**National River Conservation Directorate**
Ministry of Jal Shakti,
Department of Water Resources,
River Development and Ganga Rejuvenation
Government of India

# Infrastructure and Planning in Cauvery River Basin


**December 2024**

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## National River Conservation Directorate (NRCD)

The National River Conservation Directorate, functioning under the Department of Water Resources, River Development and Ganga Rejuvenation, and Ministry of Jal Shakti providing financial assistance to the State Government for conservation of rivers under the Centrally Sponsored Schemes of 'National River Conservation Plan (NRCP)'. National River Conservation Plan to the State Governments/ local bodies to set up infrastructure for pollution abatement of rivers in identified polluted river stretches based on proposals received from the State Governments/ local bodies.

**www.nrcd.nic.in**

## Centres for Cauvery River Basin Management Studies (cCauvery)

The Centres for Cauvery River Basin Management Studies (cCauvery) is a Brain Trust dedicated to River Science and River Basin Management. Established in 2024 by IISc Bengaluru and NIT Tiruchirappalli, under the supervision of cGanga at IIT Kanpur, the centre serves as a knowledge wing of the National River Conservation Directorate (NRCD). cCauvery is committed to restoring and conserving the Cauvery River and its resources through the collation of information and knowledge, research and development, planning, monitoring, education, advocacy, and stakeholder engagement.

**www.ccauvery.org**

## Centre for Ganga River Basin Management and Studies (cGanga)

cGanga is a think tank formed under the aegis of NMCG, and one of its stated objectives is to make India a world leader in river and water science. The Centre is headquartered at IIT Kanpur and has representation from most leading science and technological institutes of the country. cGanga's mandate is to serve as think-tank in implementation and dynamic evolution of Ganga River Basin Management Plan (GRBMP) prepared by the Consortium of 7 IITs. In addition to this, it is also responsible for introducing new technologies, innovations, and solutions into India.

**www.cganga.org**


## Acknowledgment

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# Preface

In an era of unprecedented environmental change, understanding our rivers and their ecosystems has never been more critical. This report aims to provide a comprehensive overview of our rivers, highlighting their importance, current health, and the challenges they face. As we explore the various facets of river systems, we aim to equip readers with the knowledge necessary to appreciate and protect these vital waterways.

Throughout the following pages, you will find an in-depth analysis of the principles and practices that support healthy river ecosystems. Our team of experts has meticulously compiled data, case studies, and testimonials to illustrate the significant impact of rivers on both natural environments and human communities. By sharing these insights, we hope to inspire and empower our readers to engage in river conservation efforts.

This report is not merely a collection of statistics and theories; it is a call to action. We urge all stakeholders to recognize the value of our rivers and to take proactive steps to ensure their preservation. Whether you are an environmental professional, a policy maker, or simply someone who cares about our planet, this guide is designed to support you in your efforts to protect our rivers.

We extend our heartfelt gratitude to the numerous contributors who have generously shared their stories and expertise. Their invaluable input has enriched this report, making it a beacon of knowledge and a practical resource for all who read it. It is our hope that this report will serve as a catalyst for positive environmental action, fostering a culture of stewardship that benefits both current and future generations.

As you delve into this overview of our rivers, we invite you to embrace the opportunities and challenges that lie ahead. Together, we can ensure that our rivers continue to thrive and sustain life for generations to come.

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# Abbreviations and Acronyms

| | |
|---|---|
| % | Percentage |
| ₹ | India Rupee |
| $ | Dollar |
| & | And |
| e.g. | For example |
| km | Kilometre |
| sq. | Square |
| ADB | Asian Development Bank |
| AIBP | Accelerated Irrigation Benefits Programme |
| AMRUT | Atal Mission of Rejuvenation and Urban Transformation |
| BBMP | Bruhat Bengaluru Mahanagara Palike |
| BPO | Business Process Outsourcing |
| BWSSB | Bengaluru Water Supply and Sewerage Board |
| CETP | Common effluent treatment plant |
| CRB | Cauvery River Basin |
| CTR | Catch The Rain |
| CSOs | Civil Society Organizations |
| CWSS | Combined Water Supply Schemes |
| DPR | Detailed Project Report |
| DTCP | Department of Town and Country Planning |
| ELCOT | Electronics Corporation of Tamil Nadu |
| EPTRI | Environment Protection Training & Research Institute |
| EWS | Economically weaker sections |
| HRIDAY | Heritage City Development and Augmentation Yojana |
| IAMWARM | Irrigated Agriculture Modernisation and Water-Bodies Restoration and Management |
| IDD | Infrastructure Development Department |
| iDeCK | Infrastructure Development Corporation (Karnataka) Limited |
| IHHLs | Individual Household Latrines |
| IT | Information Technology |
| IWRM | Integrated Water Resource Management |
| JICA | Japan International Co-operation Agency |

| | |
|---|---|
| JnNURM | Jawaharalal Nehru National Urban Renewal Mission |
| JSA | Jal Shakti Abhiyan |
| KIIDC | Kerala Irrigation Infrastructure Development Corporation Ltd. |
| KSIIDC | Karnataka state industrial and infrastructure development corporation |
| KTCP | Karnataka Town and Country Planning |
| KUIDFC | Karnataka Urban Infrastructure Development and Finance Corporation |
| KUWSDB | Karnataka Urban Water Supply and Drainage Board |
| LIG | Lower-Income groups |
| LPA | Local Planning Area |
| MLD | Million Litres Per Day |
| MSW | Municipal Solid Waste |
| MW | Mega Watt |
| NCRD | National Centre for Rural Development |
| NGOs | Non-Governmental Organizations |
| NKUSIP | North Karnataka Urban Sector Investment Programme |
| NMCG | National Mission for Clean Ganga |
| ODF | Open Defecation Free |
| PMAY | Pradhan Mantri Awas Yojana |
| PMKSY | Pradhan Mantri Krishi Sinchayee Yojana |
| PIPDIC | Pondicherry Industrial Promotion Development and Investment Corporation |
| RDWSD | Rural Drinking Water and Sanitation Department |
| SCADA | Supervisory control and data acquisition |
| STPs | Sewage Treatment Plants |
| SWM | Solid Waste Management |
| TNIAM | Tamil Nadu Irrigated Agriculture Modernisation |
| TNIDB | Tamil Nadu infrastructure development board |
| TNSCB | Tamil Nadu Slum Clearance Board |
| TNSUDP | Tamil Nadu Sustainable Urban Development Project |
| TPD | Tons Per Day |
| TWAD | Tamil Nadu Water Supply and Drainage |
| UGD | Under Ground Drainage |
| UGSS | Underground Sewage System |
| ULBs | Urban Local Bodies |
| UT | Union Territory |

| | |
|---|---|
| WAPCOS | Website of Water and Power Consultancy Services |
| WRA | Water Resources Assessment |
| WTP | Water treatment plant |

# 1. Introduction

The Cauvery River Basin (CRB) is a critical geographical and ecological zone in southern India, encompassing significant portions of Karnataka and Tamil Nadu. It serves as a lifeline for agricultural productivity, economic activities, and urban development across the region. Key cities and towns within the basin, such as Bengaluru, Mysuru, Mandya, and Tumakuru in Karnataka, and Coimbatore, Trichy, Thanjavur, and Madurai in Tamil Nadu, rely on its resources for sustenance and growth. The basin supports extensive agricultural activities and is instrumental in meeting the water and energy demands of both rural and urban settlements (Brema et al., 2021; Chidambaram et al., 2018). Urbanization in the CRB, particularly in districts such as Mandya, Mysuru, and Bengaluru in Karnataka, and Coimbatore, Trichy, and Thanjavur in Tamil Nadu, has necessitated advanced urban planning and sustainable infrastructure development. Rapid population growth and industrial expansion in cities like Bengaluru and Mysuru have further intensified the demand for efficient water management, waste disposal systems, and climate-resilient urban designs (Bhave et al., 2018; Brema et al., 2021).

Infrastructure development and urban planning in the CRB are driven by coordinated efforts from government agencies, urban planners, and non-governmental organizations (NGOs). These initiatives aim to address the challenges posed by rapid urbanization while ensuring ecological balance (Brema et al., 2021). Priority areas include integrated water resource management, sustainable housing development, improved urban transportation systems, waste management, and climate adaptation strategies. In Karnataka, specific focus is placed on preserving the ecological integrity of the basin while promoting equitable water sharing and addressing inter-state water disputes with Tamil Nadu.

## 1.1. Overview of urban planning and infrastructure development in the CRB

### 1.1.1. Urbanization trends in the CRB

Karnataka has witnessed significant urbanization, with 38.67% of its population residing in urban areas as per the 2011 Census. The urban population of the state grew by 31.27% between 2001 and 2011, highlighting the rapid pace of urban development, while the rural population grew by only 7.6% during the same period. The average population density in Karnataka in 2011 was 319 persons per sq. km, whereas urban areas exhibited much higher densities, particularly in major cities like Bengaluru, which had a population density exceeding 4,300 persons per sq. km. As per the latest projections by the National Commission on Population, Karnataka’s urban population is expected to rise from 23.6 million in 2011 to approximately 33.1 million by 2036, increasing its urbanization rate from 38.7% to 47.9% (National Commission on Population, 2020). This indicates a steady shift toward urban living, mainly driven by economic opportunities in major urban centres like Bengaluru and Mysuru, which are established hubs for information technology, manufacturing, and commerce.

However, Tamil Nadu has one of the highest urbanization rates in India, with nearly 48.45% of its population residing in urban areas (India Census, 2011). The state's urban population grew by 27% between 2001-2011, compared to only 6% growth in rural areas during the same period. The state's average population density in 2011 was 554 persons per sq. km. However,

in urban areas, the density was much higher at 3,521 persons per sq. km. Tamil Nadu's urban population was approximately 34.9 million in 2011 and is projected to exceed 48.4 million by 2036, accounting for 55% of the state's population (National Commission on Population, 2020). The government in both states is focused on managing this rapid urban transition to ensure sustainable development. This includes improving infrastructure, addressing housing and urban poverty challenges, and enhancing overall living standards in growing urban centres.

### 1.1.2. Urban infrastructure development

Urban infrastructure development in the CRB aims to improve the quality of life for urban dwellers and promote inclusive growth. This has been supported through various central and state-level programs like the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) and Atal Mission for Rejuvenation and Urban Transformation (AMRUT). These programs provide substantial financial assistance for urban infrastructure development, with a focus on:

- Urban Infrastructure and Governance
- Basic Services to the Urban Poor
- Urban Infrastructure Development Scheme for Small and Medium Towns
- Integrated Housing and Slum Development Program

These schemes aim to develop and upgrade the physical and institutional infrastructure, address urban housing needs, and improve governance and financial management at the Urban Local Bodies (ULBs) level.

### 1.1.3. Key urban infrastructure and governance challenges

- A major challenge is strengthening water supply and sewage systems at the ULB levels, many of which still rely on parastatal agencies for service delivery.
- ULBs need to improve their financial management systems, including better revenue mobilization and property tax collection.
- There is a need for continued professionalization of the municipal workforce, with more efficient governance mechanisms and improved financial management practices.
- Urban planning in Tamil Nadu is still primarily controlled at the state level, with ULBs having limited authority to develop city-level plans.
- The state's ULBs face challenges in revenue generation, particularly in terms of property tax collection, which is often insufficient to meet the growing demands for urban infrastructure and services.

## 1.2. State government initiatives for urban planning and infrastructure development

### 1.2.1. Karnataka State Industrial and Infrastructure Development Corporation (KSIIDC)

The Karnataka State Industrial and Infrastructure Development Corporation (KSIIDC) plays a pivotal role in driving urban planning and infrastructure development across Karnataka. As a nodal agency, KSIIDC is instrumental in the conceptualization and execution of various projects aimed at enhancing the state's industrial and urban infrastructure (Table 1).

**a) Industrial Infrastructure Development**

KSIIDC is dedicated to fostering industrial growth by developing state-of-the-art industrial parks and zones. These industrial areas are equipped with modern facilities, including transportation links, power supply, water resources, and communication networks. The corporation has developed multiple industrial estates that cater to diverse sectors, promoting balanced regional growth and generating employment opportunities.

**b) Urban Infrastructure Projects**

KSIIDC also focuses on urban infrastructure development, which includes planning and implementing large-scale projects such as townships, commercial complexes, and transportation hubs. Notable initiatives include the development of integrated townships that combine residential, commercial, and recreational facilities, thus creating self-sustaining urban ecosystems.

**c) Public-Private Partnerships**

To leverage private sector expertise and investment, KSIIDC actively promotes Public-Private Partnerships in infrastructure projects. This approach has been successful in developing key infrastructure, including highways, airports, and special economic zones, thereby accelerating economic growth and improving the quality of urban life.

**d) Infrastructure Financing**

KSIIDC also plays a crucial role in providing financial assistance for infrastructure projects. It facilitates funding through loans, equity participation, and joint ventures, enabling the timely completion of critical infrastructure that supports industrial and urban development.

**e) Sustainability and Innovation**

Emphasizing sustainable development, KSIIDC integrates environmental considerations into its planning processes. It promotes the use of green technologies and sustainable practices in infrastructure projects to minimize ecological impact and ensure long-term benefits for the community.

Through these initiatives, KSIIDC continues to be a key driver of Karnataka’s urban planning and infrastructure development, enhancing the state's economic competitiveness and improving the living standards of its residents.

**Table 1.** Summary of the notable projects undertaken by the Karnataka State Industrial and Infrastructure Development Corporation (KSIIDC) in the CRB

| Project Name | Location | Focus Area | Project Description | Project Status / Timeline |
|---|---|---|---|---|
| Hebbal-Nagawara Valley Project | Bengaluru | Sewage Treatment / River Rejuvenation | Development of Sewage Treatment Plants (STPs) and wetland systems for treatment and reuse of sewage to reduce load on rivers. | Ongoing – Phase-wise implementation since 2022 |
| Bengaluru Water Supply and Sewerage Project (Stage V) | Bengaluru | Water Supply / Sewerage | Augmentation of Cauvery water supply; improvement of sewerage systems in urban areas. | Under Implementation – Completion expected by 2026 |
| Integrated Urban Water Management Project (IUWM) | Mysuru | Water Supply / Sanitation | Revamping water supply system, reducing NRW, improving wastewater reuse. | Completed – Commissioned in 2021 |
| STPs Infrastructure under Karnataka Urban Infrastructure Development and Finance Corporation (KUIDFC) North Karnataka Urban Sector Investment Programme (NKUSIP) Phase II | Mandya, Ramanagara, Channapatna | Sewage Treatment | Construction of STPs and Under Ground Drainage (UGD) in the CRB towns. | Ongoing – Expected completion by 2025 |
| Revitalization of Lakes and Wetlands | Multiple Urban Areas in the CRB | River/Lake Restoration | Restoration of urban lakes linked to Cauvery tributaries for groundwater recharge. | In Progress – Implemented in phases (2021–present) |

| | | | | |
|---|---|---|---|---|
| Industrial Effluent Management in Vasanthanarasapura Industrial Area | Tumakuru District | Industrial Effluent Treatment | Common effluent treatment plant (CETP) and zero-liquid discharge systems to prevent pollution of streams. | Planning Stage – Detailed Project Report (DPR) under preparation |

Note: Most of these projects are collaborative efforts where KSIIDC plays a key facilitation and coordination role, often with Karnataka Urban Infrastructure Development and Finance Corporation (KUIDFC), BWSSB, ULBs, and international funding agencies (e.g., Japan International Co-operation Agency (JICA), Asian Development Bank (ADB)).

### 1.2.2. Tamil Nadu Infrastructure Development Board (TNIDB)

The Tamil Nadu infrastructure development board (TNIDB) is a key agency involved in planning and executing urban infrastructure projects across the state, including the CRB areas (Table 2). TNIDB facilitates the development of critical infrastructure such as water supply, sanitation, and transportation, especially in regions that are urbanizing rapidly due to industrial growth (TNIDB).

- **Water Supply Projects:** In cities like Coimbatore, Trichy, and Thanjavur, TNIDB has supported projects for the 24x7 water supply system aimed at ensuring sustainable access to water, especially considering the Cauvery River's importance for irrigation and drinking water.
- **Solid Waste Management (SWM):** The board has supported projects focused on solid waste management, including setting up Material Recovery Facilities (MRFs) and Bio-CNG plants in cities like Coimbatore, Tirupur, and Madurai. These projects are designed to reduce waste going to landfills and promote recycling, especially in industrial cities with high waste production.

Table 2 shows some of the projects done by TNIDB in the CRB districts.

**Table 2.** Summary of the notable projects undertaken by the Tamil Nadu infrastructure development board (TNIDB) in the CRB

| **Project Name** | **Location** | **Focus Area** | **Project Description** | **Project Status / Timeline** |
|---|---|---|---|---|
| Cauvery Riverfront Development Project | Tiruchirappalli | Riverfront Restoration/ Tourism | Development of eco-friendly riverfronts, ghats, green | Ongoing – Implementation started in 2023 |

| | | | | |
|---|---|---|---|---|
| | | | spaces along Cauvery banks. | |
| Underground Sewerage Scheme (UGSS) under AMRUT | Erode, Thanjavur, Kumbakonam | Sewerage/ Sanitation | Underground sewerage networks and STPs in the CRB towns. | Ongoing – Phase-wise progress since 2021 |
| Water Supply Improvement Scheme (WSIS) | Karur, Namakkal, Nagapattinam | Water Supply | Augmentation of piped water supply sourced from Cauvery River. | Under Implementation – Target 2025 |
| Smart Cities River Rejuvenation Projects | Thanjavur, Tiruchirappalli | River Conservation/ Sewage | Integrated wastewater and stormwater management under Smart Cities Mission. | In Progress – Since 2022 |
| Vennar and Vettar Sub-basin Modernization (Irrigated Agriculture Modernisation and Water-Bodies Restoration and Management (IAMWARM) Tamil Nadu) | Thanjavur Delta Region | Irrigation/ Water Efficiency | Canal rehabilitation, automated sluices, micro-irrigation in Cauvery delta. | Completed – Final phase closed in 2019 |
| Common Effluent Treatment Plants (CETPs) | Erode Textile Belt (Bhavani River stretch) | Industrial Wastewater Management | CETPs for dyeing units to prevent effluent discharge into Cauvery tributaries. | Operational – Upgrades ongoing |

**Source:** TNIDB

Moreover, city planners in the CRB focus on sustainable urban development and climate resilience, integrating environmental considerations into urban growth. Their work is particularly important considering the ecological sensitivity of the basin and the need to balance urbanization with resource conservation. They emphasize the need for sustainable development in urban areas like Tiruchirappalli, Coimbatore, and Thanjavur, where industrialization is growing rapidly, placing strain on infrastructure. Urban master plans are being developed for these cities to provide a clear roadmap for growth. This includes setting aside areas for green spaces, public amenities, and eco-friendly infrastructure. For instance, Coimbatore's Smart City Plan integrates sustainability features such as solar-powered public services, electric vehicle charging stations, and extensive urban green spaces. Given the crucial role of the Cauvery River in water supply for urban areas, city planners focus on integrated water resource management (IWRM) strategies, integrating urban water supply, wastewater treatment, stormwater management, and agriculture. Urban areas near the river, such as Thanjavur, rely heavily on the river for irrigation and drinking water, and planners aim to balance agricultural and urban demands. The incorporation of rainwater harvesting systems in new buildings and urban spaces is a priority. The planning includes the construction of check dams and water storage tanks to capture rainwater and alleviate pressure on the Cauvery River's water resources. They also focus on transportation infrastructure that supports sustainable growth while minimizing congestion and pollution. In Coimbatore, urban planners are focusing on expanding and modernizing the city's public transport network, including bus rapid transit systems and metro rail proposals. This aims to reduce traffic congestion and pollution. They are also focusing on pedestrian-friendly development, bicycle lanes, and walkways, particularly in urban areas along the river, to reduce dependency on private vehicles. An overview of key infrastructure development efforts led by city planners in Tamil Nadu, highlighting the areas of focus, current initiatives, and the agencies involved is given below:

**a) Urban Water Supply and Sanitation**

One of the most pressing challenges faced by urban areas in Tamil Nadu is the provision of safe drinking water and the management of wastewater. Many ULBs depend on state-run parastatal agencies to deliver these services. However, city planners are working to improve water supply infrastructure and enhance sewage systems to meet growing demand. Several cities, including Coimbatore, Chennai, Madurai, and Tiruchirappalli, are working on implementing 24x7 water supply systems, aiming to provide uninterrupted water to urban areas. The Tamil Nadu Water Supply and Drainage Board is leading many of these projects. Wastewater treatment facilities are also a major focus, with cities looking to develop or upgrade sewage treatment plants (STPs) to treat wastewater before discharge. Projects such as the STP projects in Chennai, Madurai, and other urban areas aim to address pollution and environmental degradation.

**b) Solid Waste Management**

SWM is a critical aspect of urban planning, especially in fast-growing cities with rapidly increasing populations. In Tamil Nadu, city planners are focusing on creating sustainable and efficient waste management systems to handle the growing waste burden. The Directorate of Municipal Administration is working on setting up MRFs in several cities, including Madurai, Coimbatore, Tiruchirappalli, and Erode. These facilities are designed to sort recyclable waste, reducing the amount of waste that ends up in landfills and increasing recycling rates. In addition to MRFs, Tamil Nadu is investing in Bio-CNG plants to process organic waste and convert it into clean energy. Cities like Madurai, Coimbatore, and Tiruchirappalli are already in the process of setting up Bio-CNG plants that will not only reduce waste but also generate biofuels for local consumption. Various cities are looking at waste-to-energy technologies to convert non-recyclable waste into electricity. These projects will help reduce the carbon footprint and offer an alternative energy source.

**c) Affordable Housing and Slum redevelopment**

Urbanization has increased the demand for affordable housing in Tamil Nadu, especially in its major cities. City planners are working on projects that provide low-income housing and improve living conditions in slums through redevelopment efforts. The Tamil Nadu Slum Clearance Board (TNSCB) is working on various housing projects to provide affordable housing for the urban poor, especially in cities like Chennai, Coimbatore, Madurai, and Tiruchirappalli. The Pradhan Mantri Awas Yojana (PMAY) is one of the central schemes under which the state is constructing low-cost homes for the economically weaker sections (EWS) and lower-income groups (LIG). The state is also investing in the redevelopment of slums, offering better infrastructure, sanitation, and access to basic services. The Tamil Nadu Slum Clearance Board has been instrumental in rehabilitating slum dwellers through the construction of modern residential complexes equipped with water, sewage, and electricity connections.

**d) Transportation Infrastructure**

City planners in Tamil Nadu are focusing on improving both urban mobility and public transportation systems to ease traffic congestion and improve air quality. Major cities like Chennai and Coimbatore are investing in modernizing transportation systems to accommodate growing urban populations. One of the most significant urban mobility projects is the Chennai Metro, which is expanding in phases. Once completed, it will provide a reliable and efficient public transport option for Chennai's growing population, reducing congestion on roads and improving air quality. Proposals are also underway for metro rail systems in Coimbatore and Madurai, where planners are envisioning rapid transit solutions to meet the future transportation needs of the cities. Coimbatore and Chennai are looking at Bus Rapid Transit (BRT) systems to improve road transport. These projects aim to provide high-quality, efficient public transport with dedicated lanes to reduce traffic congestion and improve commuter experience. Cities like Coimbatore and Tiruchirappalli are adopting Intelligent Traffic Management Systems (ITMS) to optimize traffic flow and reduce congestion. These systems use sensors and real-time data to manage traffic lights, improve road safety, and reduce traffic jams.

**e) Smart City Initiatives**

Tamil Nadu is also focusing on smart city initiatives, particularly in Chennai, Coimbatore, and Madurai, where planners are working on digital solutions to improve urban services. Under the Smart Cities Mission, cities like Tiruchirappalli and Coimbatore are integrating advanced technologies to improve urban living. Initiatives include the deployment of smart meters, Wi-Fi hotspots, and surveillance systems to enhance safety, energy efficiency, and service delivery. The state has made strides in e-governance with the implementation of digital services for citizens, such as online property tax payments, water bill payments, and land record management.

**f) Environmental Sustainability and Green Infrastructure**

City planners in Tamil Nadu are increasingly focusing on sustainable urban development to mitigate the environmental impact of urbanization. Key initiatives include the promotion of green buildings, rainwater harvesting, and afforestation programs. Tamil Nadu is encouraging the adoption of green building practices, with several private and public sector buildings being constructed using eco-friendly materials and energy-efficient designs. The state has made rainwater harvesting compulsory for new buildings, and existing buildings are encouraged to retrofit systems to capture and store rainwater. Planners are also focusing on the development of urban parks and green spaces to improve air quality and provide residents with recreational areas.

**g) Technology Parks and Industrial Growth**

Tamil Nadu is making efforts to boost industrial and technological growth in urban areas, creating job opportunities and reducing pressure on urban infrastructure. This includes the development of technology parks and industrial zones in cities like Chennai, Coimbatore, and Madurai. TIDEL Park is a hub for information technology (IT) and business process outsourcing (BPO) industries, helping to position Chennai as an IT and tech services destination. The Electronics Corporation of Tamil Nadu (ELCOT) is also developing a tech city in Coimbatore, aimed at fostering innovation and creating jobs in the IT sector.

### 1.2.3. Kerala Irrigation Infrastructure Development Corporation Ltd. (KIIDC)

The Kerala Irrigation Infrastructure Development Corporation Ltd. (KIIDC) is a government-owned company in Kerala responsible for developing and managing irrigation infrastructure projects across the state. While KIIDC undertakes various projects, specific details about their involvement in the CRB are limited (Table 3).

**Table 3.** Summary of the notable projects undertaken by the Kerala Irrigation Infrastructure Development Corporation Ltd. (KIIDC) in the CRB

| Project Name | Location | Focus Area | Project Description | Project Status / Timeline |
|---|---|---|---|---|
| Kabini River Irrigation Project | Kabini basin, Wayanad district | Irrigation Infrastructure | Development of canals and irrigation systems to support agriculture in the Kabini basin. | Ongoing / Expected by 2027 |
| Integrated Watershed Management | Eastern Kerala (Palakkad–Wayanad border) | Watershed Management | Holistic watershed development for sustainable water use and conservation. | Planning / Target 2026 |
| Drinking Water Supply Scheme | Rural areas near the CRB, Palakkad & Wayanad | Drinking Water | Expansion and improvement of rural drinking water supply networks. | Partially Completed / Target 2025 |
| Cauvery Tributary Canal Works | Nilambur & Wayanad region tributaries | Canal System Rehabilitation | Maintenance and expansion of aging canal systems to enhance water flow efficiency. | Ongoing / Target 2026 |
| Dam Rehabilitation Program | Banasurasagar and minor dams | Dam Safety | Structural upgrades and safety measures for existing dams within the CRB. | Initiated / Target 2028 |
| Eco-Tourism Development | Kabini riverbanks and | Sustainable Tourism | Promotion of eco-tourism to preserve | Proposed / Target 2027 |

| | | | | |
|---|---|---|---|---|
| | eco-sensitive zones | | biodiversity and support local livelihoods. | |
| Hydropower Generation Initiative | Hilly areas of Wayanad and Idukki | Renewable Energy | Installation of small-scale hydropower plants on suitable tributaries. | Planning / Target 2029 |

**Source:** KIIDC

### 1.2.4. Pondicherry Industrial Promotion Development and Investment Corporation (PIPDIC)

The Pondicherry Industrial Promotion Development and Investment Corporation (PIPDIC) is responsible for promoting industrial and infrastructure development within the Union Territory of Puducherry (Table 4). The Union Territory comprises four regions: Puducherry, Karaikal, Mahe, and Yanam. Among these, the Karaikal region is situated within the CRB. While specific information on PSIDC 's projects in the CRB is limited, here is a summary of notable projects and initiatives in the Karaikal region:

**Table 4.** Summary of the notable projects undertaken by the Pondicherry Industrial Promotion Development and Investment Corporation (PIPDIC) in the CRB

| Project Name / Focus | Location | Focus Area | Status / Timeline |
|---|---|---|---|
| 11 MLD STP, Puthuthurai (sewage) | Karaikal Town (Dharmapuram) | Sewage treatment, River cleanup | Construction; expected by end-2024 / 2025 |
| Water supply augmentation (Supervisory Control and Data Acquisition (SCADA) & pumps) | Tirumalairayanpattinam North Zone | Drinking water supply | Tender underway; execution in 2025 |
| Pipeline extension to Samathuvapuram | Samathuvapuram, Karaikal | Piped water connections | Tendered; work mid-2025 |
| Extending supply to Kalikuppam left-outs | Kottucherry Commune | Water network expansion | Tender closed March 2025 |
| Tank/Lake rejuvenation | Karaikal municipality wards | Pond recharge & groundwater | Completed |
| DPR for underground sewerage networks | Thirunallar / Kottucherry / Tirumalai zones | Underground sewer scheme planning | DPR consultant tender in March 2025 |

**Source:** PIPDIC

### 1.3. NGOs' role in urban planning and infrastructure development

Non-governmental organizations (NGOs) in Tamil Nadu, particularly those focused on environmental conservation and sustainable urban development, play an essential role in raising awareness about the environmental impacts of urbanization and promoting sustainable practices in urban planning.

**a) Environmental conservation**

Many NGOs, including the Cauvery River Protection Movement, focus on river conservation and the prevention of pollution caused by industrialization and urbanization. These NGOs work to advocate for policies that protect the river and its ecosystem while promoting sustainable urban growth. NGOs like The Coimbatore Green Movement and The Madurai Green Foundation work on raising awareness about solid waste management and recycling. They actively engage with local communities, encourage waste segregation, and promote zero-waste lifestyles.

**b) Community-based urban planning**

NGOs also play an important role in community-driven planning. They assist local governments in engaging communities to ensure that urban development is inclusive and benefits all sections of society. NGOs often collaborate with the Tamil Nadu Slum Clearance Board (TNSCB) to provide improved housing and community facilities for urban poor populations. In cities like Coimbatore and Madurai, NGOs are working to restore public parks, develop urban forests, and create more green spaces for residents, which are essential for improving the quality of life in rapidly growing urban areas.

Several NGOs in Tamil Nadu are actively involved in promoting sustainable development, environmental conservation, and infrastructure development within the CRB. These NGOs play crucial roles in raising awareness, advocating for policy changes, and directly working on ground-level interventions related to water resource management, river conservation, waste management, and community development.

# 2. Developmental plan for the CRB

The CRB, a significant water resource in southern India, spans multiple states and is characterized by its intricate network of administrative boundaries. Understanding these administrative delineations at various levels (e.g., state, district, tehsil, and village) is crucial for effective water resource management, inter-state collaboration, and regional development. Overview of the administrative delineation at various levels within the CRB is given below.

## 2.1. Land use zoning and master planning

Land use zoning in the CRB is a critical aspect of urban planning and development, aimed at managing the state's rapid urbanization while ensuring sustainable growth. The key components of Land Use (Fig. 1) zoning are explained below:

***a) Residential Zone***

This zone is designated for single-family homes, apartments, schools, and parks. It aims to provide a conducive environment for living while maintaining necessary amenities.

***b) Commercial Zone***

This area accommodates retail shops, offices, hotels, and restaurants. The regulations allow for a higher Floor Area Ratio to promote denser development in business districts.

***c) Industrial Zone***

Reserved for factories and manufacturing units, this zone is designed to support industrial activities while minimizing their impact on residential areas.

***d) Mixed-Use Zone***

This category combines residential and commercial uses, allowing for a blend of activities that can enhance community interaction and reduce travel needs.

***e) Agricultural Zone***

Strictly regulated to preserve agricultural land from non-farm activities, this zone aims to protect farming areas from encroachment due to urban development.

***f) Open Space and Recreational Use Zone***

Specific to the Chennai Metropolitan Area, this zone includes parks, playgrounds, and other recreational facilities.

Several government agencies are involved in the land use management processes described below.

***a) Revenue Department***

It oversees the process of land acquisition and provides guidelines for land use changes.

***b) Town and Country Planning Department***

It develops master plans for urban areas, ensuring that land is used effectively while considering urbanization needs.

***c) Forest Department***

It regulates land use in forest areas to prevent deforestation and promote sustainable practices.

***d) Public Works Department***

It oversees construction projects that may alter land use, such as roads, bridges, and public buildings.

However, a master plan is a comprehensive document which provides the broad framework and direction for the growth and development of the city. A master plan aims to integrate the various sectoral plans taking into consideration the overall requirements in terms of land, infrastructure services, physical and social amenities, environmental aspects etc. over a 10 – 20-year time frame. The plan aims to project the population, lay down the overall space, and provide direction for the future growth and development of the city keeping in view the larger

perspective. Besides, it aims to provide a clear circulation network and, assess the demand and gap in the facilities and amenities for the present and projected population while also reserving land requirements for future amenities and services (which may be totally uninhabited currently) together with planning for new residential areas, new work centres, new business/commerce areas, new educational and institutional areas, including the amenities and services.

In Karnataka, under the Karnataka Town and Country Planning (KTCP) Act,1961, the master plan shall consist of a series of maps and documents indicating the manner in which the development and improvement of the entire planning area within the jurisdiction of the planning authority are to be carried out and regulated, such a plan shall include proposals for the following, viz -

- Zoning of land use for residential, commercial, industrial, agricultural, recreational, educational and other purposes together with Zoning Regulations.
- A complete street pattern, indicating major and minor roads, national highways, and state highways, and traffic circulation pattern, for meeting immediate and future requirements with proposals for improvements.
- Areas reserved for parks, playgrounds, and other recreational uses, public open spaces, public buildings and institutions and area reserved for such other purposes as may be expedient for new civic developments.
- Areas earmarked for future development and expansion.
- Reservation of land for the purposes of Central Government, the State Government, Planning Authority or public utility undertaking or any other authority established by Law, and the designation of lands being subject to acquisition for public purposes or as specified in Master Plan or securing the use of the landing in the manner provided by or under this Act.
- Declaring certain areas, as areas of special control and development in such areas being subject to such regulations as may be made regarding building line, height of the building, floor area ratio, architectural features and such other particulars as may be prescribed; and
- Stages by which the plan is to be carried out.

### 2.1.1. Extent of local planning area of Bengaluru Development Authority

The Notifications/ Government Orders issued by Government that define the Local Planning Area of Bengaluru Development Authority (BDA) are as follows:

- Govt. Notification No. S.O.3446 dated 1st November 1965, declaring the Local Planning Area (LPA) for Bengaluru City.
- Govt. Notification No. HUD 496 TTP 83 dated 15th March 1984 declaring the Local Planning Area for the environs of Bengaluru.
- Govt. Notification No. HUD 167 MNJ 87 dated 1st March 1988 specifying the areas of BDA.

- Govt. Notification No. Na Aa Ee130 Bem Ru Pra 2001 dated 20th November 2001 declaring the LPA for BMICAPA.
- Govt. Notification No. UDD/118/Bem Ru Pra 2003 dated 3rd March 2006 declaring the extent of Hoskote Local Planning Area.
- Govt. Notification No. UDD 36N BMR 2009 dated 26th September 2012 specifying exclusion of 8 villages from LPA of BDA, which were overlapping with Hoskote LPA.

#### *2.1.1.1. Bengaluru Master Plan: Key highlights from 2015*

The highlights of the Bengaluru Master Plan 2015 are being discussed below:

- A structure plan was created in the Bengaluru Master Plan 2015 with a two-fold aim - strengthening existing urban areas and extending development to already developed areas.
- Five concentric belts were created and divided into – the core area, peri-central area, recent extensions, new layouts, and green belt and agricultural regions.
- A focus point was also the development along major radial roads with a concentration of industrial and commercial activities.
- Residential areas with high-density populations were planned to be served by city centres and mixed land usage to support urban development.
- The Master Plan 2015 also included plans to improve the transportation infrastructure for the people of the city.

#### *2.1.1.2. Bengaluru Master Plan: Key proposed revisions for 2031*

The proposed revisions as per the Bengaluru Master Plan 2031 are being discussed below:

- The Bengaluru Master Plan 2031 aims to improve the transit systems in the city through transport hubs, metro development, and suburban rail lines.
- Creation of different zones for specific development instead of concentric circles - Zone A (development through new stores and offices), Zone B (better roads and infrastructure), and Zone C (assisting farmers to generate more income).
- Development of higher buildings for mixed-land usage around transportation corridors.
- Infrastructural development in the form of flyovers to reduce travel time for the residents.

In Tamil Nadu, Department of Town and Country Planning (DTCP) develops master plans for urban areas, ensuring that land is used effectively while considering urbanization needs. It also manages reclassification of land use zones under the Tamil Nadu Town and Country Planning Act, 1971. Programmes are drawn and funding agencies are identified to take up such projects. 114 Local Planning Areas (108 Local Planning Areas and 6 New Town Development Areas) have been declared, and master plans and new town development plans have been prepared for these urban areas. This department has so far prepared Master Plan/New Town Development

Plan for 117 towns. Master Plan has to be prepared for the newly upgraded 50 Municipalities (DTCP).

## 2.2. Urban expansion

Karnataka's urban growth is at a critical juncture, with towns having populations of less than 100,000 emerging as significant wealth generators. The definition of "urban" needs reconsideration, particularly in terms of the percentage of people engaged in agriculture and allied activities, as well as population density. Both urban and rural areas aim for equal basic services. Between 2021-2031, Karnataka is expected to see 18 new Class I cities and 24 Class II cities, with "RURBAN" towns blending urban and rural characteristics.

Emerging urban areas in coastal, hilly, and eco-sensitive regions have been neglected due to low population density; these areas need recognition and urban status. A "Town Commissionerate" for towns with populations under 50,000 should be formed to ensure better governance and sustainable development. Additionally, a "New Township Act" should facilitate large developments and satellite towns. Bengaluru's Master Plan expired in 2015, and a new plan for 2031 is urgently needed. The Ministry of Urban Development should extend the Master Plan limits to include the Satellite Town Ring Road jurisdiction. Across Karnataka, out of 312 Urban Local Bodies, Master Plans exist for only 114 areas, City Mobility Plans for just 14 cities, and there is no regional plan except the Bengaluru Structure Plan. To ensure sustainable urbanization, Karnataka should prepare regional and eco-regional plans, especially in eco-sensitive regions. The state should also conduct a "Water Resource Audit" in every settlement to rationalize water use, in line with the NGT's 2021 order on RO plant regulations.

Tamil Nadu's urban flagship investment program focuses on water supply, sewerage, and drainage infrastructure development in at least 10 cities within strategic industrial corridors. This initiative aims to address acute infrastructure deficits, water scarcity due to climate change, and environmental pollution, with an estimated investment need of $42.7 billion. The Asian Development Bank supports part of this investment with a commitment of $1.268 billion. The Tamil Nadu Sustainable Urban Development Project (TNSUDP) seeks to empower select municipalities to deliver sustainable urban services, focusing on water supply, sewerage, drainage, solid waste management, and urban transportation networks. The Integrated Urban Development Mission, launched in 2011, addresses the infrastructure needs of urban local bodies across Tamil Nadu, allocating over ₹1309 crore for essential infrastructure works from 2011 to 2017. These programs are crucial for managing urban growth sustainably and improving the quality of life in the CRB.

While Kerala and Puducherry are smaller in comparison, they play a significant role in the urban dynamics of the CRB. Kerala's urban expansion is characterized by dispersed settlements with high population density, necessitating careful planning to balance development with ecological preservation. Notably, parts of the Palakkad district, including urban centres such as Palakkad city, lie within the CRB, highlighting the need for integrated urban and river basin management. Puducherry, with its unique administrative status, focuses on integrating sustainable urban development practices, emphasizing water management and infrastructure improvements to cope with the growing urban demands.

## 2.3. Smart city initiatives in the CRB

The CRB, encompassing regions in Karnataka and Tamil Nadu, has been the focus of various initiatives aimed at enhancing urban infrastructure and water management. It includes Belagavi, Mangaluru, and Tumakuru districts in Karnataka, while Coimbatore, Erode, Madurai, Salem, Thanjavur, Tiruchirappalli, Tirunelveli, and Tiruppur districts in Tamil Nadu, which are the part of India's Smart Cities Mission, launched in 2015, which aims to enhance urban infrastructure, promote sustainable development, and improve the quality of life for citizens. The primary objectives of the smart cities mission include:

- Upgrading urban infrastructure
- Enhancing public services
- Promoting sustainable urban development

The key areas of development are:

- **Infrastructure Development:** Construction of new roads, bridges, and improvements to public transportation systems.
- **Public Services:** Enhancements in e-governance systems, healthcare, and educational facilities.
- **Sustainability:** Projects aimed at promoting environmental sustainability through waste management and energy conservation initiatives.
- **Citizen Engagement:** Improving citizen participation in urban governance through technology.

Some of the notable projects include:

- **Hogenakkal Integrated Drinking Water Project**

  This project, initiated by the Tamil Nadu Water Supply and Drainage Board, addresses fluorosis mitigation by providing safe drinking water to the drought-prone and fluorosis-affected districts of Dharmapuri and Krishnagiri in Tamil Nadu. Utilizing Tamil Nadu's share of Cauvery River water, the project benefits approximately 3 million people across multiple municipalities and rural habitations.

- **Bengaluru's Water Management Challenges**

  Despite being designated as a smart city, Bengaluru faces significant water scarcity issues. The city relies heavily on the Cauvery River for its water supply. However, challenges such as muddy water from the CRB requiring filtration and delayed water supply have been reported. Additionally, borewells have dried out, exacerbating the water scarcity problem (Vanham et al., 2011).

- **Nature-based Solutions for Urban Water Security**

  In response to water security challenges, initiatives promoting nature-based solutions have been implemented. For instance, Bengaluru has faced groundwater depletion due to rainfall

shortages in the CRB. To address this, efforts are being made to enhance groundwater recharge and develop sustainable water management practices.

- **River Revitalization Efforts**

  The Isha Foundation's "Rally for Rivers" campaign, including the "Cauvery Calling" initiative, focuses on revitalizing rivers like the Cauvery. These efforts aim to address water scarcity and environmental degradation through large-scale tree plantation along riverbanks and promoting sustainable agricultural practices.

These initiatives reflect ongoing efforts to address water scarcity and enhance urban infrastructure within the CRB, contributing to the broader objectives of smart city development in the region.

# 3. Water supply network plan

## 3.1. Water source management

Water source management, also known as Water Resources Management (WRM) refers to the process of overseeing and regulating the use, distribution, and protection of water resources to ensure their sustainability and accessibility for both human consumption and environmental needs. It is a comprehensive process that involves planning, developing, distributing, and managing surface water (rivers, lakes, and reservoirs) and groundwater resources effectively to meet the needs of various stakeholders while ensuring sustainability and maintaining ecological health. It addresses both the quantity and quality of water to balance human, environmental, and economic needs. Water resource management also entails managing water-related risks, including floods, drought, and contamination. Water resources classified based on type of water resources into –

a) Natural sources such as rain, snow, hail or sleet which are precipitated on the surface.
b) Surface water accumulates because of direct runoff from precipitation in the form of streams, lakes and ponds which are natural or artificial storage sites.
c) Ground water which is precipitated water that infiltrates into the ground.

### 3.1.1. Objectives of water source management

a) Promote Environmental, Economic and Social Sustainability
b) Improve water supply reliability and quality
c) Protect and improve watershed health and function and Bay water quality
d) Improve Regional Flood Management
e) Create, protect, enhance and maintain environmental resources and habitats
f) Support sustainable agricultural and industrial water use
g) Promote water conservation and demand-side management
h) Improve institutional capacity and governance

### 3.1.2. Water management principles

a) Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.

b) Water development and management should be based on a participatory approach, involving users, planners and policymakers at all levels.
c) Women play a central part in the provision, management and safeguarding of water.
d) Water has an economic value in all its competing uses and should be recognised as an economic good as well as a social good.

### 3.1.3. Components of water source management plan

#### a) Water resources assessment (WRA)

It is the process of measuring, collecting and analysing relevant parameters on the quantity and quality of water resources for the purpose of a better development and management of water resources. The WRA depends on understanding the water flows and storages, their interrelationship over time and their relation to human impact or demand within the defined boundary.

#### b) Demand management

It focuses on effectively controlling the demand for water resources for various purposes and efficiently managing and using the available resources. The purpose of implementing an effective water demand management strategy include:

- Reduced water usage in terms of both average and peak demands.
- Reduced water leakage or loss.
- Reduced wastewater flows.
- Improved financial performance of the ULBs through deferment of infrastructure investments and reduced operational costs.
- Generating greater awareness for consumers on the financial and environmental value of water.

#### c) Water resource management strategies

Based on the findings from the Water Resource Assessment, strategies can be adopted focusing on key priorities and engaging all stakeholders to ensure sustainability and viability of the interventions.

### 3.1.4. Major water conservation schemes by government

#### *3.1.4.1. Atal Mission of Rejuvenation and Urban Transformation (AMRUT)*

Atal Mission of Rejuvenation and Urban Transformation (AMRUT) cover all cities and towns with a population of over 1 lakh as per 2011 census and 1 Heritage city under National Heritage City Development and Augmentation Yojana (HRIDAY) Scheme. Sub-Scheme on "Formulation of GIS based Master Plan for 500 AMRUT Cities" was launched to support States for preparation of master plans in AMRUT towns. Final GIS database has been created for 443 towns, draft GIS based Master Plan prepared for 330 towns and final GIS based Master Plans has been notified for 180 towns.

#### *3.1.4.2. AMRUT 2.0*

AMRUT 2.0 scheme was launched on 1 October 2021, aims to provide a universal water supply with regular functional taps and ensure better distribution to urban areas. This includes strengthening infrastructure to ensure equitable access to clean water, reducing wastage, and improving the efficiency of water distribution networks. It focusses on water supply, treatment, drainage, and pollution management could support the rejuvenation of rivers like the Cauvery by implementing sustainable water practices and improving the overall health of urban water ecosystems. Under this scheme, 385 projects are implemented in 18 Corporations and 7 Municipalities under the administrative control of Directorate of Municipal Administration (DMA), at an estimated cost of Rs. 9,977.37 crore. The main components of AMRUT 2.0 include:

- Universal coverage of water supply at all ULBs.
- Ensure 100% coverage of sewage/ septage management in 500 AMRUT cities.
- Rejuvenation of water bodies and formation of green space.

#### *3.1.4.3. Jal Shakti Abhiyan*

Jal Shakti Abhiyan (JSA) was launched in 2019 in 26 water-stressed districts of the country. Later, in 2021 the second series of this scheme came up with the theme 'Catch the rain (CTR) - where it falls when its falls'. Fast forward in 2024 Jal Shakti Abhiyan's fifth series was implemented in March with the theme 'Nari shakti se Jal shakti' highlighting the important role of women in water conservation. Five focused interventions include (i) water conservation and rainwater harvesting; (ii) enumerating, geo-tagging & making inventory of all water bodies; preparation of scientific plans for water conservation based on it; (iii) setting up of Jal Shakti Kendras in all districts; (iv) intensive afforestation; and (v) awareness generation. Apart from the five focused interventions, JSA: CTR 2024 has distinctive emphasis on following key aspects:

- De-silting and cleaning water bodies.
- Revitalizing Abandoned/Defunct Borewells for groundwater recharge and rejuvenating small rivers.
- Geo-tagging water bodies coupled with meticulous mapping and regular updates.
- Snow harvesting in hilly areas to conserve water, like stupas in Ladakh.
- Setting up of Jal Shakti Kendra in all districts.
- Tamil Nadu Irrigated Agriculture Modernization Project

#### *3.1.4.4. Tamil Nadu irrigated agriculture modernization project*

The World Bank Supported Tamil Nadu Irrigated Agriculture Modernisation (TNIAM) Project is a follow up of IAMWARM Project which made significant development impacts in the state by modernising irrigation infrastructure, improving water use efficiency, enhancing yields and productivity of agriculture in a climate resilient production systems, diversification towards high value crops, strengthening the institutional reforms through Participatory Irrigation Management (PIM) and Water Users Association (WUA).The main objective of TNIAM Project is to improve irrigation and water management, covering both supply and demand aspects. It consists of four inter-related subcomponents as:

- Institutional Strengthening and Capacity Building for water management
- Irrigation Systems Modernization
- Participatory Irrigation Management
- Convergence for improved service delivery

Institutional Strengthening and Capacity Building for water management aims to assist the Government of Tamil Nadu in addressing the need for (i) an integrated water resources planning, decision making and management in a sub basin context (ii) an enhancing knowledge base and (iii) an improving sustainability of water sector assets.

#### *3.1.4.5. Kudimaramathu scheme*

The Kudimaramathu scheme is a water management initiative in Tamil Nadu that aims to rejuvenate the state's water bodies, including those along the Cauvery River. The scheme aims to restore the storage level in tanks, strengthen bunds, maintain the water bodies and help overcome floods and droughts. It was announced by the Tamil Nadu government in 2017. The scheme focuses on rejuvenating traditional water systems, ensuring sustainable water management, and enhancing water availability for agriculture and rural communities. The scheme includes maintenance work on canals, tanks, shutters, and supply channels. It also involves strengthening and reconstructing surplus weirs and sluices.

#### *3.1.4.6. PMKSY - Modernisation of grand anicut canal under AIBP*

The Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) is an ambitious initiative launched by the Government of India to ensure the availability of irrigation water to every farm in the country. It aims to enhance irrigation facilities, reduce dependency on rain-fed water sources, and increase agricultural productivity. Under PMKSY, the Accelerated Irrigation Benefits Programme (AIBP) plays a crucial role in the creation of irrigation infrastructure. The modernization of the Grand Anicut Canal involves upgrading its infrastructure, improving water distribution efficiency, and expanding its reach to enhance the irrigation coverage in the region. The project will also make the canal more resilient to climate change, reducing the risk of flooding and breaches. The project include:

- Lining the canal's bed and side walls
- Repairing or replacing water regulating structures
- Desilting tanks
- Introducing a canal automation system

#### *3.1.4.7. NAM Neer Program*

In line with the JSA Mission of Government of India, the Karaikal District administration has launched the “Nam Neer” project in August 2019 to save the water resources on high priority. The mission Nam Neer focuses on better management of Cauvery water and rainwater by digging, cleaning and de-silting ponds and wells that have traditionally stored water. The objective includes:

- To enhance the development of Minor Irrigation infrastructure
- To strengthen community-based irrigation management in a decentralized manner

- To adopt a comprehensive programme for restoration of tanks and sources of water to effectively utilize Cauvery water and rainwater.

### 3.1.5. Water resource projects in the CRB

The CRB is home to several major and medium irrigation projects that support agriculture, the primary livelihood in the region (Table 5). These projects are designed to harness the river's waters for irrigating vast stretches of agricultural land. These water resource projects collectively play a crucial role in agricultural, industrial, and domestic water supply, as well as in energy generation, contributing to the overall development of Karnataka, Kerala, Tamil Nadu and Puducherry.

**Table 5.** Major medium irrigation projects in the CRB

| Sr. No. | Name | State | Type |
|---|---|---|---|
| 1 | Amaravathy Medium Irrigation Project | Tamil Nadu | Medium |
| 2 | Arkavathi Medium Irrigation Project | Karnataka | Medium |
| 3 | Badanavalu Medium Irrigation Project | Karnataka | Medium |
| 4 | Banahalli Hundi Lift Irrigation Project | Karnataka | Medium |
| 5 | Banasurasagar Medium Irrigation Project | Kerala | Medium |
| 6 | Byramangala Medium Irrigation Project | Karnataka | Medium |
| 7 | Cauvery Anicut Channels Major Irrigation Project | Karnataka | Major |
| 8 | Cauvery Delta Major Irrigation Project Puducherry | Puducherry | Major |
| 9 | Cauvery Delta Major Irrigation Project Tamilnadu | Tamil Nadu | Major |
| 10 | Cauvery Mettur Major Irrigation Project | Tamil Nadu | Major |
| 11 | Chickahole Medium Irrigation Project | Karnataka | Medium |
| 12 | Chiklihole Medium Irrigation Project | Karnataka | Medium |
| 13 | Chinnar Medium Irrigation Project | Tamil Nadu | Medium |
| 14 | Gundal Medium Irrigation Project | Karnataka | Medium |
| 15 | Gunderipallam Medium Irrigation Project | Tamil Nadu | Medium |
| 16 | Harangi Major Irrigation Project | Karnataka | Major |
| 17 | Hebballa Medium Irrigation Project | Karnataka | Medium |
| 18 | Hemavathy Major Irrigation Project | Karnataka | Major |
| 19 | Hucchana - Koppalu Medium Irrigation Project | Karnataka | Medium |
| 20 | Iggalur Medium Irrigation Project | Karnataka | Medium |
| 21 | Kabini Major Irrigation Project | Karnataka | Major |

| | | | |
|---|---|---|---|
| 22 | Kachnahalli Lift Irrigation Project | Karnataka | Medium |
| 23 | Kalingarayan Major Irrigation Project | Tamil Nadu | Major |
| 24 | Kama Samundra Lift Irrigation Project | Karnataka | Medium |
| 25 | Kanva Medium Irrigation Project | Karnataka | Medium |
| 26 | Karapuzha Medium Irrigation Project | Kerala | Medium |
| 27 | Kattalai Major Irrigation Project | Tamil Nadu | Major |
| 28 | Kodaganar Medium Irrigation Project | Tamil Nadu | Medium |
| 29 | Kodivery Anicut System Major Irrigation Project | Tamil Nadu | Major |
| 30 | Krishnarajasagar Major Irrigation Project | Karnataka | Major |
| 31 | Kuthiraiyar Medium Irrigation Project | Tamil Nadu | Medium |
| 32 | Lower Bhavani Major Irrigation Project | Tamil Nadu | Major |
| 33 | Lower Coleroon Anicut Major Irrigation Project | Tamil Nadu | Major |
| 34 | Manchanabele Medium Irrigation Project | Karnataka | Medium |
| 35 | Mangala Medium Irrigation Project | Karnataka | Medium |
| 36 | Marconahalli Medium Irrigation Project | Karnataka | Medium |
| 37 | Mettur Canal Major Irrigation Project | Tamil Nadu | Major |
| 38 | Nallur Amanikere Medium Irrigation Project | Karnataka | Medium |
| 39 | Nandhiyar Channel Medium Irrigation Project | Tamil Nadu | Medium |
| 40 | Nanganjiar Medium Irrigation Project | Tamil Nadu | Medium |
| 41 | Nanjapura Medium Irrigation Project | Karnataka | Medium |
| 42 | Noyyal Medium Irrigation Project | Tamil Nadu | Medium |
| 43 | Nugu Medium Irrigation Project | Karnataka | Medium |
| 44 | Orathupalayam Medium Irrigation Project | Tamil Nadu | Medium |
| 45 | Palar Porandalar Medium Irrigation Project | Tamil Nadu | Medium |
| 46 | Parambikulam Aliyar Major Irrigation Project | Kerala, Tamil Nadu | Major |
| 47 | Parappalar Medium Irrigation Project | Tamil Nadu | Medium |
| 48 | Pelandhurai Anicut Medium Irrigation Project | Tamil Nadu | Medium |
| 49 | Ponnaniar Medium Irrigation Project | Tamil Nadu | Medium |
| 50 | Pullambadi Canal Medium Irrigation Project | Tamil Nadu | Medium |
| 51 | Siddhamalli Medium Irrigation Project | Tamil Nadu | Medium |
| 52 | Suvarnavathy Medium Irrigation Project | Karnataka | Medium |
| 53 | Taraka Medium Irrigation Project | Karnataka | Medium |
| 54 | Thoppaiyar Medium Irrigation Project | Tamil Nadu | Medium |

| | | | |
|---|---|---|---|
| 55 | Uduthorehalla Medium Irrigation Project | Karnataka | Medium |
| 56 | Varattupallam Medium Irrigation Project | Tamil Nadu | Medium |
| 57 | Vattamalai Karai Odai Medium Irrigation Project | Tamil Nadu | Medium |
| 58 | Votehole Medium Irrigation Project | Karnataka | Medium |
| 59 | Yagachi Major Irrigation Project | Karnataka | Major |

**Source:** India-WRIS

Several dams have been constructed in the CRB to manage water resources effectively (Fig. 1). These dams play a crucial role in irrigation, flood control, and water supply. Some significant dams in the CRB are listed in Table 6.

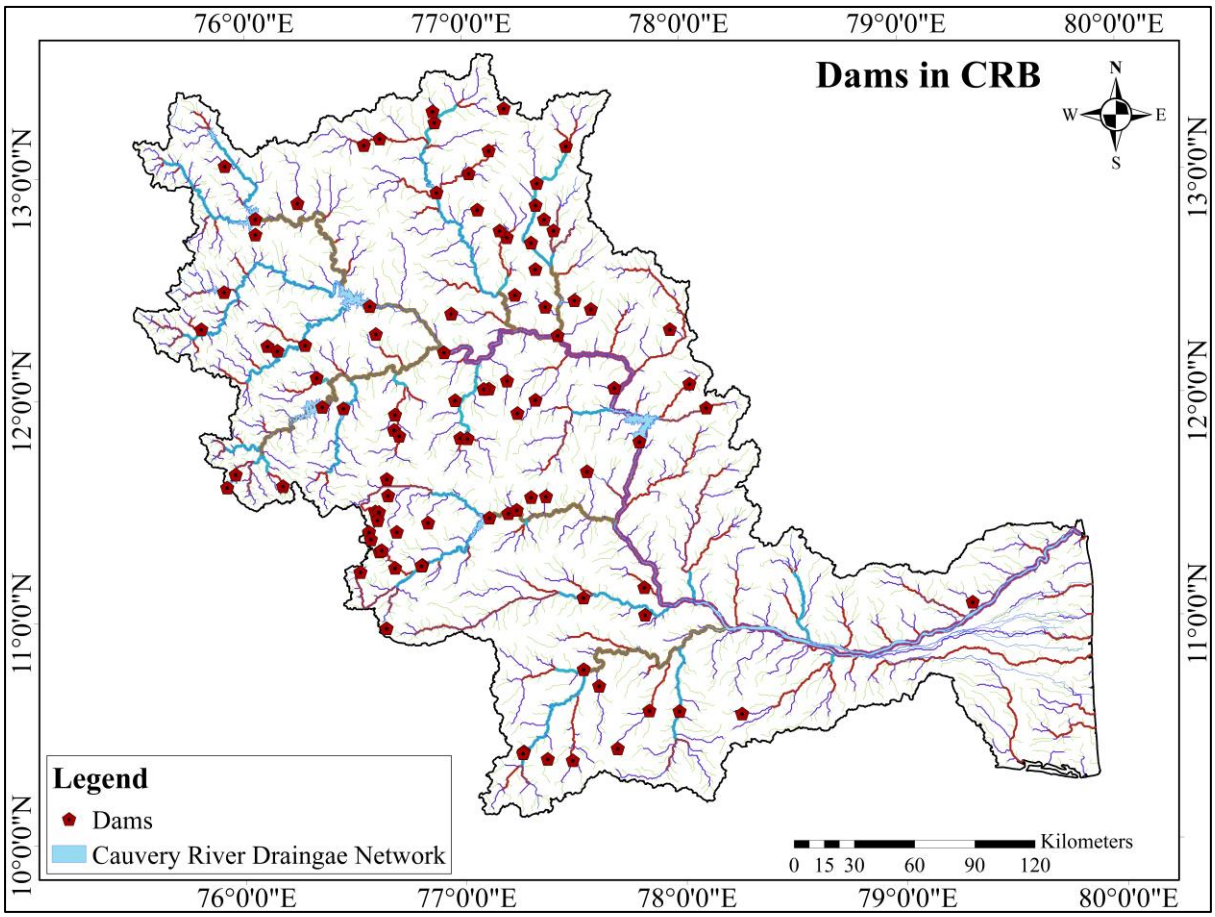


**Fig. 1.** Dams in the CRB

**Table 6.** Details of dams in the CRB

| Sr. No. | Name | Purpose | River | District | State | Length (m) |
|---|---|---|---|---|---|---|
| 1 | Alalur Dam | Irrigation | Lakshmanathir | Mysuru | Karnataka | 939.6 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | tha | | | |
| 2 | Albur Kere Dam | | | Tumkuru | Karnataka | |
| 3 | Amaravathi Dam | Hydroelectri, Irrigation | Amaravati | Tiruppur | Tamil Nadu | 1095 |
| 4 | Arkavathy Dam | Irrigation | Arkavathy | Ramanagara | Karnataka | 720 |
| 5 | Avalanche Dam | Hydroelectric | Avalanche & Emerald Streams | The Nilgiris | Tamil Nadu | 366 |
| 6 | Byramangala Dam | Irrigation | Vrishabhavathy | Ramanagara | Karnataka | 2286 |
| 7 | Chakena Hally Dam | Irrigation | Hemavathy River | Hassan | Karnataka | 886.75 |
| 8 | Chickkahole Dam | Irrigation | Chickkahole | Chamarajanagar | Karnataka | 756 |
| 9 | Chikkagondanahally Dam | Irrigation | Arkavathy | Ramanagara | Karnataka | 516 |
| 10 | Chiklihole Dam | Irrigation | Chiklihole | Kodagu | Karnataka | 464.8 |
| 11 | Deepambudikere Dam | Irrigation | Nagini | Tumkuru | Karnataka | 600 |
| 12 | Doddaladahalli Dam | Irrigation | Arkavathy | Ramanagara | Karnataka | 330 |
| 13 | East Varahapallam dam | | East varahapallam | The Nilgiris | Tamil Nadu | 173 |
| 14 | Emerald Dam | Hydroelectric | Emerald | The Nilgiris | Tamil Nadu | 323 |
| 15 | Glenmorgan | Hydroelectric | Glenmorgan St | The Nilgiris | Tamil Nadu | 80 |
| 16 | Glenmorgan Forbay Dam | Hydroelectric | | The Nilgiris | Tamil Nadu | 80 |
| 17 | Gopinatham Dam | Irrigation | Cauvery | Chamarajanagar | Karnataka | 402 |
| 18 | Gowdahally Dam | Irrigation | K.K.Halla | Chamarajanagar | Karnataka | 731.5 |
| 19 | Gundal Dam | Irrigation | Gundal | Chamarajanagar | Karnataka | 1219 |
| 20 | Gunderipallam Dam | | Gunderipallam | periyar | Tamil Nadu | 627 |
| 21 | Harangi Dam | Hydroelectric, Irrigation | Harangi | Kodagu | Karnataka | 845.8 |
| 22 | Hebbahalla Dam | Irrigation | Hebballa | Mysuru | Karnataka | 996.65 |
| 23 | Hemavathy Dam | Irrigation | Hemavathy | Hassan | Karnataka | 4692 |
| 24 | Hesaraghatta Dam | Drinking / Water Supply | Arkavathy | Bengaluru | Karnataka | 1560 |
| 25 | Hosahalli Dam | Irrigation | K.K.Halla | Chamarajanagar | Karnataka | 868.68 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 26 | K.Honnamachanahalli Dam | Irrigation | Local Halla | Tumkuru | Karnataka | 630 |
| 27 | Kabini Dam | Hydroelectric, Irrigation | Kabini | Mysuru | Karnataka | 2732.4 |
| 28 | Kachavanahalli Dam | Irrigation | Karigale & Hebbahalla | Mysuru | Karnataka | 722 |
| 29 | Kadaba Dam | Irrigation | Shimsha Valley | Tumkuru | Karnataka | 1680 |
| 30 | Kalikatte Dam | Irrigation | Kalikattehalla | Chamarajanagar | Karnataka | 1122 |
| 31 | Kamarahalli Dam | Irrigation | K.Hallihalla | Chamarajanagar | Karnataka | 1020 |
| 32 | Kamraju Sagar (Sandy Nalla) Dam | | Sandynallah | The Nilgiris | Tamil Nadu | 107 |
| 33 | Kanva Dam | Irrigation | Kanva | Ramanagara | Karnataka | 1422 |
| 34 | Karapuzha (Id) Dam | Irrigation | Karapuzha | Wayanad | Kerala | 625 |
| 35 | Karimuddenahalli Dam | Irrigation | Lakshman Theertha | Mysuru | Karnataka | 422.25 |
| 36 | Kesarigulihalla Dam | Irrigation | K.gulihalla | Dharmapuri | Tamil Nadu | 1672 |
| 37 | Kodaganar Dam | Irrigation | | Dindigul | Tamil Nadu | 2893 |
| 38 | Kothagere Dam | | | Tumkuru | Karnataka | |
| 39 | Kowlihalla Dam | Irrigation | Cauvery | Chamarajanagar | Karnataka | 393 |
| 40 | Krishnarajasagar Dam | Irrigation | Cauvery | Mandya | Karnataka | 2621 |
| 41 | Kundah Palam Dam | Hydroelectric | Kundah | The Nilgiris | Tamil Nadu | 152 |
| 42 | Kunigal Dodakere Dam | Irrigation | Nagini | Tumkuru | Karnataka | 2000 |
| 43 | Kuppareddy Dam | | | Bengaluru | Karnataka | |
| 44 | Kuthiraiyar Dam | Irrigation | Kuthiraiyar | Dindigul | Tamil Nadu | 899.9 |
| 45 | Kuttiyadi Spillway Dam | Hydroelectric, Irrigation | Panamarampuzha | Wayanad | Kerala | 56.38 |
| 46 | Lower Bhavani Dam | Hydroelectric, Irrigation | Bhavani | Erode | Tamil Nadu | 8797 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 47 | Maidal Amanikere Dam | Irrigation | Agasarahalli nala | Tumkuru | Karnataka | 810 |
| 48 | Mallaghatta Dam | Irrigation | Shimsha Valley | Tumkuru | Karnataka | 750 |
| 49 | Manchanabele Dam | Irrigation | Arkavathy | Ramanagara | Karnataka | 362.2 |
| 50 | Mangala I Dam | Irrigation | Nagini River | Tumkuru | Karnataka | 610 |
| 51 | Mangala II Dam | Irrigation | Cauvery | Chamarajanagar | Karnataka | 661.4 |
| 52 | Maralvadi Dam | Irrigation | Arkavathy | Ramanagara | Karnataka | 480 |
| 53 | Maravakandi Forbay Dam | Hydroelectric | Aravarihalla | The Nilgiris | Tamil Nadu | 415 |
| 54 | Marconahally Dam | Irrigation | Shimsha Valley | Tumkuru | Karnataka | 1609 |
| 55 | Marudhanadi Dam | Irrigation | Maurdhanadhi | Dindigul | Tamil Nadu | 808 |
| 56 | Mayasandra Dam | Irrigation | Shimsha Valley | Tumkuru | Karnataka | 1410 |
| 57 | Mettur Dam | Hydroelectric, Irrigation | Cauvery | Salem | Tamil Nadu | 1615.44 |
| 58 | Moyar Forebay Dam | Hydroelectric | | The Nilgiris | Tamil Nadu | 731 |
| 59 | Mukurthy Dam | | Mukurthi | The Nilgiris | Tamil Nadu | 162 |
| 60 | Muthurayanakere Dam | Irrigation | Local Nala | Tumkuru | Karnataka | 1140 |
| 61 | Nagavathi Dam | Irrigation | Nagavathy | Dharmapuri | Tamil Nadu | 306 |
| 62 | Nallathangal Odai Dam | | Nallathangal Odai | Tiruppur | Tamil Nadu | 3450 |
| 63 | Nallur Amanikere Dam | Irrigation | Gundlu | Chamarajanagar | Karnataka | 1802 |
| 64 | Nanganjiyar Dam | Irrigation | Nanganjiyar | Dindigul | Tamil Nadu | 2680 |
| 65 | Near Kottagiri Saddle Dam | Hydroelectric | | Wayanad | Kerala | 86.5 |
| 66 | Nelligudda Dam | Irrigation | Bidadi Halla | Ramanagara | Karnataka | 740 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 67 | Neralatti Kere Dam | | | Ramanagara | Karnataka | |
| 68 | New Amachawadi Dam | Irrigation | Yennehole Stream | Chamarajanagar | Karnataka | 540 |
| 69 | Nidasale Dam | Irrigation | Nagini | Tumkuru | Karnataka | 870 |
| 70 | Nittur Dam | Irrigation | Shimsha Valley | Tumkuru | Karnataka | 1350 |
| 71 | Nonavinakere Lake Dam | | | Tumkuru | Karnataka | |
| 72 | Noyyal Athupalayam Dam | Irrigation | Noyyal | Karur | Tamil Nadu | 2850 |
| 73 | Noyyal Orathupalayam Dam | Irrigation | Noyyal | Tiruppur | Tamil Nadu | 2290 |
| 74 | Nugu Dam | Hydroelectric, I rrigation | Nugu | Mysuru | Karnataka | 637.65 |
| 75 | Obichudanahally Dam | Irrigation | Arkavathy | Bengaluru | Karnataka | 637 |
| 76 | Palar Porundalar Dam | Irrigation | Palar Porundalar | Dindigul | Tamil Nadu | 2451 |
| 77 | Parappalar Dam | Irrigation | Parappalar | Dindigul | Tamil Nadu | 81.07 |
| 78 | Parsons Valley Dam | Hydroelectric | Parson Valley | The Nilgiris | Tamil Nadu | 146 |
| 79 | Pegumbahallah Forebay Dam | Hydroelectric | Pengumbahall h | The Nilgiris | Tamil Nadu | 181 |
| 80 | Perumpallam Dam | | Perumpalam | Erode | Tamil Nadu | 2060 |
| 81 | Pillur Dam | Hydroelectric | Bhavani | Coimbatore | Tamil Nadu | 357 |
| 82 | Ponnaniar Dam | Irrigation | Ponnaniyar | Karur | Tamil Nadu | 246.81 |
| 83 | Porthimund Dam | Hydroelectric | Porthimund St | The Nilgiris | Tamil Nadu | 335 |
| 84 | Pykara Dam | | | The Nilgiris | Tamil Nadu | 193.5 |
| 85 | Sarigehally Dam | Irrigation | Shimsha | Tumkuru | Karnataka | 1200 |
| 86 | Siddhamalli Dam | Irrigation | | Ariyalur | Tamil Nadu | 5050 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 87 | Siruvani (ID) Dam | Drinking / Water Supply | Siruvani | Palakkad | Kerala | 224 |
| 88 | Suvarnavathy Dam | Irrigation | Suvarnavathy | Chamarajanagar | Karnataka | 1170.4 |
| 89 | Taraka Dam | Irrigation | Taraka | Mysuru | Karnataka | 1272.5 |
| 90 | Thonnur Dam | Irrigation | Hebballa Valley | Mandya | Karnataka | 118.8 |
| 91 | Thoppaiyar Dam | Irrigation | Thoppaiyar | Dharmapuri | Tamil Nadu | 435 |
| 92 | Tippagondana Hally Dam | Drinking / Water Supply | Arkavathy & Kumudavathy | Bengaluru | Karnataka | 451.104 |
| 93 | Turuvekere Dam | Irrigation | Shimsha Valley | Tumkuru | Karnataka | 870 |
| 94 | Uduthorehalla Dam | Irrigation | Uduthorehalla | Chamarajanagar | Karnataka | 1530 |
| 95 | Uppar (Erode) Dam | | Uppar | Tiruppur | Tamil Nadu | 2256 |
| 96 | Upper Bhavani Dam | Hydroelectric | Bhavani | The Nilgiris | Tamil Nadu | 419 |
| 97 | Varattupallam Dam | Irrigation | Varattupallam | Erode | Tamil Nadu | 1798 |
| 98 | Vattamalaikarai Odai Dam | Irrigation | V.K. Odai | Tiruppur | Tamil Nadu | 1820 |
| 99 | Votehole Dam | Irrigation | Votehole | Hassan | Karnataka | 900 |
| 100 | West Varahapallam Weir Dam | | W.V.Pallam | Nilgiri | Tamil Nadu | 92 |
| 101 | Yagachi Dam | Irrigation | Yagachi | Hassan | Karnataka | 1280 |

**Source:** India-WRIS

The CRB also includes several powerhouses that generate electricity to support the state's power requirements. These powerhouses are typically associated with dams and reservoirs. Some of the important powerhouses are considered in Table 7.

**Table 7.** Powerhouses in the CRB

| Sr. No. | Name | State | Total Installed Capacity (MW) |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1 | Bhavani Kattalai Barrage - I Powerhouse | Tamil Nadu | 30 |
| 2 | Bhavani Kattalai Barrgae - II Powerhouse | Tamil Nadu | 30 |
| 3 | Bhavani Kattalai Barrgae - III Powerhouse | Tamil Nadu | 30 |
| 4 | Harangi Powerhouse | Karnataka | 9 |
| 5 | Kabini | Karnataka | 20 |
| 6 | Kundah - I Powerhouse | Tamil Nadu | 60 |
| 7 | Kundah - II Powerhouse | Tamil Nadu | 175 |
| 8 | Kundah - III Powerhouse | Tamil Nadu | 180 |
| 9 | Kundah - IV Powerhouse | Tamil Nadu | 100 |
| 10 | Kundah - V Powerhouse | Tamil Nadu | 40 |
| 11 | Kundah - VI Powerhouse | Tamil Nadu | 30 |
| 12 | Lower Bhavani Powerhouse | Tamil Nadu | 8 |
| 13 | Lower Bhavani RBC Powerhouse | Tamil Nadu | 7.5 |
| 14 | Lower Mettur Barrage - I Powerhouse | Tamil Nadu | 30 |
| 15 | Lower Mettur Barrage -II Powerhouse | Tamil Nadu | 30 |
| 16 | Lower Mettur Barrage -III Powerhouse | Tamil Nadu | 30 |
| 17 | Lower Mettur Barrage -IV Powerhouse | Tamil Nadu | 30 |
| 18 | Mettur Dam Powerhouse | Tamil Nadu | 40 |
| 19 | Mettur Tunnel Powerhouse | Tamil Nadu | 200 |
| 20 | Moyar Powerhouse | Tamil Nadu | 36 |
| 21 | Pykara Singara Powerhouse | Tamil Nadu | 70 |
| 22 | Pykara Ultimate (Pushe) Powerhouse | Tamil Nadu | 150 |
| 23 | Seshadhri Iyer (Sivasamudram) Powerhouse | Karnataka | 42 |
| 24 | Simshapura Powerhouse | Karnataka | 17.2 |

**Source:** India-WRIS

The CRB is home to several hydroelectric projects that harness the river's flow for power generation. These projects are vital for meeting the state's energy demands and promoting sustainable development. Some of the important hydroelectric projects are labelled in Table 8.

**Table 8.** Hydroelectric projects in the CRB

| Sr. No. | Name | District | State | River |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 1 | Bhavani Kattalai Barrage - I Hydroelectric Project | Erode | Tamil Nadu | Cauvery |
| 2 | Bhavani Kattalai Barrage - II Hydroelectric Project | Erode | Tamil Nadu | Cauvery |
| 3 | Bhavani Kattalai Barrage - III Hydroelectric Project | Erode | Tamil Nadu | Cauvery |
| 4 | Harangi Hydroelectric Project | Kodagu | Karnataka | Harangi Cnl |
| 5 | Kabini Project | Mysuru | Karnataka | Kabini |
| 6 | Lower Bhavani Hydroelectric Project | Erode | Tamil Nadu | Bhavani |
| 7 | Lower Mettur Barrage - I Hydroelectric Project | Salem | Tamil Nadu | Cauvery |
| 8 | Lower Mettur Barrage - II Hydroelectric Project | Salem | Tamil Nadu | Cauvery |
| 9 | Lower Mettur Barrage - III Hydroelectric Project | Salem | Tamil Nadu | Cauvery |
| 10 | Lower Mettur Barrage - IV Hydroelectric Project | Salem | Tamil Nadu | Cauvery |
| 11 | Mettur Hydroelectric Project | Erode | Tamil Nadu | Cauvery |
| 12 | Pykara Moyar Hydroelectric Project | Nilgiris | Tamil Nadu | Pykara and Mukurthy |
| 13 | Seshadhri Iyer (Sivasamudram) Hydroelectric | Mandya | Karnataka | Cauvery |
| 14 | Simshapura Hydroelectric project | Mandya | Karnataka | Cauvery |

**Source:** India-WRIS

## 3.2. Pipeline networks

The Karnataka Urban Water Supply and Drainage Board (KUWSDB) is the implementing body for drinking water supply and underground drainage schemes in 316 urban areas of the Karnataka State except Bangalore city. The Board aims to provide adequate water supply from assured and safe sources of supply and proper sanitation to all the urban areas. For instance the water distribution network in Somwarpet region is described in Fig. 2.

The board has taken up remodelling of existing distribution network, Automation and Integrated Management System of Mysore city under the Jawaharalal Nehru National Urban Renewal Mission (JnNURM) centrally sponsored project at an estimating cost of Rs.179.18. Crores and approved Revised Est Cost is RS. 229.93 Crores. The work is completed and handed over to Mysore City Corporation for further maintenance. Augmentation of water supply project from Kabini river has been taken up at an estimated cost of Rs. 108.81 crores under JnNURM and the project has been commissioned and handed over to Mysore City Corporation for further maintenance. A Project for providing 24x1 water supply to uncovered areas of Mysore city has been Administratively approved by the Government for Rs. 214 crores. The

project has been taken up for implementation and completed 23 district metered areas (DMA' S).

The action plan for the year 2023-24, consisting of 286 projects (116 Water Supply and 170 UGD projects) which includes projects commissioned during previous years and to be completed, projects targeted for commissioning during 2023-24, on-going projects and New Projects proposed during the year 2023-24. The Board has made the budget for plan schemes (GOK) for the year 2023-24 is amounting to Rs.1400.00 crores and the Action Plan was submitted to Government vide this office letter No. 278 dated 11-07-2023 for approval. The Grant of State Budget for the year 2023-24 is Rs. 900.00 Crores (KUWSDB APR).

The Tamil Nadu Water Supply and Drainage (TWAD) Board is entrusted with the development of Water Supply and Sewerage facilities in the State of Tamil Nadu, except Chennai Metropolitan Development Areas. TWAD Board further expanded their horizon of service to include maintenance of major Combined Water Supply Schemes (CWSS) also into their domain. During the year 2021-22 & 2022-23, 8 CWSS covering 6 town panchayats, 1014 rural habitations have been completed at an estimated cost of Rs. 266.79 crore to supply 28.37 MLD of safe potable water in Cuddalore, Krishnagiri, Tiruppur, Tiruchirappalli, Nilgiris and Tirunelveli Districts, benefitting a population of 8.13 lakh. Further, 5 Combined Water Supply schemes covering and 1,388 Rural habitations in Thanjavur, Nagapattinam, Perambalur, Krishnagiri, and Tiruppur, Districts are under various stages of implementation at an estimated cost of Rs. 257.86 crore which on completion will supply designed quantity of 32.57 MLD (Ultimate stage) of potable water to a population of 10.75 lakh (TWAD Board).

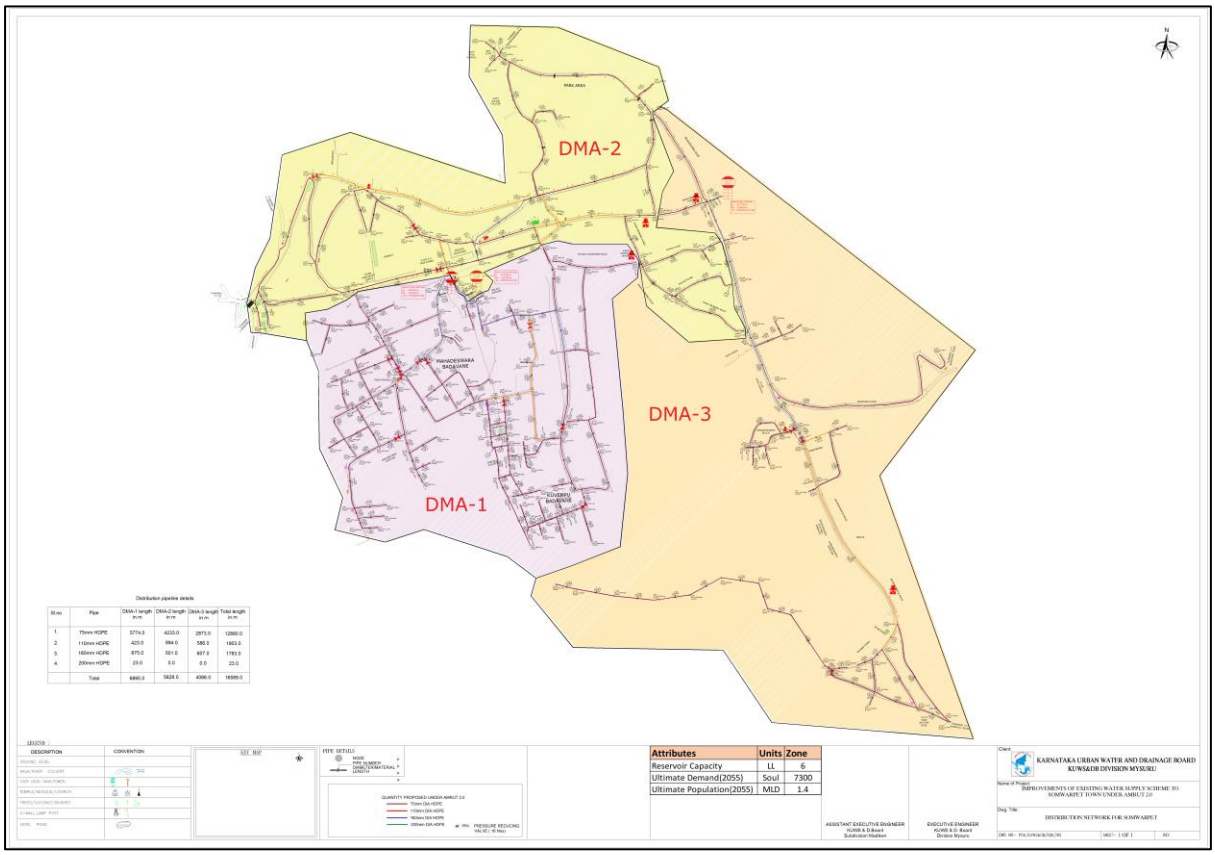

**Fig. 2.** Water distribution network in Somwarpet region, Karnataka

(Source: KUWSDB)

## 3.3. Water treatment plant

A water treatment plant (WTP) is a facility designed to treat raw water (from rivers, lakes, wells, or other natural sources) to make it suitable for human consumption, industrial use, and other purposes. The main goal of a WTP is to ensure that the water provided meets the required quality standards for safety and health, free from contaminants like pathogens, chemicals, and impurities. Water treatment processes can vary depending on the quality of the source water, but they typically involve several stages to purify the water. A brief description of WTP in the CRB (Fig. 3) is given in Table 9.

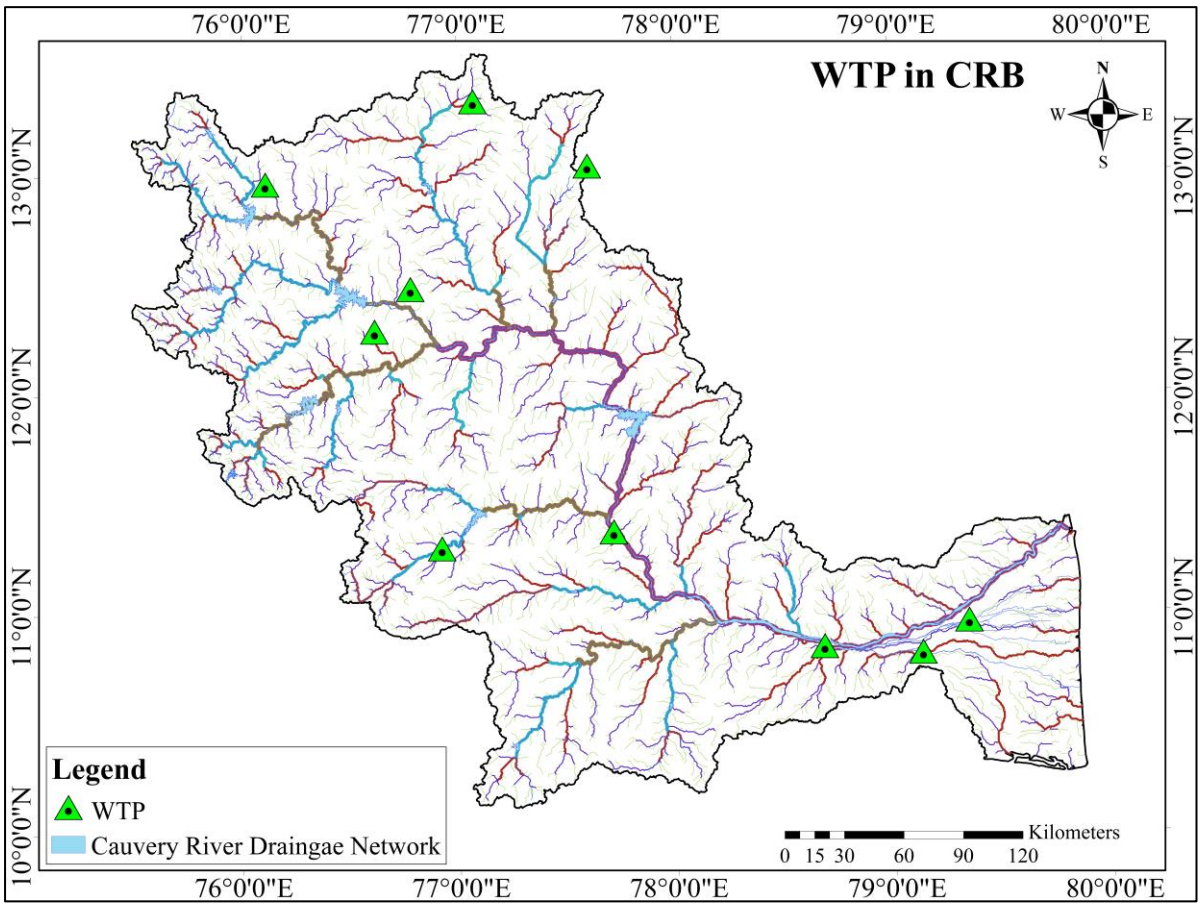


**Fig. 3.** Water treatment plants in the CRB

**Table 9.** Details of water treatment plants in the CRB

| Sr. No. | Name of Town | WTP Capacity | | Water Source | Type of Treatment | LPCD |
|---|---|---|---|---|---|---|
| | | Installed (MLD) | Water Treated (MLD) | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | Tiruchirappalli | 88 | 88 | Cauvery River | Bleaching Powder | 118 |
| 2 | Thanjavur | - | - | Vennar River and Coleroon River | Bleaching Powder | |
| 3 | Kumbakonam | 15 | 15 | G/W | Liquid Chlorine | 107.1 |
| 4 | Erode | 30 | 20 | Cauvery River | Sedimentation, Filtration, Disinfection | 132 |
| 5 | Tiruppur | 46 | 44 | Bhavani River | Sedimentation, Filtration, Disinfection | 125.2 |
| 6 | Dindigul | 10 | 10 | Lake | Sedimentation, Filtration, Disinfection | 50.9 |
| 7 | Bengaluru | 1350 | 1350 | Cauvery River | Sedimentation, Filtration, Disinfection | 150 |
| 8 | Mysuru | 175 | 175 | Cauvery River | Sedimentation, Filtration, Disinfection | 135 |
| 9 | Mandya | 70 | 70 | Cauvery River | Sedimentation, Filtration, Disinfection | 120 |
| 10 | Hassan | 40 | 40 | Hemavathi River | Sedimentation, Filtration, Disinfection | 110 |
| 11 | Tumkuru | 30 | 30 | Hemavathi River | Sedimentation, Filtration, Disinfection | 100 |

**Source:** CPCB

# 4. Sewerage and drainage network plan

Pollution refers to the contamination of the environment with harmful substances that disrupt the natural balance of ecosystems and pose risks to the health of living organisms, including plants, animals, and human beings. River pollution has become a crucial environmental issue because of its significant impact on the major rivers in Tamil Nadu. The main sources of contamination in these rivers include Industrial discharges, sewage pollution, and poor waste management practices. Domestic wastewater is primarily organic but still has a high

concentration of substances that can lead to serious environmental impacts. The release of this wastewater into open water bodies or groundwater can cause oxygen-depletion due to the chemical and biochemical reactions that occur when organic matter is broken down. This process depletes dissolved oxygen levels, which are critical for aquatic life, leading to Eutrophication.

In eutrophic conditions, excessive nutrients like nitrogen and phosphorus fuel the rapid growth of algae, which further reduces oxygen levels and disrupts aquatic ecosystems. They harm the aquatic life of the receiving water and affect humans through the food chain. Sewage from residential and commercial buildings that frequently don't have enough underground sewer connections runs directly into the rivers, further degrading the water quality. Sewage treatment plants that aren't working properly make the problem even worse. Using contaminated water for irrigation reduces the fertility of the land, creating new difficulties for agriculture. The considerable amount of solid residue generated by the CETP needs adequate treatment and reclamation before ending up in the environment as solid waste.

## 4.1. Sewerage system mapping

Sewerage system mapping in Karnataka and Tamil Nadu is crucial for efficient urban planning, sanitation management, and environmental protection. Both states have undertaken initiatives to map their sewer networks using GIS and modern surveying techniques. In Karnataka, cities like Bengaluru have implemented digital mapping to track underground drainage systems, aiding in reducing waterlogging and improving maintenance. Tamil Nadu, particularly in Chennai, has also adopted GIS-based mapping to manage stormwater drains and prevent urban flooding. These efforts help authorities monitor sewage flow, detect leaks, and enhance wastewater treatment, ultimately improving public health and water quality. However, challenges such as aging infrastructure, unauthorized sewage connections, and rapid urbanization necessitate continuous updates and technological advancements in sewerage system mapping.

The Underground Sewage System (UGSS) covers the Tiruchirappalli Corporation and 2 Town Panchayats (Fig. 4). The corporation is covered by UGSS through old schemes. The total sewage generated from Tiruchirappalli Corporation, Municipalities, Town Panchayat and Villages is 118 MLD, 5 MLD, 5 MLD and 19 MLD. 71% of the Tiruchirappalli Corporation area is covered by a sewer network. 54% of Manachanallur and S.Kannanoor Town Panchayat area is covered through sewer network (Directorate of Town and Country Planning).

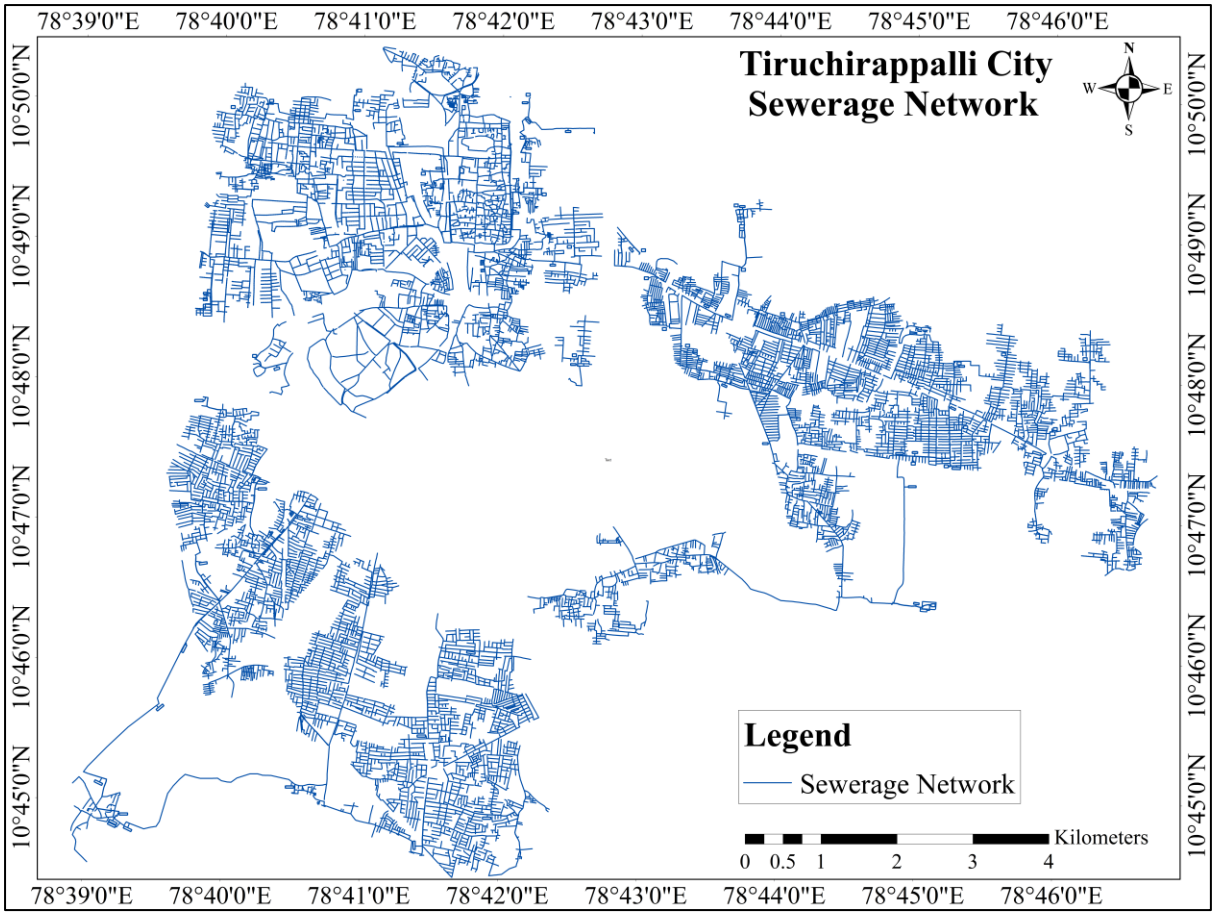


**Fig. 4.** Sewerage network map of Tiruchirappalli city, Tamil Nadu

**(Source:** Tiruchirappalli City Municipal Corporation**)**

## 4.2. Stormwater drainage

Storm water is that portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility. Storm water management is the control and use of storm water runoff. It includes planning for runoff, maintaining storm water systems, and regulating the collection, storage, and movement of storm water. Storm water management should also factor in drainage in the design of cities and housing developments. The drainage system should best preserve or mimic the natural hydrologic cycle and fit within the capacity of the existing infrastructure.

Bruhat Bengaluru Mahanagara Palike (BBMP) spread over an area of 741 sq km is demarcated into eight zones. As per the records of the Chief Engineer, Storm Water Drains, BBMP has a total drain network (primary and secondary drains only) of 842 km. However, as per the master plan of drains also prepared by BBMP, the total length of drains was 856.74 km which includes the length of drains that are outside the jurisdiction of BBMP but are considered for hydraulic analysis purposes only. BBMP did not have on records the length of the tertiary drains under its jurisdiction. Even the drainage network map of BBMP has no mention/sketch of the tertiary drains.

## 4.3. Wastewater treatment facilities

Effective wastewater treatment within the CRB is crucial to maintain water quality and support the diverse needs of the population. In Karnataka, the BWSSB is responsible for managing sewage disposal and water supply in Bengaluru. The city operates several STPs to treat wastewater before its release or reuse. These facilities are essential for mitigating pollution in the Cauvery River, as untreated sewage can significantly degrade water quality. In Tamil Nadu, cities like Erode and Tiruchirappalli have established STPs to manage urban wastewater. These plants are designed to handle the sewage generated by the urban population, ensuring that the treated effluent meets environmental standards before being discharged into the river system.

Additionally, community-based initiatives like Cauvery Calling aim to restore the river basin's health by promoting agroforestry among farmers. By planting trees, these projects enhance soil health, increase water retention, and reduce runoff, thereby improving the overall water quality in the basin. Collectively, these efforts in establishing and maintaining wastewater treatment facilities, along with community engagement in sustainable practices, are pivotal in preserving the ecological balance of the CRB. The details of various STPs (Fig. 5) installed in CRB are summarized in Table 10.

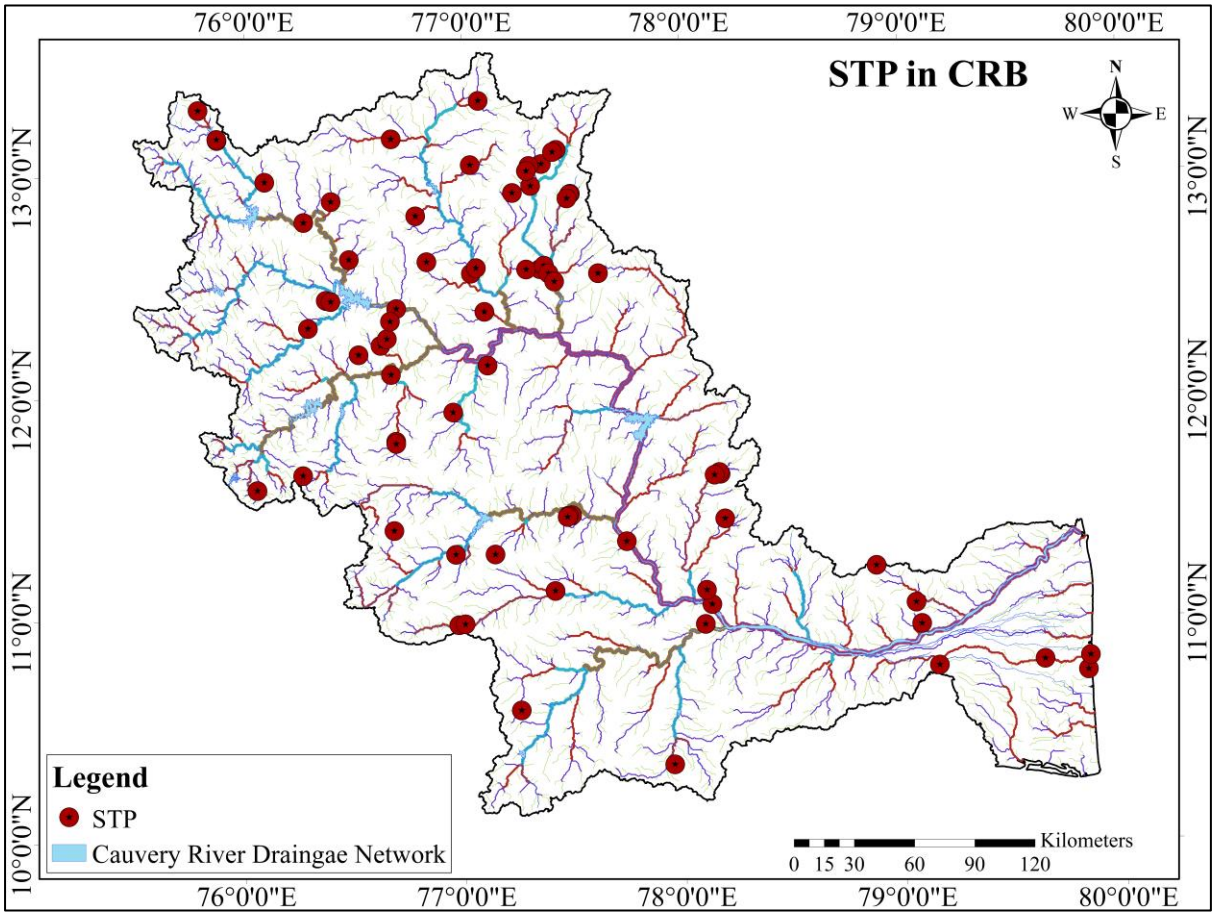


**Fig. 5.** Sewage treatment plants in the CRB

**Table 10.** Summary of various STPs installed in the CRB

| Sr. No. | Location | STP Installed Capacity (MLD) | STP capacity utilization (MLD) | Technology |
|---|---|---|---|---|
| 1 | Bangalore Urban | 15 | 15 | MBBR |
| 2 | Bangalore Urban | 218 | 190 | ASP |
| 3 | Bangalore Urban | 30 | 30 | EAP |
| 4 | Bangalore Urban | 1.5 | 1.5 | ASP and UV method |
| 5 | Bangalore Urban | 4 | 4 | MBR |
| 6 | Bangalore Urban | 10 | 8 | ASP |
| 7 | Bangalore Urban | 15 | 13 | SBR |
| 8 | Bangalore Urban | 5 | 3.5 | SBR |
| 9 | Bangalore Urban | 75 | 75 | ASP |
| 10 | Bangalore Urban | 120 | 70 | 2 stage TF |
| 11 | Bangalore Urban | 60 | 10 | HRC |
| 12 | Bangalore Urban | 1 | 1 | ASP |
| 13 | Bangalore Urban | 5 | 5 | SBR |
| 14 | Bangalore Urban | 2 | 1.8 | SBR |
| 15 | Bangalore Urban | 20 | 10.814 | SBR |
| 16 | Bangalore Urban | 20 | 8.484 | EAP |
| 17 | Bangalore Urban | 20 | 20 | UAS |
| 18 | Bangalore Urban | 40 | 30 | SBR |
| 19 | Bangalore Urban | 60 | 60 | ASP |
| 20 | Bangalore Urban | 60 | 40 | ASP |
| 21 | Bangalore Urban | 20 | 20 | SBR |
| 22 | Bangalore Urban | 20 | 10 | SBR |

| | | | | |
|---|---|---|---|---|
| 23 | Chamarajanagar | 9 | 5 | FAL |
| 24 | Kanakapura | 6.29 | 4 | WSP |
| 25 | Magadi | 3.7 | 1.5 | WSP |
| 26 | Kollegal | 9 | 5 | EAT |
| 27 | Gundlupet | 2.5 | 1.5 | WSP |
| 28 | Gundlupet | 1.5 | 1 | WSP |
| 29 | Chikmagalur | 20 | 6 | MBBR |
| 30 | Belur | 2.4 | 2.4 | WSP |
| 31 | Belur | 0.3 | 0.3 | WSP |
| 32 | C.R Patna | 4.6 | 4.6 | WSP |
| 33 | Hassan | 10 | 10 | WSP |
| 34 | H. N Pura | 3 | 3 | OP |
| 35 | Maddur | 3.5 | 3.5 | WSP |
| 36 | Mandya | 9.62 | 7.5 | OP |
| 37 | Mandya | 8.9 | 7.5 | WSP |
| 38 | SR Patna | 2.27 | 2.27 | WSP |
| 39 | SR Patna | 1.63 | 1.63 | WSP |
| 40 | Nagamangala | 3 | 1 | WSP |
| 41 | Malavalli | 5.65 | 0.5 | WSP |
| 42 | K.R Pet | 5 | 2 | WSP |
| 43 | Mysore | 60 | 39 | FAL |
| 44 | Mysore | 67.5 | 51 | FAL |
| 45 | Mysore | 30 | 15 | FAL |
| 46 | Nanjangud | 7 | 2.35 | AL |
| 47 | Bannur | 2.5 | 0.5 | WSP |

| | | | | |
|---|---|---|---|---|
| 48 | Hunsur | 3.9 | 3.9 | AL |
| 49 | K.R.Nagar | 1.45 | 1.45 | WSP |
| 50 | K.R.Nagar | 2.5 | 2.5 | WSP |
| 51 | K.R.Nagar | 1.44 | 1.44 | WSP |
| 52 | Tumkur | 25 | 18 | AL |
| 53 | Turuvekere | 1.95 | 0 | UASB |
| 54 | Udupi | 12.5 | 5 | FAL |
| 55 | Coimbatore | 70 | 35 | SBR |
| 56 | Coimbatore | 60 | 6 | SBR |
| 57 | Dindigul | 13.65 | 3 | ASP |
| 58 | Thanjavur | 28.05 | 14.15 | ASP |
| 59 | Tiruppur | 15 | 8.5 | EASP |
| 60 | Erode | 50.55 | 27 | MBBR |
| 61 | Salem | 13 | 11 | ASP |
| 62 | Salem | 6 | 5 | MBBR |
| 63 | Salem | 35 | 8 | FAB |
| 64 | Salem | 44 | 1 | FAB |
| 65 | Karur | 15 | 5.63 | EAP |
| 66 | Namakkal | 5 | 5 | ASP |
| 67 | Mettur STP-1 | 0.823 | 0.354 | ASP |
| 68 | Mettur STP-2 | 0.924 | 0.314 | ASP |
| 69 | Mettur STP-3 | 5.452 | 2.834 | ASP |
| 70 | Kumbakonam | 17 | 12.5 | ASP |
| 71 | Nagapattinam | 9.63 | 4.4 | ASP |
| 72 | Nagapattinam | 2.69 | 1.1 | EASP |

| | | | | |
|---|---|---|---|---|
| 73 | Tiruvarur | 6.92 | 4.1 | ASP |
| 74 | Ariyalur | 4.16 | 1.5 | ASP |
| 75 | Perambalur | 4.2 | 3.6 | ASP |
| 76 | Udhagamandalam | 5 | 4 | WSP |
| 77 | Udumalaipet | 7.81 | 4 | ASP |
| 78 | Rasipuram | 6.96 | 3.3 | ASP |
| 79 | Sathyamangalam | 4.08 | 0.5 | ASP |
| 80 | Mettupalayam | 8.65 | - | ASP |
| 81 | WAYANAD | 0.14 | 0.05 | FAB |
| 82 | WAYANAD | 0.01 | 0.01 | SBR |
| 83 | WAYANAD | UC | UC | - |

**Source:** NMCG

AL: Aerated Lagoon, ASP: Activated Sludge Process, TF: Trickling Filter, EAP: Effluent Application Process, EA: Extended Aeration, EASP: Extended Aeration Sludge Process, FAB: Fluidized Aerobic Bed, FAL: Facultative Aerated Lagoon, HRC: High Rate Clarifier, MBBR: Moving Bed Biofilm Reactor, MBR: Membrane Bioreactor, OP: Oxidation Pond, , SBR: Sequencing Batch Reactor, TF: Trickling Filter, UASB: Up-flow Anaerobic Sludge Blanket, UC: Under Construction, UV: Ultra Violet, WSP: Waste Stabilization Pond.

# 5. Sanitation plan

Sanitation planning refers to the strategic process of ensuring safe, equitable, and sustainable sanitation services, including waste collection, transportation, treatment, and disposal. A sanitation plan (Fig. 6) aims to identify, assess, and mitigate risks related to public health and the environment by establishing systems that provide clean water, adequate waste management, and proper sanitation. This plan involves a holistic approach to managing sanitation systems across urban and rural areas, with an emphasis on health, hygiene, environmental sustainability, and social equity. Sanitation planning is a preventive risk management approach that identifies the risks associated with waste management, focusing on the entire sanitation service chain:

- Waste collection and transportation
- Waste treatment and disposal
- Water and wastewater treatment
- Reuse and resource recovery (e.g., composting, biogas production)


**Fig. 6.** Workflow of sanitation plan

The plan involves local authorities, government bodies, NGOs, communities, and private sector participants, working together to ensure effective waste management and sanitation. In India, with its large population, rapid urbanization, and rural-urban disparities, sanitation is a critical issue. Managing sanitation systems is essential for public health, reducing disease burden, and protecting the environment.

Open defecation has been a common issue especially in rural India. Historically, it wasn't considered a shame or looked at from a sanitary perspective. Over the past few decades, Karnataka has seen the implementation of various sanitation projects under centrally sponsored schemes, externally aided programs and Government of Karnataka sponsored programs such as Nirmal Grama Yojana, Swachh Grama Yojana, etc. According to the Baseline Survey of 2012, out of 70.32 lakh rural households in Karnataka, 35% households had toilets, while the majority 65% were without toilets. To achieve the desired goal of accelerating sanitation coverage across rural India, "Swachh Bharat Mission" was launched on 2$^{nd}$ October 2014 by the Government of India. From 2nd October 2014 to 19th November 2018, 48 lakh Individual Household Latrines (IHHLs) were constructed across the state (RDWSD).

## 5.1. Public toilets

Under this scheme, every BPL household, SC / ST households belonging to restricted APL sector, small and micro families, landless families, differently abled families and household headed by women can construct individual toilets with a subsidy of Rs.12000/- which consists of Rs.7200/- from central government and Rs.4800/- from state government. The SC/ST family can get a benefit of Rs.15000/- where the state government provides an additional Rs.3000/- under SCP/TSP. Focus is also given for the construction of Community Toilets wherever needed (Fig. 7).


**Fig. 7.** Public toilets

**(Source:** RDWSD)

Sustainability of Open Defecation Free (ODF) status is the main objective of SBMG Phase-2. Central Ministry of Jal Shakti has instructed to construct community toilets (Fig. 8) if there is no availability of space to build individual toilets, and where there are maximum of 35 households. In the state, 905 community toilets are in use (as of August 2020), and the construction of 1862 community sanitary complexes are in progress. SBM (G) compensates up to 70% of the total fund and the remaining 30% can be covered under the 15$^{th}$ finance commission.


**Fig. 8.** Community toilets

**(Source:** RDWSD)

In Tamil Nadu, the responsibility for maintaining public toilets (Fig. 9) in districts outside of Chennai lies primarily with the local urban bodies (ULBs), which include municipal corporations, municipalities, and town panchayats. Each of these entities is tasked with planning, constructing, operating, and maintaining public sanitation facilities within their respective jurisdictions.

- **Local Urban Bodies:** Each district's municipal corporation or municipality is responsible for the upkeep of public toilets. This includes cities like Coimbatore, Madurai, Tiruchirappalli, and others where local bodies manage the sanitation facilities.
- **Public Health Department:** The Public Health Department at the local level also plays a role in overseeing sanitation standards and ensuring that public toilets meet hygiene requirements.
- **Private Partnerships:** In some cases, local bodies may outsource maintenance to private contractors to improve service efficiency. However, this has sometimes led to challenges regarding the quality of maintenance, as highlighted by public complaints in various districts.
- **Swachh Bharat Mission:** The central government initiative encourages ULBs to enhance public sanitation facilities, and it provides guidelines for effective management of public and community toilets. This mission emphasizes the importance of adequate maintenance and cleanliness to combat open defecation and improve overall public health.

The maintenance of public toilets in Tamil Nadu's districts is primarily managed by local urban bodies, with support from state health departments and potential private sector involvement.


**Fig. 9.** Public toilets in Tiruchirappalli
(**Source:** TNUSSP)

## 5.2. Waste management

Solid waste generation in an inevitable consequence of rapid urbanization, population explosion, changing lifestyle and modernization. SWM is efficient collection, transportation, processing, recycling and disposal and monitoring of waste and its impact on environment. SWM is one of the major challenges all over the world and in India. About 72 million Tons of SW is generated in the country, of which 43 million Tons are collected and only 12 million Tons of waste is scientifically treated. Balance quantity of 31 million Tons is dumped in landfills without any treatment. Un-scientific landfilling of municipal solid waste (MSW) generates huge quantity of leachate, which contaminates water. Most of the ULBs adopt landfilling as the option for disposal of SW, which is linked to water contamination, generation of greenhouse gases beside odour nuisance.

### 5.2.1. Objectives of waste management

- **Environmental Protection:** Prevent pollution of air, water, and soil by ensuring proper waste treatment and disposal.
- **Public Health:** Minimize the risk of disease transmission by managing waste in sanitary ways.
- **Resource Conservation:** Promote recycling and reusing waste materials to conserve natural resources.

- **Energy Recovery:** Harness energy from waste materials through processes like incineration or anaerobic digestion.
- **Compliance with Regulations:** Adhere to environmental laws and waste management standards set by governments and international organizations.

### 5.2.2. Waste generation in the CRB

The data reveals considerable variability in MSW generation across districts within the same state, underscoring the influence of population density, economic activity, and urbanization levels (Fig. 10) (Waste management in Karnataka: Realities and opportunities). For instance, Bengaluru Urban district in Karnataka records the highest MSW generation at 4,593 tons per day (TPD), reflecting its status as a major metropolitan hub. In contrast, districts such as Chamarajanagar generate significantly lower quantities, around 75 TPD, due to their rural and less densely populated nature. In Tamil Nadu, Coimbatore (990 TPD), as one of Tamil Nadu's major urban and industrial hubs, it generates high MSW due to its dense population, thriving IT and textile industries, and urban sprawl. Smaller districts like Ariyalur (14 TPD) generate less waste due to their rural nature, smaller populations, and lack of extensive industrialization.

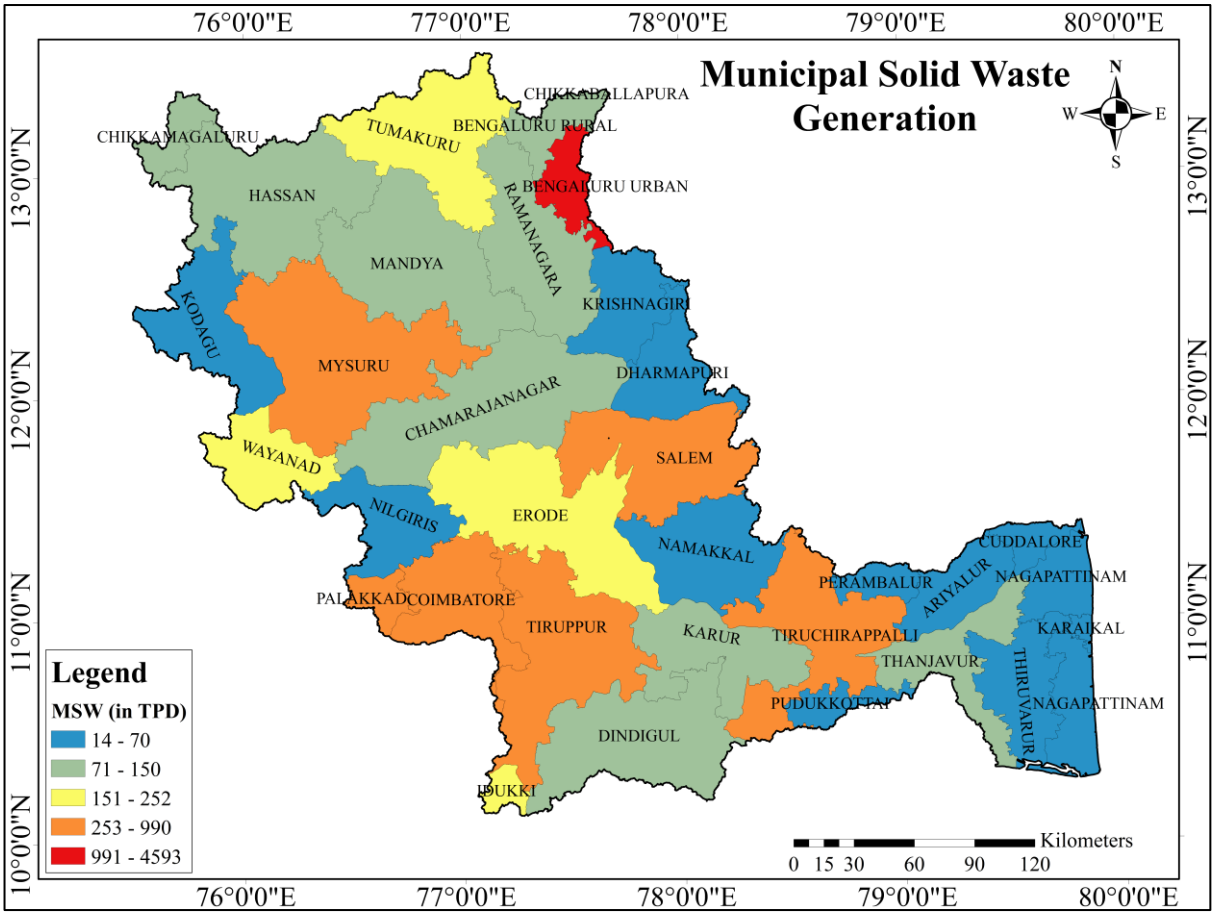


**Fig. 10.** Municipal sloid waste generation map of the CRB

District-wise analysis of municipal solid waste generation highlights the pressing need for tailored waste management strategies. Urban centres with high waste generation require

immediate interventions to prevent environmental and public health crises, while rural districts need support to establish efficient waste processing systems. Policymakers, municipal authorities, and citizens must collaborate to build a sustainable framework for managing solid waste effectively. By adopting innovative practices and fostering a culture of responsibility, districts can transition towards a cleaner, more sustainable future.

### 5.2.3. Government initiatives for solid waste management

In the context of the CRB, which is one of the most important river systems in southern India, waste management plays a critical role in preserving the health of the river and the surrounding environment. The river basin is vital for drinking water supply, agriculture, industry, and the livelihoods of millions of people. However, pollution, particularly from industrial, agricultural, and domestic waste, threatens the quality of water and overall ecosystem health in the region. The various government initiatives taken for waste management are described below:

a) **Swachh Bharat Mission**
   The central government's cleanliness mission, aimed at improving waste management practices across urban and rural areas, is being implemented in different districts under the CRB. The mission emphasizes clean cities, waste segregation, and the elimination of open defecation.

b) **State Policy on Solid Waste Management**

   The state government has adopted a comprehensive policy that sets goals for reducing waste generation, promoting segregation, recycling, and composting, and minimizing the impact of waste on the environment.

c) **Public Awareness Campaigns**

   NGOs, local bodies, and the state government are also involved in running awareness campaigns to encourage waste segregation, reduce plastic use, and promote recycling.

### 5.2.4. Efforts and challenges in effective solid waste management

While there are waste treatment plants in some urban areas, they are often insufficient or underperforming due to outdated technology or lack of proper maintenance. In some places, sewage continues to be discharged untreated into the Cauvery. Several government and non-governmental organizations have been working to reduce pollution in the Cauvery, such as the Cauvery Calling initiative by the Isha Foundation, which focuses on reforestation and watershed management. However, more targeted efforts are required to address the root causes of industrial, domestic, and agricultural waste.

## 5.3. Community sanitation programs

Community sanitation programs in the CRB are critical for improving water quality, ensuring public health, and promoting sustainable management of the river's resources. Here's an outline of how such programs can be implemented and their potential impact:

### 5.3.1. Current challenges in the CRB

a) **Water Pollution:** Untreated sewage, agricultural runoff, and industrial effluents are major contaminants.

b) **Public Health Issues:** Lack of proper sanitation leads to waterborne diseases.

c) **Social Inequity:** Rural and underprivileged communities often lack access to basic sanitation infrastructure.

### 5.3.2. Objectives of community sanitation programs

a) Reduce the inflow of untreated wastewater into the river.

b) Enhance access to sanitation facilities in rural and urban areas.

c) Raise awareness about the importance of sanitation for river health and community well-being.

d) Promote behavioural changes through education and participation.

### 5.3.3. Key components of the programs

**a) Infrastructure Development**

- Construction of toilets in rural and peri-urban areas.
- Establishment of decentralized wastewater treatment systems.
- Building community-managed solid waste management units to prevent garbage from entering the river.

**b) Capacity Building and Training**

- Training community members in sanitation maintenance and waste management.
- Forming local self-help groups to monitor sanitation activities.

**c) Awareness Campaigns**

- Conducting workshops on the linkage between sanitation and river health.
- Creating culturally relevant messages that incorporate local traditions and values, including references to the sacred significance of the Cauvery River in Hinduism.

**d) Policy and Institutional Support**

- Collaborating with local government bodies and NGOs for funding and implementation.
- Ensuring compliance with the National Water Policy and Swachh Bharat Mission initiatives.

**e) Monitoring and Evaluation**

- Utilizing GIS and remote sensing tools to track pollution hotspots and sanitation facility distribution.
- Regular water quality monitoring to measure the impact of sanitation programs.

**f) Role of Stakeholders**

- **Government**: Formulate policies and provide funding.
- **Local Communities**: Actively participate in the planning, implementation, and monitoring processes.
- **NGOs and CSOs**: Facilitate capacity building, awareness, and technical support.
- **Academia and Researchers**: Provide evidence-based solutions and evaluate program impacts.

**g) Expected Outcomes**

- **Improved Water Quality**: Reduction in contaminants entering the river.
- **Public Health Benefits**: Decrease in diseases like cholera and dysentery.
- **Community Empowerment**: Enhanced participation and ownership of sanitation initiatives.
- **Sustainability**: Long-term benefits through integrated water and sanitation management.

**h) Integrating River Conservation with Sanitation**

Sanitation programs can complement river conservation by:

- Reducing non-point and point-source pollution.
- Encouraging nature-based solutions, such as wetland restoration, to treat wastewater naturally.
- Strengthening community-centric river management models, supported by traditional knowledge and cultural practices.

# 6. Riverfront development plan

Riverfront development is a transformative urban planning initiative aimed at revitalizing and enhancing riverfronts, fostering economic growth, improving public access, creating recreational spaces, and preserving environmental integrity. By leveraging the potential of rivers as key natural assets, these developments can provide sustainable and vibrant spaces for communities. The focus of such projects is not only on improving the aesthetics and functionality of riverfronts but also on creating an integrated approach that balances ecological, economic, and social goals.

## 6.1. Initiatives on riverbank protection

To safeguard the banks of the Cauvery River, a combination of structural and bioengineering measures will be implemented. Native vegetation, such as Vetiver grass, will be planted to stabilize the soil and prevent erosion, while riprap and gabion walls will be installed in areas prone to high water flow to deflect and absorb the energy of the river. Terracing will be employed to reduce the slope of the riverbanks, slowing down water velocity and minimizing

erosion. These initiatives will be complemented by regular monitoring and maintenance to ensure the long-term stability of the riverbanks.

## 6.2. Recreational spaces

Creating recreational spaces along the Cauvery River will provide the community with areas for leisure and outdoor activities while maintaining the ecological balance of the region. Parks with landscaped green spaces, playgrounds, and sports facilities will be established to cater to people of all ages. Additionally, cultural spaces such as open-air venues and amphitheatres will host events, fostering community engagement. Designated zones for water activities like kayaking, boating, and fishing will be developed to promote safe interaction with the river.

## 6.3. Walkways

Pedestrian walkways along the river will offer scenic routes for walking, jogging, and cycling, promoting healthy lifestyles. These paths will be designed to be continuous and accessible, ensuring inclusivity for all, including those with mobility challenges. Bicycle lanes will run alongside the walkways, encouraging eco-friendly transportation. Viewing decks at strategic locations will provide panoramic views of the river and its surroundings, while tree-lined paths will offer shade and enhance the aesthetic appeal of the riverfront.

## 6.4. Ecological restoration

Restoring the natural habitat along the Cauvery River is crucial for maintaining biodiversity and improving water quality. Reforestation with native trees will help rebuild the forest cover, while the creation of wetlands will support diverse flora and fauna. Enhancing the aquatic habitat with structures like submerged logs or artificial reefs will provide shelter for fish and other species. Efforts will also focus on controlling pollution by reducing industrial discharge, managing agricultural runoff, and promoting waste management practices. Community involvement will be encouraged through awareness programs and volunteer activities, ensuring collective responsibility for the river's health.

## 6.5. Implementation plan

The implementation of these initiatives will follow a phased approach (Fig. 11). Initially, a comprehensive assessment of the current state of the riverbank and surrounding areas will be conducted. This will be followed by the development of detailed project designs and securing the necessary permissions, involving all stakeholders in the planning process. The subsequent phase will involve the construction and implementation of the protection measures, recreational spaces, walkways, and ecological restoration projects. Finally, ongoing monitoring and maintenance will ensure the sustainability of these efforts, address any emerging challenges and adapt to changing conditions. This holistic plan aims to harmonize development with environmental conservation, preserving the Cauvery River's natural and cultural heritage for future generations.

The Infrastructure Development Department (IDD), Government of Karnataka (GoK) has identified various projects in the State for development through Public Private Partnership (PPP) frameworks. One such project identified is the development of waterfronts in the State.

As a preliminary step in the project development activities, IDD intends to undertake a pre-feasibility study to ascertain the Project's amenability for development under PPP. Moreover, Infrastructure Development Corporation (Karnataka) Limited (iDeCK) has been awarded the mandate for undertaking the pre-feasibility study for the above-mentioned project. The Report also discusses the various options for implementation of the project and sets out the next steps in the study.

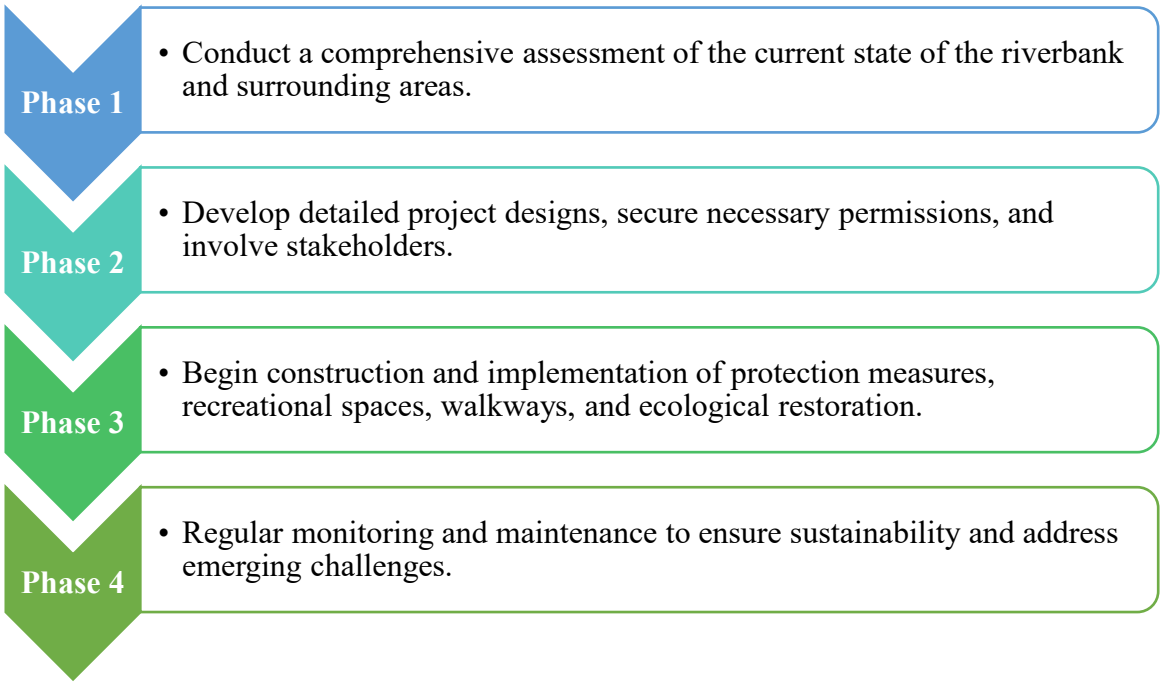


**Fig. 11.** Implementation plan for infrastructure development

The Karnataka government has initiated several projects aimed at developing and rejuvenating the Cauvery River and its surroundings. Some of the riverfront development plans are described below:

**a) Cauvery Stage V Project**

Launched on October 16, 2024, this project aims to supply 775 million litres per day (MLD) of water to Bengaluru, increasing the city's total water intake to 2,225 MLD. This expansion is expected to provide approximately 15 lakh new water connections.

**b) Cauvery Stage VI Project**

Announced concurrently with Stage V, this proposed project plans to extract an additional 500 MLD from the Cauvery River to meet Bengaluru's growing water demands. The estimated cost is around ₹7,200 crore, with funding anticipated through international loans.

**c) Mekedatu Dam Project**

The state government is set to acquire approximately 5,096 hectares of forest land in the CRB for the construction of the Mekedatu dam. This project aims to enhance water storage and supply capabilities.

**d) Waterfront Development Initiatives**

A pre-feasibility study has been conducted for waterfront development in Karnataka, focusing on balanced land use and sustainable planning along rivers, including the Cauvery. This initiative aims to enhance tourism, environmental conservation, and local livelihoods.

**e) Cauvery Calling Campaign**

Spearheaded by the Isha Foundation, this campaign supports farmers in planting 242 crore trees to revitalize the Cauvery River ecosystem. The initiative focuses on sustainable agriculture and environmental conservation.

The Tamil Nadu government has also initiated several projects aimed at developing and rejuvenating the Cauvery River and its surroundings. Some of the riverfront development plans are described below:

**a) Tiruchirappalli's first riverfront development**

The project plans to develop a 250-meter stretch along the Cauvery River. The plan includes a riverside walking track, a 30-foot watchtower, an amphitheatre, a kids' play area, bathing ghats, planters with seating, a sundial, and public toilets (Fig. 12). The Tiruchirappalli Corporation will oversee the project, with an estimated cost of Rs. 14 crores. As the Cauvery River holds both cultural and economic importance, a master plan prepared for Tiruchirappalli with projections for 2041 had suggested riverfront development for the city to tackle pollution and other non-conforming activities.

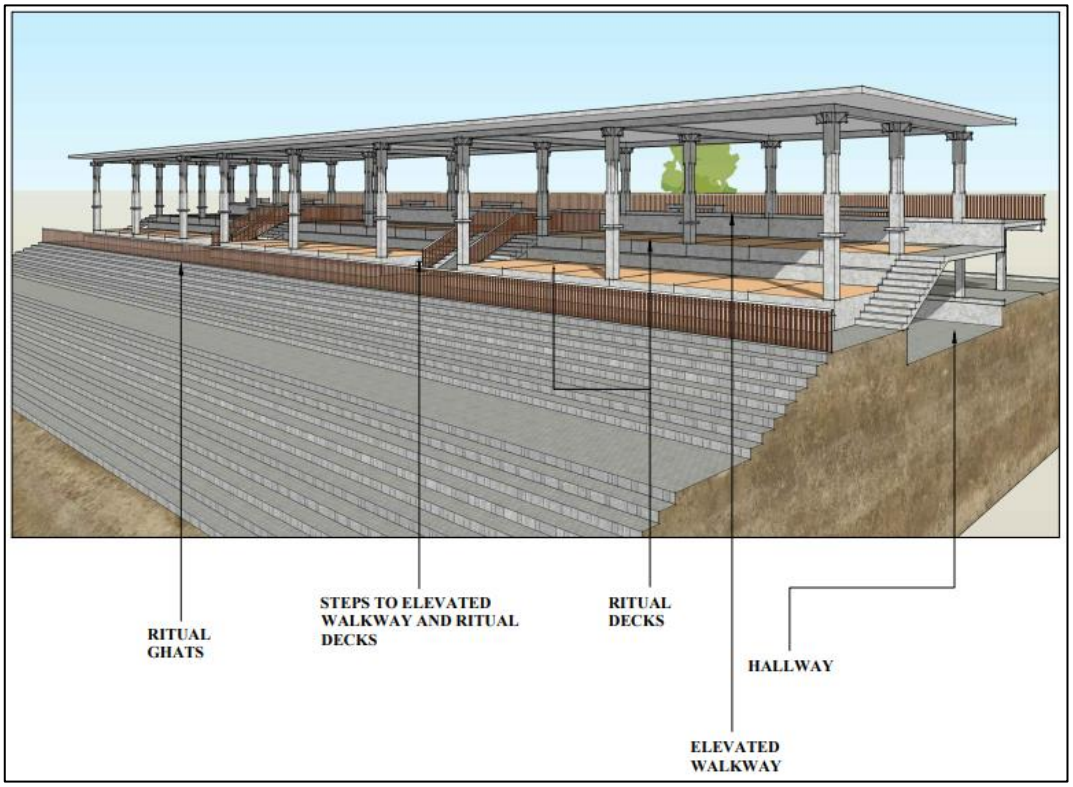


**Fig. 12.** Tiruchirappalli's riverfront development
**(Source:** WRD - Nadanthai Vaazhi Cauvery Project**)**

### b) Nadanthai Vaazhi Cauvery Project

To rejuvenate the Cauvery River and its tributaries, the project aims to construct new check dams, sewage treatment plants, and implement a real-time water quality monitoring system. The project is being executed in phases, with an estimated cost of Rs 11,250 crore, funded by both the centre and state (Fig. 13). The Nadanthai Vaazhi Cauvery Project DPR - Phase - I was completed by Website of Water and Power Consultancy Services (WAPCOS) and submitted to National Centre for Rural Development (NCRD) through Environment Protection Training & Research Institute (EPTRI). The NCRD has accorded approval and given recommendations. The replies to NCRD observations and funding pattern are submitted to the Government of Tamil Nadu for getting finance concurrence.


**Fig. 13.** Riverfront development in Mettupalayam

(**Source:** WRD - Nadanthai Vaazhi Cauvery Project)

### c) Cauvery River eco-park in Tiruchirappalli

This development focuses on eco-tourism by creating an eco-park and a riverfront walkway. Efforts are also underway to restore the natural beauty of the river and improve access to Srirangam Island, a key historical location in Tiruchirappalli.

### d) Cauvery riverfront development in Karur

The plan focuses on pedestrian-friendly areas, recreational spaces, improved waste management, and river conservation efforts to enhance the aesthetic value of the riverfront while promoting tourism.

### e) Mettur dam & surrounding area development

Plans include upgrading infrastructure around Mettur Dam to improve access to tourist sites, adding promenades, viewpoints, and facilities for boating. The project focuses on eco-tourism while preserving the ecological balance of the region.

### f) Sustainable development along the Cauvery River

Sustainable riverfront development aims at flood control, water management, waste treatment, and tree planting along the riverbanks to reduce erosion and enhance biodiversity (Fig. 14).

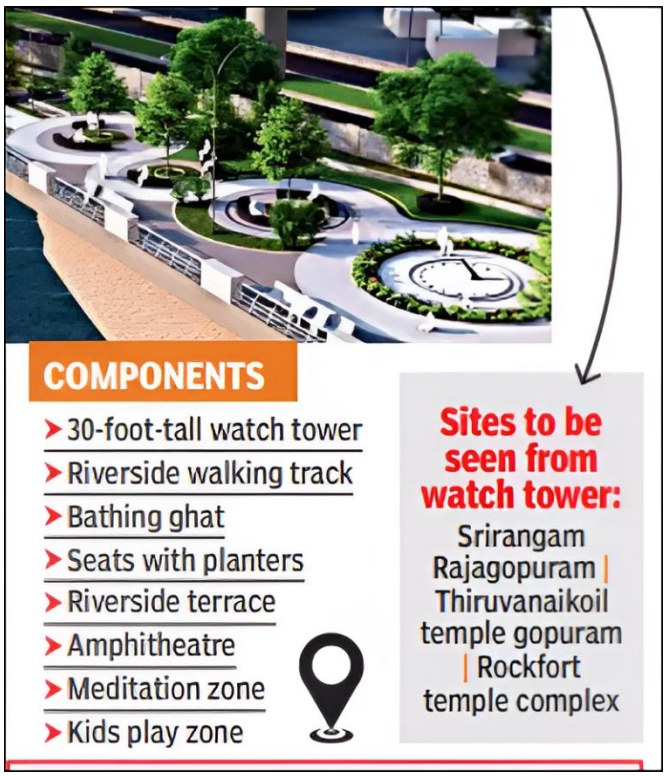


**Fig. 14.** Proposal of riverfront development plan

**(Source:** Times of India)

These efforts reflect a comprehensive approach to managing the Cauvery River's resources, balancing developmental needs with environmental sustainability.

## 6.6. Goals of Cauvery Riverfront development

### a) Ecological Conservation

Protect and restore the river's ecosystem by reducing pollution, improving water quality, and preserving biodiversity.

### b) Tourism Promotion

Develop the Cauvery region as a prominent eco-tourism and heritage tourism destination by building recreational and cultural spaces.

c) **Urbanization & Infrastructure**
   Improve urban spaces along the riverfront with pedestrian walkways, green spaces, transportation access, and enhanced public utilities.
d) **Sustainable Development**
   Ensure that all developments respect environmental sustainability, balancing modern infrastructure with ecological preservation.
e) **Cultural Heritage**
   Emphasize and preserve the cultural and historical importance of the Cauvery River to local communities, while integrating new development with existing heritage sites.

## 6.7. Need for riverfront development

The increasing pace of urbanization and industrialization has left many towns/ cities with minimum avenues for recreation and open green spaces. A developed waterfront trail would provide residents access to new recreation opportunities and an expanded awareness of the natural aspects of river life. The waterfront would attract a growing legion of morning walkers and after-work runners. Added to this, public access sites connected by linear greenways will tie developments together, eliminating barriers, both real and imagined and animate the waterfront with the light and life of the city.

This form of urban redevelopment can pull the waterfront areas from marginal use and neglect into the mainstream of public activity and private investment. Cities enjoy increased tourism, employment and growth. This amenity would attract significant new high-quality investment and encourage people once again to approach the water; an instinct lost during a century of industrialization. Most importantly, a vital and vibrant waterfront serves to unite residents and visitors in a shared experience of the city. It is in that daily exchange of ideas and points of view that a city finds the energy and desire to continually improve and remake itself.

## 6.8. Advantages of riverfront development

The advantages of developing river front are manifold ranging from economic benefits, environmental benefits to social/ community benefits. These benefits are detailed below.

a) With the development of waterfront there would be creation of jobs in developing the front, jobs as it gives way to starting up of a host of commercial activities in that region and indirect job creation associated with the set of activities.
b) Source of revenue for government – government would be able to earn revenue in terms of taxes from the commercial activities in the region. The commercial activities include shops, restaurants, sport activities, transportation, boating etc which can be leased out or giving to private players to operate.
c) Development of tourism in the region – with the development of waterfront the tourism in the region can be increased by offering a variety of attractions like water sports, entertainment arenas, parks, shopping areas, etc.
d) Economic spin-off's – rise in the value of properties in and around the region, acting as a catalyst for redevelopment and renewal of nearby places.
e) Habitat protection and restoration.

# 7. Other initiatives or plans

Accompanying the major activities directed towards the management of river basins, a few more activities are also important in the context of development and improvement of the infrastructure in the territories (Table 11). These activities are concerned with managing water resources which calls for meeting the requirements of agriculture, industry, and domestic use and at the same time protecting the ecosystem. Such modern irrigation systems, flood control features, and sewage treatment plants are developed for improvement of water efficiency and environmental conservation.

Additionally, constructing multipurpose dams and reservoirs for the development of hydroelectricity generation and recreational activities, as well as water supply is also being considered. There are also people-oriented approaches aimed at developing capacity of the community in engaging local water management, ownership and responsibility of the stakeholders. The capacity building and technological programs suggested works to empower the local authorities and the people in effective resource use.

Also, the other proposed activities include restoration of tree cover along the riverbanks for water purification, preservation of vector biodiversity and curtailing soil erosion. There is a marked and planned synergy with academia and research institutions to support evidence based decision-making and new approaches. All in all, these activities seek to provide the river basin enhancement approaches with a diversified and flexible base to promote sustainable environmental management and economic prosperity objectives.

**Table 11.** News articles related to other development plans

| Sr. No. | Title | Description | Year | Source |
|---|---|---|---|---|
| 1. | NRCD approves ₹934.3 crore for first phase of 'Nadanthai Vaazhi Cauvery' project. | A project proposed by the Tamil Nadu government for the conservation and rejuvenation of Cauvery River. The National River Conservation Directorate (NRCD), a wing of the Union Ministry of Jal Shakti, has approved ₹934.3 crore for the first phase of the 'Nadanthai Vaazhi Cauvery'. The Union and State governments would share the project cost as ₹560.58 crore and ₹373.72 crore respectively on a 60:40 basis. The components of the project include sewage management at ₹577. 151 crore, riverfront development activities at ₹176.98 crore, river surface cleaning at ₹27 crore, solid waste management at ₹30.89 crore and people | June, 2024 | https://www.thehindu.com/news/national/tamil-nadu/nrcd-approves-9343-crore-for-first-phase-of-nadanthai-vaazhi-cauvery-project/article68317112.ece |

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| | | participation and awareness creation at ₹6 crore. Among the other items would be rehabilitation and resettlement for the high-risk area, flood-prone zone and intervention required area along with real-time monitoring system to ensure water quality (₹27.58 crore), a museum at Grand Anicut (Kallanai) at ₹36.7 crore and biodiversity at ₹52 crore. In the first phase, the project would cover the river from downstream of the Mettur dam up to Tiruchirappalli and in the second, the remaining part of the river from Tiruchirappalli to Poompuhar, the river's confluence points with the sea. | | |
| 2. | CWC gives nod for Rs 11K crore Cauvery rejuvenation project in Tamil Nadu. | Central Water Commission (CWC) has given its approval for the Rs 11,250 crore Nadanthai Vaazhi Cauvery project which aims to rejuvenate hundreds of water bodies linked to the Cauvery River and its tributaries across the state to prevent them from pollution and effluents. The rejuvenation programme is executed in two phases at a cost of Rs 1,958 crore and Rs 8,753 crore. The project aims to conserve, rejuvenate, and enhance water resources in the CRB on the lines of Namami Gange Programme, a flagship scheme of the Union Government implemented with the objectives of effective abatement of pollution, conservation and rejuvenation of Ganga. The Cauvery project proposes to address pollution concerns by identifying sewage and effluent inflow into water bodies through setting up of STPs and ecological conservation of the Cauvery River and its tributaries. Ten common effluent treatment plants for textile units will be built at a cost of Rs 119.56 crore under the project in Erode and Namakkal regions and 65 sewage | June, 2024 | https://www.newindianexpress.com/states/tamil-nadu/2024/Jun/08/cwc- gives-nod-for-rs-11k-crore-cauvery-rejuvenation-projec t-in-tn |

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| | | treatment plants (209.30 MLD combined capacity) will be built in areas from Mettur to Tiruchy under the project. Riverfront development will also be taken up at Bhavani Kooduthurai, Karur, Kodumudi, Mettupalayam, Mettur, Pallipalayam, Sathyamangalam Bridge site and upper anicut. | | |
| 3. | Rs 7,700-crore project to modernise irrigation infrastructure in the CRB to be ready by 2024. | The Project aims to the CRB's irrigation infrastructure would be extended, renovated and modernised by the end of year in a few parts and the rest of the works would be completed before 2024. The CRB has hundreds of rivers and rivulets and more than 10,000 canals of various sizes and categories. Most of the irrigation infrastructure, including canal lines and water pathways, was built during the Chola and British eras, they have been severely damaged.<br>Moreover, tail-end areas of CRB haven't been getting enough water, affecting agricultural activities. Also, due to inter-state water disputes, there are roadblocks in undertaking renovation works in areas around Cauvery River and its tributaries. After the green signal by Cauvery Water Regulation Committee, the State government had planned to extend, renovate and modernise irrigation infrastructure in the CRB at Erode, Namakkal, Tiruchirappalli, Thanjavur and nearby districts at an estimated cost of Rs 7,705.75 crore in 2019. Though a few works are nearly complete, most of them are still on. Under this project, 95 per cent of works have been finished at Erode, Namakkal, Tiruppur and Karur districts. "The State government sanctioned Rs 933 crore for Lower Bhavani project in Erode, Rs 335 crore for Kattalai High-Level Canal in Karur | January, 2022 | https://www.newindianexpress.com/states/tamil-nadu/2022/Jan/21/rs-7700-crore-project-to-modernise-irrigationinfrastructure-in-cauvery-basin-to-be-ready-by-2024-2409454.html#:~:text=Tamil%20Nadu-,Rs%207%2C700%2Dcrore%20project%20to%20modernise%20irrigation%20infrastructure%20in%20Cauvery,infrastructur |

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| | | and Tiruchy, Rs 3,384 crore for Cauvery sub-basin in Tiruvarur, Myladuthurai Nagapattinam, and Karaikal districts, as well as Rs 1,038 for the Grant Anicut in Thanjavur," the official added. Water from Mettur dam is released between June 12 and January 28 every year for irrigation. Hence, WRD officials temporarily stop works in the CRB during this period. Occasionally, rivers and canals might have water till February, and work is stopped during this period as well. Works start when riverbeds are dry. As part of the project, in all districts where the Cauvery flows, concrete linings would be made in all damaged sluices, check dams, drainage inlets, cross masonries and regulators. Works will be undertaken along nearly 2,000 km as part of the project. The official assured that, after completion of works, tail-end regions will get more water and 8.83 lakh acres of ayacut lands are likely to benefit. | | e%20in%20the%20Cauvery%20basin. |
| 4. | Cauvery Calling drive to stop river from drying up | The Isha Foundation launched the Cauvery Calling campaign in Bengaluru on July 21, 2019. The Cauvery Calling campaign aims to revitalize the Cauvery River and help farmers by planting 242 crore trees. The campaign's goals include improving soil and water conditions, improving farmers' economic situation, increasing farmers' income, and retaining water in the soil. Cauvery Calling is a first of its kind campaign, setting the standard for how India's rivers – the country's lifelines – can be revitalized. It will initiate the revitalization of Cauvery River and transform the lives of 84 million people. Cauvery Calling follows a tree-based agricultural approach that not only multiplies farmers' income through | July, 2019 | https://timesofindia.indiatimes.com/city/bengaluru/cauvery-calling-drive-to-stop-river-from-drying-up/articleshow/70314308.cm |

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|---|---|---|---|---|
| | | diversified tree-based agriculture practices but also enhances soil organic matter. This facilitates better water absorption, which in turn replenishes underground reserves and sustains the river's flow throughout the year. Agroforestry will revive the dying soil, increase water retention as well as river water levels. Agroforestry means farmers will dedicate one-third of their farm to growing fruit or timber trees. While 'Cauvery Calling', along with citizen volunteers and corporate bodies, will crowdfund saplings for these trees, the organisation plans to ask the government to incentivise farmers' decision to shift from conventional crops to fruit trees. | | |
| 5. | Short stretch of canal construction work along Tiruchi-Pudukottai border nears completion. | The construction of a canal along a short stretch, as part of Phase-I of the Cauvery-Vaigai-Gundar intra-state river linking project, is nearing completion. Launched in 2021, the project aims to divert surplus flows from the Cauvery to water-scarce regions of the State, including Pudukottai, Sivaganga, Ramanathapuram, and Virudhunagar, by constructing a canal connecting the Cauvery to the Vaigai and the Gundar. The barrage across the Cauvery at Mayanur in Karur district serves as the starting point of the new 262-km link canal, designed to transport surplus water from the Cauvery to the South Vellar, the Vaigai, and ultimately the Gundar. The canal is designed to carry approximately 6,000 cusecs of water. | November, 2024 | https://www.thehindu.com/news/cities/Tiruchirapalli/short-stretch-of-canal-construction-work-along-tiruchi-pudukottai-border-nears-completion/article68915820.ece |

# 8. Gaps/shortcomings in initiatives and plans

## 8.1. Identification of inefficiencies in current infrastructure

The current infrastructure across the CRB exhibits several inefficiencies, particularly in the provision of water supply and sanitation services. Many ULBs depend on state-run parastatal agencies for delivering these services, which are often unable to meet the growing demand

due to outdated infrastructure and insufficient capacity. Furthermore, the solid waste management systems, though improving, still face challenges in processing capacity and coverage, particularly in expanding urban areas.

### 8.2. Misalignment with urban growth

Urban growth in the CRB regions such as Karnataka and Tamil Nadu have been rapid and often unplanned, leading to misalignment between the available infrastructure and the needs of the population. Many master plans are outdated, and there is a lack of integration in planning efforts, particularly in eco-sensitive regions. For instance, several urban areas have exceeded their infrastructure capacities, and new developments have not been adequately supported by corresponding expansions in infrastructure.

### 8.3. Inadequacy of resources

The inadequacy of financial and technical resources is a significant challenge in the CRB's infrastructure development. The financial resources allocated for urban infrastructure projects are often insufficient to cover the expansive and rapidly growing needs of the urban population. Despite significant investment programs such as the Tamil Nadu Sustainable Urban Development Project, the estimated funding requirements far exceed the available budget, leading to delays and partial implementations. Additionally, there is a shortage of skilled personnel and modern technology to manage and maintain the infrastructure efficiently.

## 9. Significance of the infrastructure and planning report

The Infrastructure and Planning Report is crucial for the condition assessment and planning of the CRB, as it provides a comprehensive analysis of the existing infrastructure, including dams, canals, irrigation systems, and reservoirs (Fig. 15). This report identifies areas needing maintenance, upgrades, or new infrastructure to optimize water resource management. It also assesses the ecological health of the basin, highlighting issues like sedimentation, pollution, and biodiversity loss, which are essential for planning sustainable development projects that minimize environmental damage. Moreover, the report plays a vital role in flood and drought mitigation by helping design effective control measures and early warning systems, improving water storage and distribution networks. By evaluating current water usage patterns across sectors, the report supports equitable water allocation and identifies socio-economic opportunities where investments can enhance agricultural productivity, industrial growth, and living standards. Additionally, it serves as a key input for policymakers to make informed decisions regarding water governance and basin management, ensuring a balance between development and conservation. Importantly, the report also addresses climate change adaptation by identifying vulnerabilities in the basin’s infrastructure and aiding in planning resilient solutions to cope with changing environmental conditions. Overall, the report is essential for sustainable development, water security, and the long-term health of the CRB.

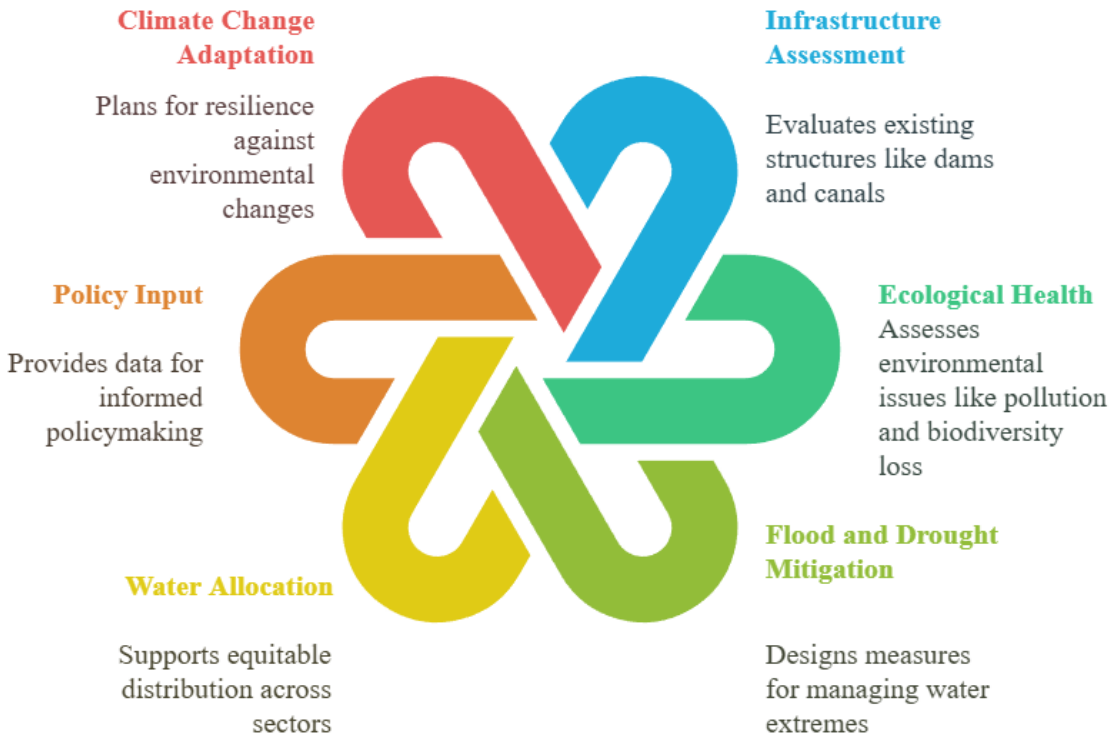


**Fig. 15.** Significance of the infrastructure and planning report

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