasthagir, 2024), as social life on the planet is intimately and intricately intertwined with water and not only human survival is premised in the Water; water shapes and reshapes social life, human interaction, and relationships in various ways, such as by structuring institutions, inequalities, and development. Historical evidence shows that Urban life emerged due to the congregation of people accompanied by the population growth on the Riverbanks. Demographical changes, development, and advancements in infrastructure, communication, and Information technology have accelerated growth and spread of the emergence of Cities and Towns. Accordingly, Urbanization has a strong and close association with the Water resources. Therefore, Water is not only a source of human survival, but it is also the basis on which Urbanization has become universal.

Though, there is a strong affinity between Water resources and Urbanization, the centrality of water resources for Urbanization has recently emanated challenges in the wake of the expansion of cities and the highly dense urban population. While urban growth facilitates economic opportunities and improved living standards, it also exerts immense pressure on natural resources, particularly Water. Of late, Urbanization has become synonym for water management challenges. Since, Rapid population growth, expanding economies, and changing lifestyles impose tremendous pressure on urban water systems (Pandey, 2021; Talat, 2021). The negative consequences of Urbanization to Water resources manifest in the form of obliterating water bodies, polluting water bodies, or shrinking water resources. While the encroachment of water bodies and wetlands by the residential and commercial plots largely diminish Water bodies, the industrial effluents and Urban community waste lead to despoliation of water resources.

Thus, Water resource management is considerably impacted by rapid urbanization and population growth, which results in

challenges such as scarcity, flash flooding, and contamination of waterways (Adeyinka Alex Banso et al., 2023; Mishra et al., 2020). The urban water crisis radiates well beyond the confines of the city, affecting neighboring environments and serve urban populations (Singh et al., 2022). Since the Urban population is consistently growing on a daily basis, the water management challenges are assuming grave proportion in contemporary Urban society. Concomitantly, the cities evolved because of Water are currently facing predicaments when Water is mismanaged. Thus, in the backdrop of the drive to accomplish sustainable goals wiz. SDG 6 for clean water and SDG 11 for Sustainable cities, this paper examines contemporary Urban Water management challenges in Kerala. The study relies on existing secondary data, including Government reports and websites, media reports and articles, and academic databases.

## 2. Water Situation in Kerala

Kerala, a state renowned for its abundant vegetation and numerous lakes and rivers, is not an exception to the global trend. Kerala possesses 55,734 water bodies across the State comprising Tanks, Lakes, Reservoirs, and Ponds (Water Bodies, First Census Report, 2023). Kerala is known for high amounts of rainfall and precipitation. 'The average rainfall of the State is 3,055 mm, which is two times more than that of national average' (Economic Review, 2017). In the context of Kerala, the challenges of urban water management are exacerbated by several factors. The State's unique geographical features, including its hilly terrain and extensive network of rivers and backwaters, make it susceptible to floods and droughts. The rapid urbanization and population growth have led to increased water demand, pollution, and degradation of water resources. Furthermore, inadequate infrastructure, pollution, and inefficient water use practices have compounded the problem.

## 3. Water Management Challenges Confronting Urbanization in Kerala

### 3·1 Water Pollution and Challenges to Urban Life

Access to safe Water is a basic need for every human being. Water, as the most vital natural resource for the existence of life, was declared as a human right by the UN General Assembly in 2010 (The Human Right to Water and Sanitation, n.d.). Yet, Safe and Clean

Water is an illusion for a large section of society. In 2022, globally, at least 1.7 billion people use a drinking water source contaminated with faeces (The Human Right to Water and Sanitation n.d.). Faecal contamination poses the greatest risk to drinking water safety. (Drinking Water, n.d.). Kerala, a place known for abundant water resources, is also facing water pollution due to industrial effluents and community discharges. Kerala is one among the states where the ground water contains the toxic elements like Arsenic and Fluoride (Sabha, n.d.). This year, two large-scale water pollution incidents occurred in two of the biggest water bodies in the State: Periyar River, Ernakulam, and Ashtamudi Lake, Kollam.

Periyar is the longest river in Kerala. The river is a vital source of Water for the region, with several purification units providing drinking water to the population (Khalid et al., 2018). The Periyar River which serves as a critical resource for local populations, supporting livelihoods through agriculture and fishing, is constantly polluted by the industries located on its banks with negative consequences to river's ecosystem, local communities and regional biodiversity. On May 21st, 2024, the Periyar River's Edayar- Eloor Industrial region experienced a dangerous environmental crisis where thousands of fish began to float dead. The incident involved a discharge of hazardous chemicals into the river from industrial plants in the Eloor industrial area, particularly affecting the water quality and the local ecosystem. The leakage caused widespread contamination of the river, leading to the death of numerous aquatic species and severely impacting the livelihoods of local communities dependent on fishing and agriculture (Martin, 2024).

Also, the studies show that faecal contamination and industrial effluents are present at an alarming level in the Periyar River (Water Quality of Medium & Minor Rivers under NWMP Data, 2022). A preliminary report by the Kerala University of Fisheries and Ocean Studies (KUFOS) on the mass fish kill along the Eloor-Edayar stretch of the Periyar River has indicated the presence of dangerously high levels of ammonium and hydrogen sulphide in the water samples collected for analysis. The discharge of chemicals to the river happened when three shutters at the Pathalam regulator-cum-bridge were opened by the Irrigation Department.

A similar incident happened at Ashtamudi Lake in Kadavur, Kollam. Ashtamudi lake, the second largest lake in the State and a

Ramsar site, is prone to consistent dumping of plastic, poultry waste, abattoir waste, and sewage lines from many households. A mass fish death happened in the lake last week in October due to alleged pollution. The studies conducted by Department of Aquatic Biology and Fisheries, Kerala University and Kerala State pollution Control Board revealed that the lake was under pollution distress with high amount of micro plastics and sewage wastes (Sudhish, 2024). Even though the Kollam Corporation has launched various schemes to preserve the lake, the lack of coordination and follow-ups has hindered their effectiveness, resulting in limited progress and continued environmental degradation.

### 3·2 Water Disasters and Challenges to Urban Life

With cloudbursts and flash rains frequently visiting the State, the urban centres became highly prone to flash foods. Proper and well-functioning drainage systems are very essential to tackle these challenges. Urban drainage systems are crucial in controlling water logging and flooding in cities, especially in the wake of climate change and rapid urbanization (Cai et al., 2024). Developing countries are facing more urban flooding scenarios than developed countries due to poor planning of drainage systems (Menon & Sharma, 2022; Pervin et al., 2020).

Kochi, one of the largest cities in Kerala, faced a flash flood during the start of the southwest monsoon this year. The city was found submerged under Water after a few hours of intense rain on May 22nd, 2024 (Sreemol, 2024). Waterlogging in the city is an ongoing problem, as flash floods of this nature have been reported annually in various newspapers. Panampilly Nagar, MG Road, Kadavanthra, Petta junction, KSRTC bus stand, etc, are the frequently flooded places inside the city (Heavy rain caused Water logging in Kochi city, Manorama Online, n.d.). Encroachment and the obstruction of proper canal flow of Mullassery Canal, located on the city's western side, have further exacerbated flooding in the area (Menon & Sharma, 2022). Kerala Government launched a scheme to control the flash floods in the city named 'Operation Breakthrough' in 2019 (Flood Mitigation Kochi, 2021). It was envisaged to clean the existing drainage systems, canals and to build new water flow pathways to avoid waterlogging the city. Yet, Various news reports shows that the drainage systems are filled with plastic bottles, broken tiles and other sediments which aggravated the situation worse. Solid wastes

accumulated in drainage affect the entire drainage system, which results in waterlogging at the time of rain fall (Pervin et al., 2020). The annual flooding in the city during the monsoon shows that the limited capacity of drainage systems in Kochi city should be rechecked and integrated policy measures to be taken urgently to address the issue. Waterlogging and flash floods were also reported in various Municipalities and Towns in the Districts of Palakkad and Malappuram.

### 3·3 Water Scarcity and Challenges to Urban Life

Water scarcity has become a major concern throughout the world. Urban centres are facing acute water shortages due to various reasons. Rapid Urbanization, population growth, and climate change play crucial roles in water scarcity (Jiang, 2009). The number of urban residents who lack access to safe drinking water has increased by more than 50% (UN Water, 2021). Kerala faces water scarcity, with less than 562 m3 annual per capita water availability in some places (Prasood et al., 2021). Kerala, once termed as Water rich state is now became Water scarce state due to various Anthropogenic activities like over extraction of Water, Concretization and conversion of Agricultural lands and wetlands to residential and commercial plots. Kerala's groundwater level is in alarming condition, where nine districts have semi-critical groundwater tables (Ground Water Resources of Kerala, 2020). Along with that, the privatization of Water also contributes to Water Scarcity. Water scarcity and privatization of water are interconnected issues that have significant social, economic, and environmental implications (Johnson et al., 2016). The coastal cities of Kerala experiencing intrusion of salt water to the existing ground water tables, which in turn affects the day-to-day life of coastal communities.

### 3·4 Mismanagement of Municipal Water Supply and Challenges to Urban Life

Mismanagement of the Governing institutions and stakeholders are also contributing to water scarcity and shortages. For instance, Cape Town's "Day Zero" water crisis shows how urban water scarcity is not solely the lack of physical water availability but also of governance, infrastructure, and social factors (Bischoff-Mattson et al., 2020). This scarcity is exacerbated by increasing water demand in densely populated areas and inadequate water management infrastructure. Kerala faced acute water shortage challenges during

the summer of 2024. Major district capital cities like Palakkad, Kollam, Malappuram and Thiruvananthapuram faced the scarcity of Water. In Malappuram Municipality, the supply of drinking water stopped due to the tank constructed in the Kadalundi River drying up. Kerala Water Authority, the Government agency which is the active supplier of Drinking Water to households in Kerala, had to fill the tank by carrying the Water through tankers to meet the crisis.

Along with the scorching summer, the numerous leakages of age-old water supply pipes and infra structures exacerbated this scarcity. It is reported that the tanks and pumps that are used to supply Water to households are approximately 40 years old ("Malappuram Town under Water Scarcity Threat", 2022). Kollam district also faced acute water shortages due to extreme summer. In addition, the concreting of the Kallada irrigation project prevented the Water from percolating into the soil, and it affected the groundwater recharge disastrously ("Water scarcity in the district", 2024), which is an example of unsustainable management of water resources.

Thiruvananthapuram, the capital city of Kerala, had to undergo five days (From September 05th to September 10th, 2024) without drinking Water due to the restoration works of the water supply pipelines. Initially the KWA, announced that the works will be carried out within 24 hours, but the lack of coordination and proper planning resulted in the prolonged maintenance work. The crisis affected nearly half of the wards of the Thiruvananthapuram Municipal Corporation. The water supply system of Thiruvananthapuram is one among the oldest existing in the country (J. Kumar, 2024). A well-planned restructuring of the system is needed for the city to ensure a long-term water supply.

## 4. Institutional Reforms and Emerging Urban Governance in Kerala

Kerala is lauded as the model for several aspects of social development of which Water management is not an exception. The Government of India and the Government of Kerala actively implemented various plans for the equitable allocation and distribution, conservation, and sustainable use of Water. Atal Mission for Rejuvenation and Urban Transformation (AMRUT) is the flagship programme of Union Government which focuses on development of basic infrastructure, Water supply and drainage system. After that, another plan called the AMRUT 2.0 scheme was launched on October

01st, 2021, for a period of 5 years, aiming to provide universal coverage of water supply through functional taps to all households in all the statutory towns in the country. AMRUT 2.0 will promote the supply of Water through the development of a City Water Balance Plan (CWBP) for each city, focusing on reuse of treated sewage, rejuvenation of water bodies, and water conservation. It will help cities to identify the scope for projects focusing on universal coverage of functional water tap connections, water source conservation, rejuvenation of water bodies, reuse of treated used Water, and rainwater harvesting. Based on the projects identified in CWBP, the Mission envisages making cities' Water secure' through circular economy of Water (Amrut Scheme, 2022). The scheme is aligning with Sustainable Developmental Goal 6, which ensures Safe and clean Water for all. In Kerala, six corporations and three municipalities are listed as the AMRUT mission cities in the scheme.

Kerala Government has envisaged unique policies to address Water crisis to resolve Water management challenges towards the achievement of Sustainable Cities, which adhere with Sustainable Development Goal (SDG) 11, to make cities and human settlements inclusive, safe, resilient, and sustainable. Kerala Government, under Haritha Kerala Mission, introduced another water conservation and sustainable use scheme called water budget, the first of its kind in India on April 17th, 2023. 'A water Budget is a document that assesses the water availability against its utilization in a specific geographical region' (Navakeralam Karma Padhathi, n.d.). The Water Budget is aiming to resolve the water scarcity of the local community on a scientific basis by developing potential interventions and participatory campaigns and through coordination of the Local Self-Government Institutions (https://haritham.kerala.gov.in, n.d.). Also, people's participation is ensured in various localized schemes and policies of Government and local self-bodies for the conservation and rejuvenation of Water resources.

## 5. Way Forward

Kerala, like most of the developing region, experiencing rapid urbanization and population growth. An integrated approach to development is needed for the State to adhere to sustainable practices of usage and conservation of Water. About two billion people worldwide does not have access to safe and clean drinking water (United Nations Department of Economic and Social Affairs, 2023).

The water-scarce Indian urban population of 153 million in 2016 may increase up to 422 million in 2050 (Sahu & Debsarma, 2023). Waterman of India, the Magsaysay award winner Rajendra Singh says that Kerala needs a river rejuvenation strategy and 'Water literacy' to conserve Water (World Water Day | Disaster Beckons Kerala. Heed the Waterman's Warning, n.d.). Kerala needs a holistic approach to address the various issues of pollution, water scarcity, Groundwater depletion, and flash floods. To address these challenges, Kerala can adopt integrated urban water management (IUWM) approaches. IUWM links various elements, such as spatial planning, stormwater management, and urban environment, to provide a more holistic approach to water management (Feilberg & Mark, 2016). Understanding hydro social cycles is essential for addressing complex water-related challenges. Effective water management must prioritize equity, sustainability, and local accountability (Sultana, 2018). It is crucial for public health, environmental protection, and economic growth. However, a multitude of factors, such as population growth, industrialization, and climate change, can disrupt the delicate balance of urban water systems.

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**Article Received on December 02, 2024; Accepted on December 21, 2024**